Chapter 1 — The significance of research in science education

1.1 Background information

The teacher is like a gardener who treats different plants differently, and not like a large scale farmer who administers standardised treatments to as near as possible standardised plants. Stenhouse (1979, in Hopkins, 2002).

This quotation, although nearly thirty years old, is one which hopefully every teacher in every classroom in Ireland and worldwide would be in agreement with. Teachers should aspire and strive to create and foster an environment in which all children can prosper, educationally, to the fullest of their potential. Rice and Corboy (1995) maintain that if children are to develop positive attitudes to science they must be taught by a teacher who has and who projects a positive attitude to the subject. Consequently every now and then it is prudent, as an educationalist, to ask oneself if this is true of one's own classroom and attitude. It is the continuing quest for the most inclusive teaching environment and the achievement of optimum participation rates which prompted this research project.

However media focus continues on the decline in interest of students in science at second level schools. Therefore I decided it was time to review and reappraise my efforts at teaching science in the classroom and to observe if the pattern of some children opting out of the subject was apparent at a junior primary level. This project focused on studying student behaviour in science lessons. The analytical methodology used was primarily video-recording and subsequent analysis of the data.

1.2 The current situation

It is understandable that our society is constantly changing. Our lives are vastly different now than they would have been thirty years ago due to various extrinsic factors such as the wealth of our country, the increasing use of the internet, satellite television and other factors too numerous to mention. In the same way our education system has been constantly evolving to fulfil our social needs becoming wider and more accessible to everyone. The question arises whether we, as teachers, and the children have moved with new developments in the Irish Education system, principally the hands-on involvement and enjoyment in science lessons for all students.

The latest development, in the primary school curriculum in Ireland, was the 1999 Revised Primary School Curriculum. This has effected major changes in the primary education system in Ireland. Within the revisions and of particular interest are the revised Social, Environmental and Scientific Education (S.E.S.E.) guidelines, which were implemented in 2003 by the Department of Education and Science (D.E.S.) in conjunction with the National Council for Curriculum and Assessment (N.C.C.A.). Prior to the revisions, science (as a subject) was taught under the umbrella of Environmental Studies and was not a priority for teachers as its status as a subject was low on a teacher's tight time schedule. The status of the subject changed dramatically, for teachers, with the revised S.E.S.E. guidelines which elevated the importance of science in the sense that it should be timetabled as a subject in its own right.

The major change in the teaching guidelines for science in the primary school is due in no small measure to the D.E.S. with the implementation of the Revised Primary School Curriculum and in particular the inclusion of science as a subject area. The

D.E.S. continues to monitor the status of science, as seen in the report of 2004 which recognised the declining number of students opting for science subjects, particularly physics, to study at third level; 4,166 males attempted the higher level paper at Leaving Certificate level compared with 1,670 females which was a marked decline from the previous year. The decline in interest was by no means a new revelation as it had been the trend in preceding years and a deciding factor in the revision of the science curriculum in Ireland. Regan and Childs (2003) report the declining numbers of student participation in sciences at Leaving Certificate over the previous fifteen years, made all the more significant with the rise of 17% in Leaving Certificate candidates. The D.E.S. demonstrates their commitment to improving declining interest in science at second level but it is important to note that it will take the students at the lower end of primary school nine or ten years to reach a level where science is offered as a subject choice.

In an effort to stimulate an interest in science as a subject the D.E.S. recognised that the primary school programme was of vital importance in awakening an interest in science. The D.E.S. in conjunction with the N.C.C.A. state that,

As well as helping children to become scientifically literate members of society, the curriculum aims to foster positive attitudes to science and to encourage pupils to develop an appreciation of the contribution of science and technology to society. An environmental and investigatory approach to science can make a unique and vital contribution to the holistic development and education of the child (D.E.S. and N.C.C.A., 1999).

The implementation of the revised guidelines would be fundamental to children as they progressed through the education system and hopefully should *"promote curiosity and enjoyment, so that the pupils develop a lasting interest in science"* (D.E.S. and N.C.C.A., 1999). The decision to place science firmly within the S.E.S.E guidelines was taken to *"promote its relevance and help children to develop informed attitudes towards scientific and environmental issues"* (D.E.S. and N.C.C.A., 1999), i.e*.,* put science

in context of everyday life for the children. The fact that teachers would identify with science as a compulsory part of the curriculum was intended to further catapult science into classrooms.

The D.E.S. also recognised the importance of skills used for the learning of science as a subject and the cross-curricular value of these skills. In the revised English curriculum (D.E.S. and N.C.C.A., 1999) the importance of class based discussions and the need for children to be enabled to respond to the initiatives of other children all the while developing the skill of taking turns is advocated. Furthermore in the revised Mathematics curriculum (D.E.S. and N.C.C.A., 1999) the importance of other children's opinions is reiterated as listening and discussing peers' mathematical observations. These changes in the science curriculum and the underlining of skills needing to be taught follow the trend internationally as in the United States where Ballone and Czerniak (2001) advocated looking at

cooperative learning, thematic approach, constructivism, classroom management, assessment and evaluation, equity, science technology-society, educational technology and learning styles (Ballone and Czerniak, 2001).

Whereas a multitude of new skills and practises have in theory been introduced into Irish classrooms due to the revisions of the curriculum the question arises whether the new skills and practises address the problem, of disinterest in science which the D.E.S. endeavours to change. Therefore it remains to be seen whether the apparent lack of interest in science as a subject continues even with the implementation of these revisions.

It is important to remember that trends only change over a period of years and it would take eight years for a child in junior infants to make his/her way through the revised curriculum in primary school and then a few more years of secondary schooling to come to a point where choosing science as a subject is possible. The D.E.S.

recognises the revisions as a long term plan and realises that progress takes time. The D.E.S. is therefore targeting younger children in the hope that they will bring a love and curiosity for science with them throughout their life. Through the revisions of S.E.S.E. they are trying to break down the barriers and make science accessible to everyone from four years old and upwards. The D.E.S. is advocating a, *"gender mainstreaming approach,"* one which will incorporate a, *"gender perspective into policy development and sound baseline data on the relative position of men and woman, boys and girls in the Education system."* For teachers it includes, *"Clear target setting indicators and evaluation"* (D.E.S. and N.C.C.A., 1999).

The need to target children and young adults and to increase their interest in science as a subject to pursue a career in has not been ignored. Academic institutes are trying to promote science at these levels. In response to concerns voiced by Irish academics and scientists about the low uptake of science within the Irish education system steps have been taken to make an improvement. The Royal Irish Academy held a workshop in May 2005 in agreement with the D.E.S. revisions that the Irish educational policy should,

aim to achieve a scientifically literate society in a holistic way. There should be a clear development of science education from primary and throughout second level, with logical progression (Acadamh Ríoga na hÉireann, 2005)

This statement adds credence to the vital importance of the foundation of scientific attitudes and practises in the primary system and the D.E.S.'s intention to pursue this avenue. An old Gaelic proverb states, *"tús maith leath na hoibre!"*- (a good start is half the battle) which appears relevant here.

Lynch (2000) recommends science literacy for everyone and emphasises that it will take all teachers, children and parents to reform the current science situation. The need for a whole-school approach to combating the decline in interest for science is

therefore obvious and is paramount in achieving the most inclusive teaching environment and the optimum participation rates which prompted this research project.

International research has shown that the phenomenon of declining numbers interested in science as an academic route is not exclusive to Ireland. Numerous researchers have found that it is a common problem. The British Council (2007) comments on the fact that the numbers of students studying science continues to decline at third level and advocate making science more relevant and hands-on to young people. It has implemented projects such as the "Next generation science" which targets young people with the basic approach being to take science out of the classroom. This is in partnership with the Netherlands to promote science as a subject relevant to life. Similar patterns of declining interest of students in scientific studies have been noted in Australia. Kovac (2005) observes that if the decline is not reversed there will be serious implications for Australian society. She also underlines the need to make science relevant and hands-on for the students.

Although much of the documented research, in relation to participation, is collected from children and adults outside the primary education sector some research studying primary school levels suggests distinct patterns begin to appear even at the lowest of levels. The Organisation for Economic Co-operation and Development (O.E.C.D.) in the Irish Council for Science Technology and Innovation (1998) states that interest in science essentially develops at primary and secondary levels of education and outlines the difficulties with trying to fill gaps which have appeared during these education periods. If these gaps are appearing in the primary sector they will only increase as the children age through the system. Rice and Corboy (1995) underline the importance of a positive elementary/primary science education and concur with the research of Beane (1988, in Rice and Corboy, 1995) which concludes that primary

school is the most effective level for improving attitudes, achievement and participation in science. Rice and Corboy (1995) also state that children's interest in science declines between the ages of nine and seventeen. Further support to these findings is given by the research of Grandy (1987, in Theberge, 1993) who confirms that primary level boys and girls are equally interested in science but by the end of high school the number of boys who are still interested in science is double that of girls. These findings indicate to the researcher that intervening factors in the children's education effect change in interest for science at an early stage in the child's education. As the children in the researcher's classroom are of young ages, four to eight years old, the above research suggests that there should be limited apathy to science. If the findings show a minimal lack of interest in science where the revised curriculum guidelines have been implemented, it could be indicative that the pattern of lack of interest in science is beginning to change from "the bottom up" and that curiosity for science is firmly embedded in children's educational attitudes. However if any gaps, as mentioned above, appear in interest/participation levels in the researcher's classroom is there a specific discernable reason why this is so or can the researcher find a way to reduce the gaps and therefore foster more curiosity or participation in the subject.

1.3 The aim of this work

The pattern of lack of participation in science poses the question of whether there are specific detectable reasons why certain children are reluctant to become involved in science. Furthermore, it remains an outstanding question whether there is a noticeable pattern of participation or non-participation present in the lower end of the primary education sector. Therefore the focus of this research is to attempt to analyse the level of pupil participation in science within the researcher's own classroom and to try to optimise the learning environment in order to achieve the highest level of participation

from as many of the children as possible. The underlying assumption here is that the higher level of participation in the science lessons is indicative of the level of interest by the pupil which in turn is indicative of science success. In other words, to utilise the gardening analogy once more, to cultivate and develop every individual child's desire to succeed in science to the best of their ability.

As previously mentioned the N.C.C.A. in conjunction with the D.E.S. is trying to improve the perception of science in education through a more hands on approach for all children. In order to optimise the learning environment, lessons covering a wide variety of strands and strand units, from the revised curriculum, are utilised in the research project. It is hoped that these would allow for each child, regardless of gender, to pursue a style of learning optimising their science education. The importance of the need for varying the strategies and format of lessons in science and therefore making it easier to meet the needs of different learning styles which different children have is discussed and the utilization of differing styles of the lesson described. Included are,

1. Hands-on materials 2. textbooks 3. videos 4. audio recordings 5. visual aides 6. cooperative group activities 7. computer-technology related activities 8. outdoor related activities 9. kinaesthetic activities and 10. creative art activities (Armstrong, 1994: Dunn & Dunn, 1979, in Ballone and Czerniak, 2001).

Furthermore the emphasis in the revised curriculum is firmly placed on working scientifically *i.e.,* practical investigations are central to the programme. Children are expected to make observations, hypothesise, predict, investigate, plan fair tests and to analyse. Through the use of a hands-on approach it is hoped to cultivate,

Positive attitudes to science and an appreciation of the contribution of science and technology to society (D.E.S. and N.C.C.A., 1999).

These expectations of the children, in skills and attitudes, are very similar to those of the Scottish curriculum (S.O.E.D., 1993, in Harlen, 1996) which are planning, collecting

evidence, recording and presenting, applying skills and presenting solutions, interpreting and evaluating and developing informed attitudes. The findings give support to the revised Irish curriculum and show its relevance in the acquisition of science skills in the primary context.

In the course of the research it is hoped to establish a pattern of active participation through the implementation of "working scientifically" and the implementation of the age appropriate activities as written in the revised S.E.S.E. guidelines. Through these variations in strand units and the realisation that different children have different learning styles it is hoped to create a learning environment that supports learning inclusive of both sexes.

Chapter 1 outlined the status of science in international and Irish classrooms and the changes which various organisations are attempting to make in order to redress the dwindling interest in science as a subject. This work investigates the participation levels of children in science within the confines of the researcher's classroom; however in order to understand other factors that may influence participation in class, the literature to date on the following issues *i.e.*, gender, the teacher, grouping and the school are all reviewed in Chapter 2. This background work is necessary as these factors may also affect children in the author's classroom. In Chapter 2 these are discussed in depth with reference to the researcher's classroom.

Chapter 2 ― Factors influencing participation levels in the science classroom

2.1 Science and the gender debate

The subject of science has somehow become affiliated with the male student as shown by the declining numbers of females pursuing science as a subject (D.E.S. 2004). The research conducted by Kahle and Meece (1994, in Ryan, 2000) confirms that on a masculine-feminine scale both men and women rate science as masculine. It appears the assumption is that *science and math are hard disciplines that are perceived by girls as cold, isolating masculine pursuits that are pointless and unrewarding for them"* (Mann 1994, in Ryan, 2000). According to Ryan (2000) the lack of female interest in science is due in no small measure to the societal expectations on females of what a girl's role should incorporate. The conception that science is "unladylike" immediately erects a barrier for females who may consider science subjects as study options. The notion that science is a subject suited to male students has vast implications to the research as it is difficult to teach a subject to children who expect they will never succeed because they are misplaced within the scientific world and thus are resigned to failure before beginning.

It is apparent from research undertaken by Kahle (1991) that the perception of science is that it is a tough and analytical subject and this leads to a masculine image which can be reflected in student participation levels. Rubba *et al.,* (1997)*,* through their study involving fifth graders (10-11 year olds), confirm the stereotypical image of a white, male scientist working in a laboratory. During research by Ryan (2000), using

the "Draw a scientist test" (D.A.S.T.) on one hundred students taking sophomore biology classes, it was again confirmed that the majority of students have a male image of a scientist. It is interesting to note that from a study by Rennie (1986, in Kahle, 1991) when teacher trainees were asked to sketch a scientist in the (D.A.S.T.) 82% of them drew a male. Only 12% stated that he would appear "normal". The rest indicated that he would have unusual and crazy traits. Here we clearly see aspiring teachers with quite narrow views of the image of a scientist and these are the teachers of tomorrow who supposedly will influence children's views of science. Kahle hoped that teachers would find ways to *"infuse science education with an accurate and neutral image"* (Kahle, 1991), thus dissipating the notion of male-only scientists and the idea that you must be male to have an affinity to science. Finson *et al.*, (1995, in Pedersen and Thomas, 1999) developed the "Draw a scientist test checklist" (D.A.S.T. - C) to facilitate assessment of images drawn. Pedersen and Thomas (1999) modified the checklist to create the "Draw a science teacher test checklist" (D.A.S.T.T. - C.). The checklist was hoped to reveal student's perceptions about themselves as science teachers and their impressions of science teachers. The findings were that the students thought of science teachers as lecturing rather than displaying inter-active work and activities. There was no particular reference in the preceding research to the findings in relation to gender. The conclusions of Finson *et al.,* (1999) when utilising the D.A.S.T.T. – C. concentrate on the teacher and his or her self-efficacy *i.e.,* belief in their ability to teach science, and introduce the idea that self-efficacy, rather than gender, is key to the teacher's ability to teach science and therefore key to children's inclusion in science lessons.

In contrast to Finson *et al.'s* findings is the unequivocal evidence outlined below that points to gender as having a direct influence on the involvement of certain individuals in science lessons, in particular the participation of females. Hammrich *et al.,*

(2003), in the United States of America, raised the issue of concern over the equity gap in the subjects of science and mathematics and mentioned the need to address and reform the opportunities that girls face in these subjects post secondary education. Further research, by Ballone and Czerniak (2001), states that reform of science means equal opportunities and conditions should be provided for each student to learn to the best of his/her ability. However the researcher must be mindful of the fact that "*the very subtlety of modern gender bias means we are not consciously aware of it*" (Ryan, 2000) and should pay special attention to guard against this pitfall.

Research undertaken by Sharp (1997) indicates that during the years of secondary science, girls were found to dislike physical sciences *i.e.,* physics and chemistry, dislike the abstract nature of science topics and dislike the atmosphere of the science laboratory. The boys were more confident in their ability to succeed at science thus making it important and exciting to them. Although the children in the researcher's classroom are very young, ranging from four to eight year olds, certain topics, as observed by the researcher in the course of teaching science, are already perceived by particular children as masculine or feminine *e.g.,* gathering snails is masculine and drawing butterflies is feminine. These perceptions could be construed as the beginning of a distinct attitude to science which will be perpetuated by the masculine image of science which was found by Ryan (2000).

Through a bias study carried out by Thompson (in Hollis, 1995) it was shown that as children get older and become exposed to outside influences they will be inundated with jargon suggesting that only white men can be scientists, women in many movies are merely shown as assistants. Unfortunately these negative influences have remained as Eugster (2007) states that scientists still have an image problem. His research in America concludes that the curriculum, children's literature, television,

movies and the print media still perpetuate a male and negative image for a scientist. Science programmes such as "Bill Nye the science guy" present a mostly positive image of a scientist but white males are still predominant as the main characters. Eugster (2007) mentions a surprising shift in female seventh graders perspectives (12-13 year olds) who 50% of, when asked to draw a scientist, drew female scientists. He proposes that programmes such as "Crime Scene Investigation (C.S.I.)" are responsible for this positive shift in perspectives. However it is interesting to note that although the C.S.I. series defines the role of women scientists to be of importance and projects a positive image of females in scientific jobs it is also true that in these programmes all the highest ranking scientists are male. The masculine image of science appears to be in agreement with the findings of Kahle (1986, in Kahle, 1991) and suggests that the primary teacher faces an uphill battle against the media and influences from outside the classroom. In direct conflict to the assumption of children gaining a masculine image from the media, Harlen (1996) states that negative and inflexible ideas cannot be attributed to children in the primary school sector as they have not yet experienced sufficient scientific activities to have formed preconceived ideas and attitudes to science. However she does concede that they may have notions that have been modelled on a parent's ideas of science. Pedersen and Thomas (1999) refute Harlen's statement that primary school children could not possess negative ideas about science. They suggest that children form stereotypical ideas about science and its teaching from a very young age. Their research is supported by the findings in Science and Engineering Indicators (2002) which reiterate the damaging influence of negative images pertaining to science which are seen by young children and the effect they have on the children's attitudes and behaviours; they also mention the stereotypical image of a male scientist as being very much alive and well in the minds of children. The implications of the literature are significant to the researcher in that the idea of science as a male subject could begin to surface in children

as early as four years old therefore establishing a precedent which could be difficult for the teacher to overcome.

The lack of female representation in science at levels where a choice of participation is given is well documented. Brown University (1996) writes that it is sometimes incorrectly assumed that non-participating science students are less capable academically. Shewey (1997, in Hammrich, 2001) found that as students grow older and enter the workforce, the percentage of females taking on science and engineering as a career is much lower that the percentage of males. It becomes more obvious as age and career positions become more prominent. The pattern is obvious in all ethnic groupings. It is another international problem which Sjøberg & Imsen (1991) discussed. They found that in a comparison with boys, a low percentage of girls choose science in schools and fewer women are found in careers in science and technology. Lamb and Ball (1999) when discussing the enrolment of seventeen to nineteen year olds in the Australian education system noted that about one in five boys enrol in physical sciences compared with one in twelve girls. Many researchers, such as Ryan (2000) and Kondrick (2003) document the under-representation of females in scientific careers. Kondrick states that in science-based undergraduates 59% of men and only 48% of women continue into a scientific career. She underlines the discrepancy between men and woman by demonstrating that women have overtaken men in the achievement of bachelor and master's degrees but the number of women in the career field is not representative of these statistics. Theberge (1993) equates this imbalance to cultural and social factors. The researcher wishes to eliminate the appearance of differences in the interest levels of children of both sexes in the classroom. The ideal is to produce a view of science as accessible and inviting to both genders.

2.2 The role of the teacher

According to research carried out by Harris *"the most important school factor affecting student achievement is the quality of teachers"* (Harris, 2004). Shimizu (1997) also found that teachers can restrict or increase opportunities to learn. Bearing this in mind it is interesting to note the documented research on how teachers respond to children during science lessons. The fact that teaching habits affect various children differently in the classroom is repeatedly pointed out. Hall (1982, in Brown University, 1996) attests to the fact that there are different styles of communication for each gender, broadly speaking. For example Hall states men will respond to questions more confidentially and aggressively whilst women tend to wait longer to formulate their response. Kahle, (1988, in Dalton *et al.*, 1993) found that as a result of the differences in styles of communication for the genders, fewer girls than boys actively participated in science lessons. Theberge (1993) stated that boys expect to contribute at least 70% of the talk in science lessons and limit the females talk to around 30%. This may indicate that females are at a disadvantage in science as they are thinking of a response while the males are blurting out their thoughts first or dominating classroom dialogue.

The teacher's reaction to classroom dynamics is a factor which influences the communication styles within the classroom. Hall (1982, in Brown University, 1996) stated that females who are interrupted become hesitant to join in future discussions. His recommendations include allowing time before choosing someone to answer a question. His studies have shown that boys answer quickly and were more readily chosen by the teacher, whereas the girls were more likely to be ignored. Another recommendation by Hall is for teachers to be aware of whom they are calling on to answer *i.e.*, ensure no bias towards a certain gender or person is evident. He advocates the use of writing exercises in science and the rearranging of the classroom setting to

15

form smaller groupings. Also underlined are the merits of relating the scientific study to the real world, which is appealing to females, and in this way encourage increased participation from both sexes.

The importance of the role of the teacher is further underlined by the D.E.S. and N.C.C.A. (1999) when discussing assessment of science learning. Teacher observation is given a significant role in establishing whether a child is attaining sufficient science learning and the additional responsibility of rectifying the situation, where necessary, is also the class teacher's responsibility.

2.3 Teaching styles

The importance of teacher awareness to his/her teaching styles has been discussed by Hall (1982, in Brown University, 1996) in the previous section. His research found bias towards the males in questioning and communication styles in that teachers utilised styles more suited to males. The need for heightened teacher awareness of teaching science, in this area, is evident in order to include provisions for females and their communication styles *i.e.,* encouraging class participation, questioning females proportionately to males, getting a colleague to analyse teaching style and varying exam structure. Galton (1981, in Kahle, 1991) identified three teaching styles in science. The first of these *problem solvers,* which involve a high frequency of teacher questioning and a low frequency of pupil initiated interactions. The second *informers*, which use teacher delivery and facts and an infrequent use of questions except to recall facts. Finally *enquirers*, which uses pupil initiated and maintained experiments as well as inferring, formulating and testing hypothesis. Galton concludes that girls prefer the enquirers' technique. Further support to this method is given in Kahle, 1991 by Kahle, (1985), Whyte, (1986) and Johnson and Murphy, (1986). Galton focuses on the need to target the females of the classroom who, in the main, are sitting back letting the males

take over. A simple change in the teaching style of the lesson could combat the severity of this. Research conducted by Ryan (2000) reinforces Galton's findings. She refers to Galton's *problem solvers* as *Inquiry learning* which she recognises as being the method of instruction utilised by the majority of science teachers. It involves a high frequency of teacher questioning and a low frequency of pupil initiated interactions. It requires the student to process information quickly and to ask questions. This method requires risk-taking; children may ask questions and formulate opinions to share with the class, and competition to achieve the answer to the question at speed before peers. As both are contrary to the girls' preferred method of learning *i.e.,* cooperative situations, it allows for the dominance of males. Hands-on group work is cited by Ryan as more beneficial to both sexes.

Ballone and Czerniak (2001) state that teachers are capable of meeting the needs of every individual child in their science lessons and they categorise children as *"brainstormers, concrete, active and risk takers"* (2001). Harlen (1996) categorises children and their learning through their individual attitudes. She discusses the children who feel they can succeed and therefore usually do and the children who think they will fail and usually do through a self-fulfilling prophecy. Harlen also categorises children's attitudes in the following way,

(i) curiosity (ii) respect for evidence (iii) willingness to tolerate uncertainty (iv) critical reflection (v) perseverance (vi) creativity and inventiveness (vii) open mindedness (viii) sensitivity to the living and non-living environment and (ix) co-operation with others (Harlen, 1996).

She recognises the need for teachers to identify any child who lacks any of the previously mentioned attitudes as it will limit their science education. It is through recognizing the different learning styles and attitudes and exposing all children to multiple instructional techniques while extending to the individual child the support needed to achieve their potential that the needs of individual children will be attainable

as stated by Wheeler (1988, in Ballone and Czerniak, 2001). Some researchers such as Beresford (1998, in Hopkins, 2002) have drawn up individual and group learning style preferences; however these are not suited to the lower primary school as data show that the teachers who have used them indicate that they feel that the students' strategies for judging the suitability of teaching lack the necessary judgement skills. More importance at the junior level is placed on the teacher's own instincts and knowledge of the individual children as demonstrated by the D.E.S. and N.C.C.A. (1999) with the inclusion of teacher observation as an important tool in assessment of science learning.

Other research such as A.A.U.W., 1992; Baker & Leary, 1995; Evans, Whigham & Wang, 1995; Hammrich, 1996; N.S.F., 1990; Wilson & Milson, 1993, in Hammrich (2001), has documented the wide gender gap in achievement scores between girls and boys in the areas of science and mathematics. The authors assert that when girls are allowed to work in a manner intrinsic to their collective learning style, appropriate science and mathematics learning takes place. Their work is supported by other professionals who demonstrated that many girls have different parental, cultural and educational experiences than boys. Coupled with this is the observation by Hammrich (2001) that girls tend to rely more on others' opinions than boys. They grow in confidence with success and gain credibility in themselves which they can only gain if they are taught in a way which is compatible with their learning style.

2.4 Gender and grouping in the science classroom

Teachers promote equality in the classroom but the question remains whether teachers ever actually contemplate equality as a factor in their lessons and in particular in science groupings. According to Sjøberg and Imsen (1991) teachers should consider equality between the sexes as their problem as science teachers, as they communicate a hidden curriculum about the subject *i.e.,* social relationships, role models etc. They state that

a separation of pupils by sex may be instrumental in increasing the number of girls who choose science, but may have other negative effects that may be considered more serious. In each particular context, the teacher should, however, be sensitive to possible unwanted effects or different organizational settings (Sjøberg and Imsen, 1991).

In other words the decision on groupings, when weighing up the implications for males and females, rests with the teacher who should have an insight into the dynamics of her classroom and an ability to base the decision on male/female groupings correspondingly. Ryan (2000) stresses the importance of groupings for the inclusion of females. She states that females prefer cooperative learning and discussion with hands-on activities. She also makes clear that girls, when in same sex groupings, tend to be in agreement with each other and are less likely to interrupt their peers and therefore advocates the use of same-sex groupings which in her opinion facilitate female learning more readily than mixed-gender groupings.

Also underlined by Sjøberg and Imsen (1991) is the importance of being aware, as a teacher, of the distribution and use of equipment. Vigilance is required in group settings, in order to ensure that one group is not allowed to dominate the resources. Sjøberg and Imsen indicate from their work that in situations of freedom, the boys tend to take over. Teacher behaviour and the classroom organization should encourage the participation of the girls and safeguard against domination. If science is to become more "girl-friendly" it is important that the curriculum is personally relevant to each child and taught in context but equally important is the protection of the females from over bearing males. The teacher should be able to achieve this equality through his/her choice of groupings.

Hollis (1995) advocates that when optimising participation in science a teacher must remember that, *a student's willingness to learn and his/her enthusiasm for discovering knowledge and developing understanding will dictate the level of student*

learning (Hollis, 1995). She states that she believes interested and enthusiastic students are more willing learners and that this willingness to learn helps them to become more active participants in their own learning. It is pertinent to note that it is the responsibility of the teacher to ensure that the children receive the curriculum in such a way that they can achieve an air of enthusiasm. Hammrich *et al.*, (2003) concur and emphasise the need for a child, in particular the female, to learn about science in an environment that is non-competitive and non-threatening. They maintain that girls are usually taught about scientific principles in a manner which is outside their normal everyday experiences, in contrast to boys who learn differently and in a manner in accordance with the methodology utilised by most science teachers in science lessons.

With grouping in mind it is important to note the findings of Howe (1997) that boys predominate both physically and verbally during classroom interaction and have more experience of having their contributions evaluated during classroom interaction. Girls request help to a greater extent than boys and support their conversational partner to a greater extent also. It is an area of interest to the author to note if these prove true of the researcher's classroom; also if a pattern of females being overpowered by males is visible or indeed if the females appear needy and lacking in confidence in their groups.

Dubois (1995) talks about an agreement within his school's science department that science classes should be active and the students should have hands-on experience in order to build and reinforce concepts, consequently bringing benefits to both boys and girls. He advocates the use of grouping as it leads to the children taking on a responsibility for their learning. They have a freedom to investigate topics but are aware that they must report their findings to the teacher at the end of the lesson (Cohen, 1992, in DuBois, 1995).

Kahle (1991) states that boys and girls bring different sciences to school and receive very different scientific educations with evidence of fewer girls handling equipment, performing experiments and participating in general. Therefore it would seem abundantly clear that the practice of science in classrooms has to be addressed and re-evaluated. Whyte (1986, in Kahle, 1991) cites example after example of boys dominating discussions and "hogging" resources while girls are left to fetch and carry things on request. This is a phenomenon that most teachers are displeased about and surprised to find occurring in their classroom but nevertheless it is a phenomenon which cannot be ignored in the research.

Another factor pertinent to the research is the difference in boy and girl self-concept and value orientation which is apparent in a Norwegian study carried out by Sjøberg and Imsen (1986, in Sjøberg and Imsen, 1991) in which four factors of self-description items were structured. These are valuable to remember when thinking about forming mixed groupings in the classroom. They included

1: Orientation towards others — consideration, kindness, thoughtfulness and responsibility.

2: Independence — determination, independence, willingness to stand up for oneself and assertiveness.

3: Empathy — Ability to console others, display feelings easily, feel for others and be open-minded.

4: Competitiveness — Displaying leadership, knowledge, ability, competitiveness, take risks and seize the initiative.

1,364 students aged 15-17 years of age responded to a self-description scale based on the above items in which they had to choose which of the above numbers best suited them and rate them in order of suitability. Girls scored higher for factors 1 and 3. Factor

2 showed no difference for boys and girls. The boys scored highest for factor 4. Differences between the boys' scores and the girls scores were most pronounced in respect to the empathy factor. These results were found to be connected to occupational aspirations for *e.g.,* girls picking caring careers with a low uptake from the boys. The research suggests that girls display a higher level of empathy and consideration in their group work whereas boys are much more aggressive and likely to dominate their group.

Howe (1997) poses the dilemma of schools perpetuating behavioural differences between males and females. She specifies the ways classroom interaction might result in discrimination. One of the possibilities is that classroom interaction might provide boys and girls with different opportunities to acquire and practise the relevant skills. More research such as Sjøberg and Imsen (see previous section) confirms that pupils play an active part in bringing the gender differences in classroom interaction into being. Boys are more likely than girls to create conditions where their contributions are sought by teachers and they are more likely than girls to push themselves forward when contributors are not explicitly selected. It is also noted that teachers initiating questioning lean towards asking the boys. Perhaps the reason this occurs may be because the boys make themselves more visible as they are more likely than girls to call out in class. Therefore in turn boys receive more teacher feedback in lessons confirming what Hall (1982, in Brown University, 1996) stated earlier.

A study by Knain (2001) analysing gender aspects of self-regulated learning for low and high performing students in science and mathematics in a Norwegian based study concluded that high and low performing students differ by the largest amount in their academic self-concept or confidence in their ability and their self-concept in mathematics. Generally it is in the high achievers group that the differences occur. Low

performing girls and boys have similar self-concepts. High performing students are highly motivated for learning and lean towards competition among students.

Harlen (1996) talks about the composition of groups as being a point of contention between teachers. In Harlen (1996) some teachers preferred grouping the children on the level of understanding of a concept while others preferred to group on the basis of differing abilities stating that they should work together easily. Howe (1990, in Howe, 1997), when talking about the grouping of children of differing abilities, concluded that advancement in science took place after the group work, suggesting that these differences perpetuate progress rather than stunt it. She calls for further research into the dynamics of group work to provide guidance to class teachers on how to group children. The different conclusions of Harlen (1996) and Howe (1990) suggest that the area of grouping may be dependent on individual classroom situations and lends further support to the pivotal role of the teacher in choosing the correct groupings for his/her class.

The school, and therefore the classroom teacher must encourage interaction between children. The need for pupil to pupil interaction is emphasised and advocated in a plethora of British Curricular documents spanning the last thirty years.

This was one of the strongest messages in Plowden (1967), and it has been preserved in both the National curriculum for England and Wales and the 5-14 Programme for Scotland. Within the 5-14 Programme, the English language guidelines present talking and listening in groups as major curricula strands (S.O.E.D., 1991) and the mathematics guidelines refer explicitly to the need for pupils to exchange ideas while engaging in problem solving (S.O.E.D., 1993, in Howe, 1997).

Children are reliant on their peers for parts of their social education, hence interaction should be encouraged in the school. Hopkins (2002) mentions looking at the types of questions asked, the order in which they are asked and most importantly to whom the questions were asked. He advocates the use of peer questioning and discussion as a way

that some children learn. The importance of these two interactive learning roles is observed in classrooms when children prefer to ask questions and discuss the task within their peer groupings rather than seek outside help from the teacher.

The guidelines, from the British Curricular documents mentioned above (Howe 1997), are in agreement with the revised curricular guidelines of the Irish Education system with the science guidelines for assessment stating

Information gained about the child's learning will be used primarily by the teacher but it will also involve the pupil in self-evaluation and in the setting of personal learning targets. (D.E.S. and N.C.C.A., 1999).

Importance is also placed on, starting from the junior infant level, developing skills in the areas of evaluating and being able to,

- "Talk about own work during design and making tasks

- Report to others on what has been done

- Discuss the work of peers in a positive way" (D.E.S. and N.C.C.A., 1999).

The importance of developing these skills from the lowest levels of schooling cannot be over-emphasised. Children require teaching in how to appraise, in a constructive manner, their own efforts and just as importantly the efforts of others. The foundation of communication skills should begin in junior infants and become stronger through emphasis on the skills during the child's science learning. Teachers must instil and encourage scientific and communication skills, which are very important in a child's education, in the children starting from four years old upwards in order to achieve improvements in attitudes towards science.

2.5 Criteria for grouping in the classroom

The area of participation in science is a complex one with a plethora of influencing factors in addition to the gender issue. In an effort to limit non-participation in science lessons further research into grouping was carried out. It was obvious from the onset

that the bulk of published research into grouping was observed in classes where all the children were of an age and certainly not of four different class levels. Although posing a dilemma for the researcher all the information thought significant to the research and applicable to multi-class situations is discussed here. Through gaining a broader insight into what research has been carried out in the area of grouping in science it was hoped to investigate the relevance of the literature to a multi-class situation.

Green (1995) in her research into encouraging participation in a middle school science classroom cites Ames (1992) when talking about what types of learning activities are more likely to increase the involvement of non-participating students. She concurs that activities should appear worth-while to the student, be adapted to the students interests, they should contain an element of choice, provide an appropriate level of social interaction, allow for active participation rather than a passive response, allow for the creation of finished products, include a game-like element and rely more on formative rather that summative assessment. In research carried out by Green (1995) she notes that although there were non-participating girls that it was the boys who demonstrated the highest degree of habitual non-participation. The particular boys were above average intelligence but showed a history of declining grades in science. Green's conclusions show how these non-participating low achievers participate much more frequently in group activities as opposed to individual activities. The low achievers relied heavily on their peers in groups to help them and in doing so the activities contained less risk taking for them, as opposed to attempting a task individually. Green talks about the classroom climate, or positive classroom atmosphere being absolutely critical for these improvements to occur. This is created from the awareness and prior knowledge on the part of the teacher to make productive groupings and tasks. The data, while informative on the activities which add to grouping, does not specify how the

actual groupings should be formed; rather Green prefers to leave it to the discretion of the teacher. However the study highlights the benefits of groupings for the low achievers and describes what should happen in a group which is functioning properly.

Howe (1997) talks about the need for effective groupings in order to maximise learning. She refers to the fact that although children aged eight to eleven years old are mainly seated in groups they rarely work in a collaborative manner rather they complete tasks individually. She states that in order to foster effective group work the group must be symmetrical, *i.e.*, all pupils must be given equal responsibility for ensuring success. However she then describes another type of group which is the asymmetrical group. In this group some children are instructed by the teacher to help others *e.g.,* peer tutoring. This can be a successful grouping also which contradicts her initial statement. She acknowledges that it is possible to group children of different abilities and knowledge and yet to maintain equality of responsibilities and therefore the symmetry. According to research conducted by Damon & Phelps, (1989) and Rogoff, (1990), in Howe, 1997, it is preferable to have symmetrical roles if the content of the task is conceptual. Asymmetrical groups are better if the emphasis is on skills, based on having the more able child do the tutoring or helping. Using this information the researcher deduced that an older child should be more academically capable than the younger children and therefore could be given the tutoring role. Within the group two issues have dominated, whether groups should work collaboratively throughout the task or whether they should undertake separate parts of the task and only come together to pool the results at the end of the task. The latter can foster competition between group members and studies by Johnson & Johnson, (1995, in Howe, 1997) found that co-operative interaction is superior to competitive.

The grouping must be beneficial to the individual child in order to foster learning as,

Today's science reform efforts focus on the belief that all students are capable of learning science and therefore must be granted the necessary opportunities and conditions for optimal science learning (Ballone and Czerniak , 2001).

Children's learning styles must be taken into account and research conducted by Okebukola (1986, in Ballone and Czerniak 2001) concludes that if learning styles are matched with an environment which is preferred by the individual, the individual will perform better. During their investigations competitive and cooperative learning styles were compared. It was concluded that students who preferred cooperative tasks performed better in a cooperative group than those who were placed in a competitive grouping. Okebukola also notes that although cooperative learning is generally favoured in science that this is not the only method that encourages student learning *i.e.,* some children may prefer a competitive grouping. Hopkins (2002) suggests cooperative group work as the most effective in gaining active participation from the children. On the other hand for this method to attain success each child must accomplish something in the group, be responsible for the learning of the group, must communicate freely with peers, take turns in rotation and be able to suggest improvements for the group.

In the process of forming groupings within the classroom, to enhance individual children's learning, Harlen (1996) writes that it is prudent to be mindful of the different attitudes which influence children's learning at this early stage. These include,

(i)   attitudes towards school work

(ii)   attitudes towards themselves as learners

(iii)   attitudes towards science as an enterprise

(iv)   attitudes towards objects and events in the environment.

She stresses the importance of staying vigilant for the child who anticipates failure and therefore does not put in a great effort to the task and remarks that children who believe that they can succeed usually do. It is the position of the teacher to take all these into account when forming groups.

There is little to no research documented specifically on the grouping of children in a multi-class scenario for science lessons. Harlen (1996) however looks at differentiation which holds fundamentally the same principles that the class teacher in a multi-class level situation follows. She states that the whole class can be working on the same topics but differing tasks could be given depending on the individual or group. If differing tasks were not an option the teacher should vary the degree of support given to individuals. Finally the teacher should have different goals in mind for different children and should praise accordingly. Miller (1991) in research carried out in multigrade class groupings in general discusses the merits of using flexible groupings. He admires the ability of the older children to instruct younger children in a non-domineering manner. Also admired is the higher degree of self-discipline that children in a multi-class grouping must develop which derives from the teacher's expectation of a higher level of independence (especially true of the older children).

Through the reading of research conducted into learning in the science classroom the researcher is aware that the level of academic ability that a child has is considered by some to be a contributing factor to participation levels. Others refute the notion that ability exerts any influence on participation. The differing opinions on the topic proved interesting and pertinent to the study and therefore it was decided to examine, closely, literature relating to academic ability and achievement in science. This is carried out in Chapter 3.

Chapter 3 ─ Academic ability and achievement in science

3.1 Research on academic ability as an influence in science learning

Nuthall (1996) poses the question of the role ability plays in classroom learning and through various in-depth research projects, Alton-Lee & Nuthall, 1990, Alton-Lee & Nuthall, 1992, Nuthall & Alton-Lee, 1995, in Nuthall 1996, have endeavoured to answer this question. In the course of these studies a model of the learning process involved in knowledge acquisition has been developed. They have identified that learning occurs through the child's classroom experience. Nuthall and Alton-Lee are able to predict from the content, sequence and timing of certain classroom events, the student's likelihood to learn and remember the events/content of lessons and vice-versa. The interesting thing to note is that they do not take into account the child's ability *i.e.,* students whose percentile scores on school-administered tests indicate high ability levels appear to learn in exactly the same way as students whose percentile scores are relatively low. They state that the nature, frequency and timing of the classroom events are the defining elements. They are more concerned by what the children already know and how they access and create learning opportunities in the classroom. The study utilised data collected about the students' classroom experiences in science from parallel audio and video recordings and from interviews with the students. Student learning was measured by the administration of a pre-test and post-test based on learning outcomes intended by the teacher for different lessons. Predictions about whether the student would or would not learn the content of the lesson were based on analysis of the content, nature, sequence and timing of the relevant experiences as

formulated from the afore mentioned interviews *etc*. Furthermore these predictions were analysed in conjunction with the ability scores of each student. The researchers were able to predict learning of a particular item at an accuracy rate of 85.6% and predict failure to learn for 80.3% of the items that were unlearned. The data from the study indicates that there is a considerable difference between students in what they learn and do not learn in class. These differences are governed by what the children already know and how they access and create learning opportunities in the classroom. Their research refutes the previous research which noted gender as a major element influencing participation in science lessons.

Their evidence points undeniably to the fact that children who achieved high scores on the Progressive Achievement Tests (P.A.T.s), indicating high ability levels, appear to learn in exactly the same way as the low scoring children. They concede that standardised tests are a common part of teachers' thinking about student learning and are a prediction of how a child will continue to achieve. They acknowledge that teachers use the tests to make judgements about practical issues and about potential academic achievements and streaming *etc*, leading to high expectations for some and low expectations for others. They strongly profess that there is no research to support the widely held opinion that low ability children learn differently to high ability children and state that the above conclusions are drawn from the standardised tests which lead to a self-fulfilling prophecy. They maintain that streaming studies suggest that students in high ability groupings learn more because they are taught more and at a higher level (Oakes, 1992, in Nuthall, 1996). Howe (1997) states that pupil variables may be relevant to attainment, in particular ability. Mentioned in her research is the finding that high-ability boys are particularly favoured, in the science classroom and by the teacher, whereas low-ability boys can contribute the least of all. She concurs with Nuthall (1996)

finding that academic scores do not have straightforward implications for achievement in science *i.e.,* a high scoring female may not achieve accordingly in science. She maintains that females may adopt compensatory strategies in a group situation that is contrary to their learning style *e.g.,* females will approach the teacher individually in order to receive attention. Sanchez, Kellow and Ye (2000) after comparing students' Stanford Achievement Test results, which is an academic achievement test, over such categories as grade, gender and ethnicity, found that females scored higher in reading, language and spelling but that males had higher scores in the subject of science. This underlines the notion that academic ability is not of vital importance in grouping and suggests that gender remains more of an issue.

3.2 Academic ability and grouping as an influence in science learning

When talking about grouping, Nuthall (1996) suggests that common sense tells us that putting the high ability students with less able students will limit the progress of the more able students. Similarly having groups composed of less able children will result in slow progress. Jones & Carter (1994, in Nuthall, 1996) are in concurrence with the latter as they found that when low ability children were paired they became preoccupied with the organization of the task and lost focus of the academic purpose of the task. It was also found that low ability children tended to lose interest, disrupt and ridicule each other's behaviour in the task. Contrasted with this is the fact that high ability children co-operated in supportive ways and focused on the academic purpose of the task. The complete opposite is to be noted below,

Low attainers produced very little work, concentrated on the production aspects of the tasks, were slow to start, made extensive demands on the teacher and consequently spent considerable time waiting for help (Bennett & Desforges, 1988, in Nuthall, 1996).

Nuthall (1996) advises lowering the difficulty of the task rather than changing the grouping.

Forman & Larreamendy-Joerns (1993, in Nuthall, 1996) studied groups of differing abilities in problem-solving groups. Their predictions were that the high ability children would help the low ability children attain a higher level of performance but they found that the students sometimes changed the nature of the task and also which of them had control of the group's activities. The conclusion was that social status and academic expertise as the students observe them are likely to be negotiated and renegotiated within each group.

Nuthall (1996) found a link between the child's ability using a P.A.T. score and the amount of science learning. He explains the link as the amount of greater relevant knowledge that the high achieving child brings to the lesson.

Inevitably the way in which students negotiate and manage their private and public relationships affect their access to, and use of, learning opportunities (Nuthall, 1996). Also recognised within the study is the tendency for students of low ability to be extra critical of each other. They appear to focus on status and ability which consequently stunts their involvement in the group. It also curtails the low achievers use of academically relevant discussions which the higher ability children use to further their knowledge.

Chapter 3 outlined the current debate on academic ability influencing participation levels. It appears an area significant to the research and will be investigated during the course of the study. Through the researcher's evaluation of many studies compiled on the vast area of science learning it became apparent that gathering information on all the relevant topics such as gender, teacher role, ability *etc.,* could prove difficult due to the vast amount of data involved. The researcher intended compiling the data in her own classroom independent of outside influences so it was

perceived practical to investigate the use of video-taping as an aid to the collection of

analytical data. This is described in Chapter 4.

Chapter 4 ― Classroom observation

4.1 The use of video-recording in the classroom as a data collecting medium

In this section, the use of video as a data collection tool is discussed as this was the main instrument used in the project. In Chapter 5, the detailed methodology will be given along with the design of the study. As the preceding research indicates, the area of non-participation in science is a complex topic with a multitude of factors influencing it. In order to optimise data collection in the researcher's own classroom, it was decided to investigate the area of video-recordings as a means by which to gather information.

According to research, such as Reyer (2005), the use of video recording in research has become more prevalent in recent years as technology becomes more advanced, more readily available and, of course, more user friendly. Video-recording lends itself as a good analytical tool in research as it eliminates the need for a full-time outside observer *i.e.*, the classroom researcher can view and analyse his/her own lessons. It also enables the researcher to collect non-verbal behaviours and supplementary extracts of conversation that would otherwise be impossible to record and assemble (Dixon, 1995). The use of video-recording as a data gathering tool is advocated when used as a way for teachers to identify intended messages and prepare structured feedback (Banbury & Herbert, 1992, in Dixon, 1995). Dixon further advocates the use of video recording as she states it enables the researcher to view self-study through his/her eyes and also through the eyes of the student. Further research carried out by Hopkins (2002) also recognises the increasing trend of using video recordings to analyse data with. He acknowledges the advantages of being able to review the situation,

identify the beginning of a specific problem, record behavioural patterns in the classroom and the ability to map these patterns over a long period.

In a study by Gais (2005) which as the main goal had to,

develop and test a research tool for video-analysis of German teachers' and students' actions during topic-related instructional talks in primary science classrooms (Gais, 2005),

Gais states that the use of video-recordings in analysis is not a new tool. However he underlines that the majority of research was in the area of teacher education rather than in empirical work (Wild, 2003, in Gais, 2005). The increase in the use of observational data in recent years is cited by Stigler *et al.,* (2000), Prenzel *et al.*, (2001), Labudde (2002), Reusser *et al*., (1998) and Clausen, Reusser & Klieme (2003), in Gais (2005).

Gais also emphasises the broad scope that video-analysis allows, such as allowing the researcher to: (i) record the lessons exactly as they are and (ii) use curriculum based topics and (iii) keep the teacher in their own surroundings. He states that the benefits of these should limit any bias in the studies' results *i.e.,* exact details are recorded, lessons are relevant to the children and no outside disruption is felt by the children as may occur when an unfamiliar person is recording the lesson. Reyer (2005) advocates the use of video-analysis for the following reasons; all information held can be watched and re-watched in detail; the researcher has time to decide which parts of the data to collect and analyse in detail; the researcher can transcribe classroom talk or watch actions down to the smallest detail. He maintains that these reasons lead to a provision of extensive data.

In Gulek (1999) the need for teachers to become reflective practitioners in order to cope with the diversities in the students they meet is highlighted. There is much research discussing the importance of reflection for a teacher of science as outlined by

Bleakley (1999), Calderhead (1989), and Gilroy and Tremmel (1993), in Carlton-Parsons & Summer (2004). Smith (1990), in Carlton-Parsons & Summer (2004), states that *the teachers' views influence what they (the teachers) attend to and what they perceive they need in order to do a better job*. Carlton-Parsons & Summer (2004) discuss three definitions of reflection for teachers (i) the analysis of one's teaching (ii) the analysis of one's teaching while teaching and looking back on teaching and (iii) technical, contextual and ethical inquiry which involves the setting of specific goals, the understanding of why these goals were chosen and the contemplation of social ethics in the classroom. This research of Carlton-Parsons & Summer concentrates on the use of images as a way for teachers to reflect on teaching practices and cites D.A.S.T. (Kahle 1986, in Kahle, 1991) as important in gathering children's scientific views. Also underlined in Gulek (1999) is the need for alternative modes of assessment in determining the educational ecology of classrooms. One such alternative is the use of video recordings. Using the immense collection of educational literature held in the Educational Resources Information Clearing house (E.R.I.C.), which at that time was around one million documents, Gulek found that out of 14,370 studies using observation as a method of inquiry, only 14 used video recordings as a data gathering technique.

It must be said that the use of video taping has become more widespread in recent times. The increased use of E.R.I.C. for holding documents means that at present the total of studies using video recordings as a data gathering technique is 42 out of 26,649 (studies using observation as a method of inquiry). Gulek talks about the long tradition that videos have of being a vehicle to train pre-service teachers and to build critical inquiry skills for reflective practitioners. According to Gulek many pre-service teacher education institutions have cited the importance of the use of video and within

this setting they have proved their worth. Osborne (2005), in a paper discussing the role of argument in science education, refers to the importance of using video exemplars to demonstrate, in this instance, key points of introducing arguments and group discussions *i.e.,* the use of video allowed the study to isolate and model effective practices.

In undergoing a classroom study using video recording, Gulek (1999) suggests the advantages of using a wide-angle camera in a small classroom to maximise coverage. Other guidelines were that at least 75% of the classroom had to be observable in the recording, the diagonal placement of the camera in either of the rear corners was identified as the most favourable position and at least 50% of the students had to be observable in the recordings. The above advice would be subject, of course, to the shape and size of the classroom and to the researcher's specific requirements *i.e.*, if he/she wishes the entire classroom to be observable. Reyer (2005), when discussing the practicalities of using video-recording mentions the importance of fixing camera position, standardising the camera-work and deciding whom or what to record before commencement. He also advocates the use of camera operators who are familiar with the equipment to facilitate the recording. He is adamant that researchers must follow a set of guidelines laid down for their study, on how to refer to and collect observations, to reduce the influence of the researcher's own subjectivity. He suggests developing a coding procedure which is accurate and specific to the research. He advises the copying of the video-recording on to CD-ROM or a hard disc, the writing of transcripts, having worksheets available from the lessons and the using of a suitable computer program.

The use of video-recording as a tool for classroom analysis appears to hold merit for this research due to the multi-class situation and the practical impossibilities of

recording manually all the relevant data whilst continuing to teach four different class levels.

4.2 Limitations of the use of video-recordings

Although much of the published research on the use of video-recording underlines the merits for current study, the limitations must also be taken into account. Gais (2005) warns about the limitations of the use of video-analysis. He refers to the key elements of research, reliability and validity and makes it clear that the video will only be appropriate to describe the teachers' and students' actions. It cannot be used to analyse a particular teaching style as, generally, the appearance of a video camera in a teacher's classroom stimulates the teacher to show not their everyday actions but what they regard to be best practice. Reyer (2005) states that video-analysis is a demanding research method and one which must follow strict guidelines in order to produce reliable and valid data. He warns that the sheer amount of data collected can prove difficult to analyse. He also advises the use of triangulation with other kinds of data, such as performance tests, to enrich and to ensure the validation of the data. Hopkins (2002) states that one of the disadvantages is that the camera is noticeable to the children and may cause a distraction. Furthermore, when using an operator only certain incidents that they think noteworthy may be recorded. The advice of Reyer (2005) to include more sources of data such as performance tests seems prudent and imperative in order to ensure reliable data and a complete overall picture of the information for research.

4.3 Classroom research as an aid to enhancing science learning

In investigating the topic of classroom research it was found that there is a large amount of literature giving advice on large scale projects. However the researcher's study is on a small scale and within the researcher's own classroom. Therefore only the research

deemed pertinent to the proposed study is included below. The premise of classroom research according to Hopkins (2002) is that the research should enhance teaching, test a particular educational theory or assess and put into practice a school-made plan of work. Teachers need to have an interest in the dynamics of their own teaching and aspire to optimise them. Denscombe (2003) states that action research should be practical, should require a change in practice, should be a cyclical process and the participation of teachers and students is integral to the process. Cohen *et al.*, (2000) echo the statement that action research is, *"a powerful tool for change at a local level"*. Hopkins (2002) advocates the use of a collaborative effort during the research. However in the researcher's situation where there is only two teaching staff in the school it would be impossible to implement collaboration.

Hopkins (2002) discusses observation techniques for the classroom and advises using a classroom plan on which to map the on-task/off-task behaviours of the children. He gives the Flanders Interaction Analysis Categories (F.I.A.C.) as an example of a coding system which could be used. This system analyses teacher/pupil interaction. It is based on ten analytical categories as follows: Teacher talk - (i) accepts feelings, (ii) praise, (iii) accepts ideas, (iv) question, (v) lecture, (vi) command, (vii) criticism and Pupil talk - (viii) solicited, (ix) unsolicited (x) silence. The observer then writes down the category which best describes the verbal behaviour at that moment. The observer records a category every three seconds on a data sheet. The intensive nature of the recording process involved in the F.I.A.C. system would require a separate researcher and teacher and was therefore impossible to utilise in this research work. However the categorization and methodical nature of the analysis is noteworthy and could be used as a model of analysis.

Denscombe talks about systematic observation also; however he advises the devising of an observation schedule similar to a checklist for completion during each lesson; in this way a consistent record of events are recorded. The schedule is completed with help from the literature review which the researcher would have read and any pertinent items, relating to the topic, appear in it for discussion. These items, which the researcher regards as relevant to the particular study, are then incorporated into the observation schedule (see below for examples). He advises keeping the schedule as small as possible to obtain an accurate record of incidents on the given topic. He advocates recording the,*" frequency of events...events at a given point in time...the duration of events and recording a sample of people* (Denscombe, 2003). He cites the advantages of systematic observation as it records directly what the individual does, it eliminates bias, it is efficient, and the data is ready for analysis and is reliable. The disadvantages are that it focuses on behaviour only, has potential to oversimplify; it is not a holistic approach and is in breach of the naturalness of the classroom. Harlen (1996) recommends, when providing for children's learning through classroom research, that the teacher bears in mind that this process is a never-ending cyclic process and therefore should be continuously revisited throughout teaching careers (Figure 4.1).
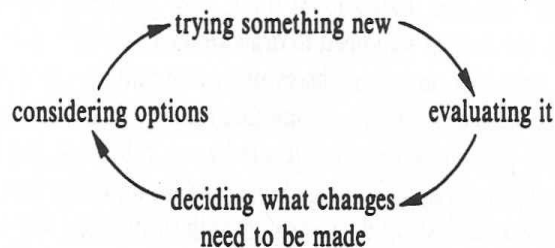

Figure 4.1 Cyclic process of development of teaching (Harlen 1996)

Hopkins (2002) also advocates the spiral approach when undertaking action research in the classroom. He states that analysis and fact finding should occur and recur as the research progresses.

When talking about the use of field notes in gathering information, Hopkins (2002) advises that they are written as soon after the lesson as possible. Denscombe (2003) readily agrees with this point. The field notes can be issue orientated in nature or used to reflect general impressions of the classroom. A third use is to gather case study material on a particular child. Some advantages are that they are simple to keep and give continuity. They also describe emerging trends. Some disadvantages are that they need extra resources such as worksheets *etc.,* for specific information, are time-consuming and possibly are highly subjective. Lofland (1971, in Cohen *et al.,* 2000) gives similar advice when collecting field notes. He advises the quick recording of them by writing, the making of two copies and at least two pages of notes for every hour of observation.

Hopkins advises the use of triangulation, *i.e.,* the using of three different sources of data with which to observe the research. Denscombe agrees that the differing sources give the researcher a consistency across his or her methods and enhances the validity of the research. Cohen *et al.,* (2000) talk about triangulation but they describe it as the use of two or more methods of data collection. They do agree, however, that it is highly useful for viewing the complexities of human behaviours and interactions.

The decision was taken to investigate if there is a lack of participation during science in the researcher's classroom. This would be investigated by identifying the amount of active-participation *i.e.*, children involved in the lesson, versus the amount of non-participation *i.e.*, children uninvolved in the lesson and furthermore to study in-depth if there is a pattern or a reason that perpetuates the phenomenon of non-

participating children focusing mainly on gender issues, content of the lessons and the grouping of the children during the lessons. The investigation takes place within the confines of the researcher's own classroom *i.e.*, classroom research. The classroom-based research is optimised through the implementation of strands and strand units from the revised curriculum. Included are the strands of Energy and Forces, Materials, Environmental awareness and Care and Living things; and the strand units of Forces, Light, Properties and Characteristics of materials, Magnetism and Electricity, Our classroom locality, Materials and change, Myself, Plants and animals and Sound. Furthermore the research is analysed through the use of video-taping various groupings of children. These groupings include:

(i) children within their class groupings performing tasks together,

(ii) children within their class groupings performing individual tasks,

(iii) children within their class groupings paired or in threes with children who appeared to demonstrate similar learning traits *i.e.*, two dominant children together or two passive children together,

(iv) infant children grouped specifically by age *i.e.,* four year olds *etc.*, $1^{st}/2^{nd}$ class performing individual tasks,

(v) children paired or in threes of same gender and age,

(vi) children in a mixed gender and age grouping and also grouped with children of similar participation rates (as observed in previous lessons),

(vii) children in a same gender but mixed age grouping and also grouped with children of similar participation rates (see further details of groupings in Chapter 5 -5.3 Groupings)

The children's participation rates during the written parts of the tasks are analysed through use of their completed worksheets or indeed their incomplete worksheets. All the collected data is then analysed with reference and comparison to the children's

achievement scores from standardised tests, which children have completed on a yearly basis from 1st class upwards in the researcher's school. The infant classes, in which the children are not of the age to receive standardised tests, have (in most cases) completed infant assessments; the scores of which are combined with teacher-based assessments and compared with their participation levels in the lessons.

Throughout Chapter 4 the advantages and disadvantages of using video-taping as a data collecting source were discussed. In addition the significance of classroom research for use in the current research topic was outlined including the opinion that triangulation of different data sources would be advisable. In this study a combination of video-taping, teacher observations and children's work was studied to provide a high degree of accuracy for the collected data.

In the following section, Chapter 5, the methodology used is outlined with reference to the topics covered in Chapters 1 — 4. The underlying reasoning for the choice of certain analysis and collection techniques and the rejection of others is also discussed. The use of teacher observation is recommended by a myriad of research which underlines the important role the teacher has in guiding the children to knowledge (Hollis, 1995; D.E.S. and N.C.C.A., 1999). Furthermore the high value for research that the wealth of information possessed by a teacher who is familiar with the children undergoing the research is of great relevance (D.E.S. and N.C.C.A., 1999). The researcher, who believed there would be a pattern, was eager to compare the findings with that of Nuthall (1996) who claimed intelligence bears no relevance to participation rates.

Chapter 5 – Methodology

5.1 Design of the investigation and description of the measurement techniques

The research was carried out in a small two teacher school in a rural setting in County Donegal. The researcher was also class teacher to the nineteen children. The class was multi-grade ranging from junior infants to second class *i.e.,* four to eight year olds. The children come from a variety of family backgrounds but are mainly residing in a rural setting rather than an urban one. They have all had similar prior experiences in their formal science education to date as they have all been taught by the same teacher.

The first step was to devise a method of observing the participation levels of the children in science class. To facilitate observation during class time the research was conducted in the researcher's own classroom. The decision to use video-recordings was taken by comparing the advantages of the use of video-recording as cited by Reyer (2005) and Dixon (1995) with the limitations as described by Gais (2005). The comparison suggested that the use of video-recording should provide validity and accuracy to the data. The advantage of allowing the teacher to continue teaching and prevent disruption to the flow of the lesson was seen as a worthwhile asset. The positive aspects of video-recording as shown by Reyer (2005) and Gais (2005) also support the choice of video-recording for gathering data which they assert ensures a consistent and routine flow of data as opposed to the inconsistencies arising from asking another teacher to allow taping of her/his lessons. The using of video ensures that the familiarity of the researcher with the children gives a deeper insight into the way a child perceives certain events. Therefore the researcher is more aware of nuances, gestures *etc.*, and their effects on particular children than a stranger might be or indeed as the researcher

would be with unfamiliar children. The fact that the research was carried out within the teacher's and the children's own surroundings kept the normality of school life and observed the day to day dynamics within the working classroom with as little disruption as possible. Furthermore it gave the researcher more control of the research and allowed for a more hands-on approach for the teacher and the children. The hands-on approach is demonstrated in Figure 5.1 which is a still frame of video recorded during Lesson 1 — Floating and sinking. This lesson provided opportunity for all children to take part in the investigation and to demonstrate active participation in the hands-on lesson.

Figure 5.1 Lesson 1 — Floating and sinking (hands-on activity)

The hands-on approach, advocated by the revised S.E.S.E. guidelines (D.E.S. and N.C.C.A., 1999), is based on children working effectively in groups. Following the recommendations of having the students working scientifically *i.e.,* all participating in practical investigations, expecting all students to make observations, hypothesise, predict, investigate, plan fair tests and to analyse and finally cultivating positive attitudes to science, the decision for grouping the children and the frequency with which the changes in these groupings should occur was made. Due to the plethora of somewhat conflicting advice on the arrangement of groupings for science lessons, as discovered in Chapter 2, the researcher observed the children in various groupings through the course of the research and changed the groupings to try to optimise the

amount of active participation and minimise the non-participation. The point must be made that the class is already, in effect, grouped in their separate class groupings *i.e.,* six 1st/2nd class, six senior infants and seven junior infants. These were taken as the first grouping for observation and if a particular child was found lacking in participation, in relation to his/her peers, a change in groupings would be made to try and combat any deficiency in participation. The researcher decided to try different groupings in the classroom and observe if this effected a change in children's learning styles and participation rates. The changes in groupings were modelled on the cyclical representation of advice by Harlen (1996) on evaluating in the science classroom (see Figure 4.1).

Sixteen lessons in all were chosen for observation. All sixteen lessons were compiled following the Revised Primary School Curriculum guidelines. The intention was to utilise a wide variety of strands and strand units in an effort to eliminate the possibility of a child deciding to opt out of participation because of an aversion to a particular topic. The same reasoning is behind the idea of a different topic for each individual lesson. Efforts were made to include a wide assortment of scientific skills to involve all children. These are listed on the following page:

1. questioning

2. observing

3. predicting

4. investigating and experimenting

5. estimating and measuring

6. analysing

7. recording and communicating

8. exploring

9. planning

10. making and evaluating (D.E.S. and N.C.C.A., 1999).

Figure 5.2 shows children participating in Lesson 9 ̶ "Look outside" and Figure 5.3 shows the lesson plan for this class. Each of the other 16 lessons followed a similar plan as shown in Figure 5.3.

Figure 5.2 Lesson 9 ̶ Look outside

Lesson 9- Look outside

Groupings: Infants = four year olds, five year olds and six year olds
                   1st/2nd class = individual tasks

Objectives:
1. The child should be enabled to observe, discuss and identify a variety of plants in the immediate environment.
2. The child should be encouraged to use the correct names of parts of plants when describing the plant *e.g.,* stem, leaf, petal *etc*.

Resources:

Nine large hoops   Pencils
A4 sheets numbered 1-3   Infant worksheets
Objects such as a stick, rubbish or stone to place in infants' hoops
1st/2nd class worksheets

Introduction:

Brief discussion on things we might find growing outside. Take examples. What does growing mean? Have a brief discussion. Explain that we are going outside and everyone has got something to find out. Divide into groupings.

Development of lesson:

Discuss the nature of the tasks *i.e.*, Infants will have to locate a numbered hoop (1-3) somewhere in the school grounds and must fill on their sheet in the correct hoop anything which they can see inside the hoop. The children can draw these. They will switch hoops at a given time until they have visited the three hoops. The teacher will direct the groups to find hoops at the correct interval by blowing the whistle each time a group is to search *i.e.,* find the initial hoops in rotation to avoid confusion. 1st/2nd class each take their own hoop and place it somewhere in the grounds. They then have to follow a worksheet asking them to count how many of four different flowers that they can find in their hoop. Stress it is their choice where they think the hoop should be placed.

Conclusion:

(Question Time) Discuss the findings with the children. Get children to name the parts of the flowers. Did anyone find something that was not growing? Did 1st/2nd class have any problems? List what the children found on the blackboard.

Figure 5.3 Sample lesson plan

The rationale as to why each individual lesson was chosen is listed in Table 5.1 and is in keeping with the research carried out by Hollis (1995) which found that to optimise participation in science a teacher must at all times take into account that

"*A student's willingness to learn and his/her enthusiasm for discovering knowledge and developing understanding will dictate the level of student learning*" (Hollis, 1995).

Table 5. 1 *Rationale for choosing lessons*

Lesson number and name	Rationale for choosing the lesson — Strands, strand units and skills included
Lesson 1- Floating and sinking	*Energy and forces — Forces 1, 2, 3, 4, 6, 7 and 8. The topic was chosen as it was felt that all children have experience and familiarity with the topic and therefore be encouraged to participate.
Lesson 2- Making shadows	Energy and forces — Light 1, 2, 3, 4, 6, 7 and 8. The lesson had a different strand unit. It included outdoor and indoor activities which were oral, pictorial and written in nature.
Lesson 3- Properties and characteristics of materials	Materials — Properties and characteristics of materials 1, 2, 3, 4, 6, 7 and 8. It was hoped that every child would relate to the different examples of materials as everyday items they would have contact with. Activities were hands-on in manner.
Lesson 4- Pushing and pulling	Energy and forces — Forces 1, 2, 3, 4, 6, 7, 8, 9 and 10. The focus was again to provide accessibilityl. Hands-on activities and classroom objects used.
Lesson 5- Magnetism	Energy and forces — Magnetism and electricity 1, 2, 3, 4, 6, 7, 8, 9 and 10. This is a topic which is generally very enjoyable for children. It lends itself to the inclusion of all in the fun of science. The activities would hopefully encourage communication between peers.
Lesson 6- Mapping-litter/Plans	Environmental awareness and care — Caring for our earth/our classroom locality 1, 2, 3, 4, 6, 7, 8 and 9. Infants who have recently begun a campaign to win a green flag will talk about being safe and tidy using a familiar story as inspiration and make caring for our locality a worldwide issue. $1^{st}/2^{nd}$ class were becoming overly familiar with magnets so planning the classroom was an alternative which could be taught concurrently.
Lesson 7- Magnetism/ Reactions	Energy and forces/Materials — Magnetism and electricity/Materials and change 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10. Lessons contained huge scope for skill enhancements. They allowed the infants to reinforce their previous knowledge and allowed $1^{st}/2^{nd}$ class to create and demonstrate their science skills.

Table 5. 1 *(cont.) Rationale for choosing lessons*

Lesson number and name	Rationale for choosing the lesson — Strands, strand units and skills included
Lesson 8- Body parts	Living things — Myself 1, 2, 4, 6, 7 and 8. Lesson was designed to refer to the child's prior knowledge and to extend this through fun activities. Recording and communicating is important in the lesson.
Lesson 9- Look outside	Living things — Plants and animals 1, 2, 4, 5, 6, 7 and 8.The strand of living things is continued but moved outdoors changing the learning environment and facilitating different groupings. Simple to complete activities regardless of ability.
Lesson 10- Planting	Living things — Plants and animals 1, 2, 6, 7 and 10. The lesson involves working in groups in close interaction with peers. It is interesting to observe the dynamics of groups as the children by now should have experienced and adapted to working in different groups and communicating with their peers.
Lesson 11- Construction	Materials — Properties and characteristics of materials 1, 2, 4, 5, 7, 8, 9 and 10.Indoors based lesson talking about houses and the construction of a home for teddy as most children, at some point, endeavour to construct in their play.
Lesson 12- Colours	Materials — Materials and change 1, 2, 3, 4, 6, 7, 8 and 10. Children love to paint and mix colours to find new ones and are familiar with colours at this stage. Tasks are relatively simple and all should be able to take part.
Lesson 13- Sounds	Energy and forces — Sound 1, 2, 3, 7 and 8. Oral work is involved in this lesson and participation in an action poem. Listening to our classroom noise brings sounds to life.
Lesson 14- Air	Energy and forces — Forces 1, 2, 3, 4, 6, 7 and 8. This lesson allows for lots of different fun group activities. It is a highly active lesson with a role for each child.
Lesson 15- Minibeast hunt	Living things — Plants and animals 1, 2, 3, 4, 5, 6, 7 and 8. Content is based on the researcher's previous experience of the reluctance of girls to participate in lessons pertaining to minibeasts. Children start by drawing and observing and the topic is expanded in Lesson 15.
Lesson 16- Minibeast collection	Living things — Plants and animals 1, 2, 3, 4, 5, 6, 7 and 8. Inclusion of this lesson is based on the researcher's experience that girls are reluctant to collect minibeasts. Each child is given a chance to participate and waylay their fears using a hands-on technique but not actually having to touch any of the creatures.[1]

[1] * Energy and forces = Strand, Forces = Strand unit and 1 – 10 = skills included in the lesson(full list above in Section 5.1).

The sixteen lessons were taught during the year. The time for intervening with a change *i.e.,* change in groupings, was not formally decided beforehand; rather it was an ongoing process dependent on what the researcher could see from the data collected in the previous lessons. This was to allow for a more fluid and evolving research that would take the reactions of the children into consideration before moving on to the next lesson and is in accordance with the cyclical manner of evaluating in the classroom (Figure 4.1, Harlen, 1996). The specific grouping changes are explained in depth in section 5.3 Groupings.

5.2 Data collection

The data was collected as follows so as to optimise the collection of information and to agree with the advice given by Reyer (2005) in which he suggested the gathering of evidence from other sources as well as the use of video-recordings. Several sources were used:

1. Teacher observation ─ Time was set aside during each lesson in which the teacher would sit quietly noting any comments or actions, by the children, relevant to active participation or indeed non-participation. These were recorded in a notebook. The researcher kept this notebook to hand throughout all the lessons and noted any relevant comment or action. Furthermore during each lesson the teacher held a question or comment time for the children. Specific questions were posed relevant to the following or previous lesson. The teacher then plotted on a classroom plan the children who took no part *i.e.,* made no attempt to answer and also the children who appeared uninterested or got distracted by an occurrence in the surroundings (See Figure 6.28).

2. Video clips ─ Each group was video-recorded at some period during the lesson. Originally it was thought that each group would be video-recorded for a period

51

of approximately five minutes and then the video would be trained on the next group. However, as the research progressed it became apparent that the most efficient use of the video was to observe the older, more independent, children with it and record the infant classes with teacher observation (noted as above) and a shorter video section. Predominantly because the infants were still quite dependent on the teacher's guidance/approval and it was easier to jot down their actions and comments as they occurred. This meant the teacher was free to circulate and keep the children motivated. The older children were happier to proceed with their tasks independently and remained mostly static in view of the video.

3. Field notes were then compiled from the video-tapings and teacher's notes. These consisted of children's comments, where relevant, and also the teacher's comments. They also contained detailed descriptions of children's body language and general interaction with their peers. Furthermore they noted the children's interaction with the tasks to which they were applying themselves or indeed not applying themselves. Each child was referred to by a pseudonym for the purpose of the research. The field notes were written up as per advice from Hopkins (2002) and Denscombe (2003). The notes were written up by the researcher with no prior constraints for amount written or a time limit to complete them in as Lofland (1971, in Cohen *et al.,* 2000) advocated. (See Figure 6.30 and Appendix A for examples of the teacher's field notes).

4. The children's work ─ Any tasks completed or attempted by the children were collected and analysed. Worksheets were all named and evidence of participation from each one was noted and plotted in the field notes *e.g.*, ¼ completed, ½ completed *etc*. Any drawings or models were also included providing a way to observe, concretely, the level of participation the child put into written or constructed work. (See Figure 6.31 and Appendix D for examples of worksheets).

5. In accordance with research carried out by Reyer (2005) in which he mentions the value of using performance or achievement tests to validate data gathered, it was decided to use standardised tests and achievement scores to investigate if there were any discernable patterns between intelligence and participation rates.

5.3 Groupings

To begin with the children were grouped by classes which meant there were similar ages within a group. To keep all the groups roughly the same size, and also to aid the collection of the data, first and second class were grouped together. Junior and senior infants worked as two separate groups at two separate tables with the same tasks to complete. $1^{st}/2^{nd}$ worked together on tasks. Initially there were seven $1^{st}/2^{nd}$ class children. However one child, pseudonym Harry, was only present for three of the lessons. The data recorded pertaining to his actions were consequently removed from the results section as it was deemed insufficient to be representative of the child's participation. A second child, Kevin in senior infants, was present for only half of the lessons. However enough data was considered to be collected to analyse his participation rates. This meant there were seven junior infants, six senior infants and six $1^{st}/2^{nd}$ class as shown in Table 5.2.

Table 5.2 *Children's pseudonyms and classes*

$1^{st}/2^{nd}$ class	Senior infants	Junior infants
Donal age 8	Kevin age 6	Tony age 5
Tara age 8	Tom age 6	Beth age 5
Pat age 7	Ellen age 6	Bob age 4
Ann age 7	Jack age 6	Tim age 4
John age 7	Eve age 5	Chris age 4
Jen age 6	May age 5	Lara age 4
		Mags age 4

Table 5.3 *Groupings of lessons and the rationale for the changes in groupings*

Lessons	Grouping	Criteria for grouping
1, 2 & 3	Grouped in classes.	This grouping was in order to establish the current participation rates within the children's normal class groupings.
4	Infants – Grouped in classes. $1^{st}/2^{nd}$ – Grouped in class but with an individual task to perform.	Infants remained in their class grouping as they appeared to interact satisfactorily. In $1^{st}/2^{nd}$ a female exhibited elevated non-participation levels in comparison with her peers therefore warranting the change to an individual task.
5, 6, 7 & 8	Grouped in pairs or threes (depending on no. of children in class) in class groupings.	Children were paired on basis of dominant children together/passive children together.
9 & 10	Infants – Grouped by age *i.e.*, four year olds, five year olds & six year olds. $1^{st}/2^{nd}$ – Individual tasks in lesson 9 then by age in lesson 10.	The researcher observed younger children deferring control to the older children in their groupings and so instigated the change of groupings for infants. In the $1^{st}/2^{nd}$ class group peer dependence was notable (not linked to age) so in order to combat copying individual tasks were again implemented. In 10 due to evidence of passive behaviour in $1^{st}/2^{nd}$ class the groupings were changed to age specific groupings.
11, 12 & 13	Grouped in same gender groups in pairs or threes (depending on no. of children in class) in class groupings.	The researcher noted that some children appeared to respond more to children of the same gender and therefore grouped on the basis of this observation. The groupings remained small in order to facilitate the inclusion of non-participating children who may have had difficulties communicating in a large group.
14 & 15	Grouped with mixed gender and mixed age but with like participation rates *i.e.*, low participating children/high participating children. Six groups in all.	The researcher could still observe non-participation from some of the $1^{st}/2^{nd}$ class children. It was decided to place one of the six $1^{st}/2^{nd}$ class children in each of the groups thus encouraging the quieter children to take on an active role in the lesson. Next the infants were chosen based on their previous participation levels in comparison with the $1^{st}/2^{nd}$ class pupil in the group (grouping similar participating children together).
16	Grouped with same gender but mixed age and with like participation rates *i.e.*, low participating children/high participating children (Six groups).	The decision to make what appears a small change in the groupings was taken to observe if non-participating children would take on a more active part when grouped with their own gender. The children ordinarily play with their own gender in the schoolyard and so therefore have a rapport already in place which might facilitate learning.

There were sixteen lessons in all which are summarised in Table 5.3. The following was the grouping for lessons one, two and three (see Table 5.3). These lessons were in the same groupings to give the researcher an opportunity to check if any particular pattern of participation was occurring within the class groups. Also the researcher observed if any child was denied the chance to participate by a dominating member of his/her group. These types of observations were written down in the teacher's field notes and indicated using arrows in the keyword maps Figures 6.2 – 6.17. Following these lessons a small change in the groupings was made to monitor if the problem of a non-participating passive child was exaggerated or reduced. Lesson four had just a small variation for $1^{st}/2^{nd}$ in that each child had an individual test to complete for themselves. This change was made due to observation demonstrating that one child in particular seemed to opt out of participation in the group activities.

For lessons five, six, seven and eight the groupings were changed (see Table 5.3). The children remained in their class groupings but the groups were divided either in threes or paired. This change was undertaken to investigate if non-participators would take on more active roles in a smaller group situation. In each of the class groupings it had already been noted that at least one child would opt out or allow other children to do their task for them. It was also noted that a pattern was developing as to children's individual participation rates. This rough pattern was used to put the children in pairs or threes within their class groupings *i.e.,* two domineering children or two passive children together.

Lesson nine was grouped differently. For some children the level of participation was still low so in order to ascertain if levels could be altered the groupings were changed. For the infants this was age specific due to the younger children deferring to the older children's views on their tasks. There were three groups:

four year olds, five year olds and six year olds. The $1^{st}/2^{nd}$ group performed a different task individually due to the apparent dependence of some of the $1^{st}/2^{nd}$ group on their peers which led to copying or passiveness. It was intended that these children would be compelled to think or act without reliance on others. Lesson 10 continued the age specific groupings. This time all children were grouped, regardless of class, by their ages *i.e.*, four year olds, five year olds, six year olds and seven/eight year olds.

After observing the patterns that appeared with age groupings and the dissatisfaction that children felt by being grouped with children from a different class than their normal class groupings it was decided, once more, to change the groupings. From the researcher's experience of children's play in the yard at lunchtimes it was decided to investigate if the children responded favourably to groups of the same gender. Lessons eleven and twelve were grouped by gender (see Table 5.3). The infants were paired whilst the $1^{st}/2^{nd}$ group were in threes. The groups were kept small as all indications were that the quieter children or non-participating children would have more chance of joining in as part of a small group. Another contributing factor to making the change was to facilitate observation to investigate if the children worked better along with children of the same gender. Lesson thirteen had the same groups for $1^{st}/2^{nd}$ but the infants returned to individual tasks in their class groups. At this stage the infants were found to work better with individual worksheets to complete as they were still quite egocentric and some were unwilling to share during tasks.

Lessons fourteen and fifteen were grouped in a mixed gender and age fashion but were grouped with children of similar participation rates (as observed from the preceding lessons *e.g.,* low levels of active participation with others of low levels of active participation). It was decided to have six groups, each containing one of the $1^{st}/2^{nd}$ class children. This was mainly to check if a higher level of participation could

be encouraged from those children who at this stage habitually sat back and let others take over. The change was also intended to give the chance to others who were not allowed to fully participate by a domineering child in their group. The reason one child from 1st/2nd was in each group was to hopefully maintain a fair system of operation *i.e.,* prevent someone from completing the entire task.

Lesson sixteen, the final lesson, was grouped as lessons fourteen and fifteen but with one change, the groups were of the same gender (see Table 5.3). As some of the quieter children had been observed by the teacher conversing and playing with their own gender but also different age groups in the yard it was interesting to observe if this aided participation in science tasks as some evidence of non-interaction between the genders was observed in preceding lessons. The decision to have this as the final lesson was prompted by the positive results of gender specific groupings which have been recorded by studies such as Ryan (2000).

5.4 The use of Transana 2.1 – Coding and Video Analysis

The use of a computer software program was advocated by Reyer (2005) who also suggested a coding procedure to allow uniformity in data collection and analysis. In this the computer software program Transana 2.1 was used. Transana 2.1 contains free software (now only available for a fee) written at the Wisconsin Center for Education Research by Chris Fassnacht and maintained by David K. Woods and is available to download at www.transana.org. The computer program allows transportation of video data into the software and pinpointing of key occurrences in all the lessons. Through use of the software the researcher identified and organized relevant and analytically interesting portions of video. Keyword maps, which are explained in Chapter 5 p. 61, were then created from the keyword occurrences and the frequency and identity of each

child exhibiting certain participation traits was recorded. In this study the keywords, or coding words, were

(i) camera tricks,

(ii) dependence on peer,

(iii) dependence on teacher,

(iv) independence,

(v) taking on the role of teacher,

(vi) loud children,

(vii) aggressive participation,

(viii) active participation,

(ix) non-participation and

(x) passive participation.

These keywords were chosen as the main factors which had a direct bearing on the child's participation level and ability to work within a group-setting during the lessons. These were informed by the researcher's own classroom experience over ten years in teaching in a multi-class situation and by the academic research by Brown University, (1996); Galton in Kahle, (1991); Ballone & Czerniak, (2001); Hammrich, (2001); Sjøberg & Imsen, (1986, in Sjøberg & Imsen, 1991); Hollis, (1995); Hopkins, (2002); Harlen, (1996). The keywords are explained in detail in the following keyword summary report, (Figure 5.4), which was compiled in Transana 2.1.

Keyword Summary Report

Camera tricks
camera
Any instance of performing for the camera e.g. making faces, waving etc.

Learning styles
DP: Dependence on peer
Any instance of a child relying on another child's opinion or direction. This can be oral reliance, a sideways glance or a sustained period of observing another child's work.

DT: Dependence on teacher
Any instance of questioning of the teacher for direction and clarification occuring after the teacher's initial instructions. Also included are incidents which contain seeking for the teacher's approval.

I: Independence
Demonstrating the ability to work independently for more than two minutes.

TR: Taking on the role of teacher
Any instance of a child instructing his or her peer in what to do for the task. Included are children who have been asked for help by peers and those who impose their directions on others.

Loud children
Loud
Any instance of a child shouting or being heard, on the video recording, noticeably above the general level of noise from the rest of the children.

Participation roles
AG:Aggression
Any act of aggression during the task. These includes instances of hitting the table, pushing peer, standing in group, taking the first go, taking extra goes etc.

AP:Active participation
Any instance of direct involvement in the task and in the group.

NP:Non-participation
Any instance of being completely off-task i.e not joining in with the others or with individual tasks.

PP: Passive participation
Any instance of a child waiting for instruction but not actively seeking instruction, allowing peers to tell them what to do and making no comment and also copying.

Figure 5.4 Keyword summary report from Transana 2.1

All sixteen lessons were recorded by the researcher using a Sony digital handycam which stored the video clips on mini-DV cassette tapes. These tapes, which held two to three of the lesson recordings, were then loaded onto computer hard drive. The software, for transferring the images from the video camera to the computer hard drive, limited the length of each video transferred to roughly eleven and a half minutes. Consequently some of the recorded lessons were split into two or more image files. Subsequently they were imported into the Transana 2.1 database and labelled accordingly *e.g.,* Lesson 1.1, Lesson 1.2 Both being part of the same lesson 1) *etc*. Following this, the key words or instances that the researcher was looking for were noted in a transcript.

The researcher wrote the transcript while watching the video recordings. The transcript consists of keyword instances as identified by the researcher rather than a complete transcription of the children's conversations. Beside each incident the researcher placed a code to aid identifying each keyword. The code letters appear in the transcripts rather than the entire keyword names *e.g.,* C appears each time a child takes an interest in the camera. The following are the codes for the ten keywords:

C = Camera tricks,

DP = Dependence on peer,

DT = Dependence on teacher,

I = Independence,

TR = Taking on the role of teacher,

L = Loud,

Ag = Aggression,

AP = Active participation,

NP = Non-participation and

PP = Passive participation

(See Figure 6.18 or Appendix C for a sample transcript).

Each incident of a keyword or action was then given a time code which appeared at the start and end of the new keyword incident. *e.g.,*

```
¤<475046>NP: Chris is not trying any of the task now.
¤<492818>
```

If one incident was closely linked with another incident the time code included multiple keywords incidents and the researcher placed codes to state a new occurrence of a different keyword incident *e.g.,*

```
¤<559537>AP: Tara complains that she keeps going off count
in the daisies. In the end the teacher helps her.
PP: Ann stands watching. ¤<563823>
```

The researcher inserted time codes which are marks placed into the transcripts in order to link the encoded sentence with a relevant short clip of video. Clips are grouped together in the software by common keywords so that the researcher can analyse corresponding incidents. The software compiles keyword maps for each transcript. Keyword maps are visual displays of where keywords have been assigned to clips from the transcript. The keyword only appears in the keyword map if it has been noted.

Each colored band in the keyword map shows the start and stop points of a clip, along the horizontal timeline of the episode (i.e., lesson), where a particular keyword, along the vertical axis, has been applied. Bands of the same color with the same starting and ending points indicate that a single clip was assigned multiple keywords (Fassnacht, Transana 2.1, 2002).

Keyword maps represent a distillation of the information gathered from the video footage and are of vital importance when compiling key incidents of individual lessons. (See Figures 6.2 − 6.17 for keyword maps). Arrows indicate *passive participation* throughout Figures 6.2 − 6.17. Through the research the amount of *passive* incidents and specifically passive children were important for ascertaining the effectiveness of a particular grouping. Thus these arrows facilitated the pinpointing of concentrations of *passive participation* and allowed the researcher to investigate why a concentration of passiveness occurred.

The Transana software also compiled a keyword usage report for each transcript. This recorded the time and length of the keyword incident. The researcher named every individual clip of video containing a keyword incident thus was able to see in this report the name of the perpetrator and the actual keyword incident. At the end of each report a compilation of the usage of each keyword was produced. (See Figures 6.19 – 23).

It must be noted that the keyword usage report alone was not enough to read results from, as the researcher named more than one child for some clips. The consequence of this was that not every individual incident of each activity of active participation for each child, or whatever the particular keyword was, was recorded in the report. Being aware of this the researcher triangulated the results from the keyword maps, transcripts and keyword usage reports to ensure the highest accuracy possible when compiling the frequency of the keywords in relation to a particular lesson, child and grouping.

This chapter described the procedures used for collection of data. The rationale for grouping the children and formatting the lesson content was also discussed. Finally the method for data analysis using Transana 2.1 was stated. In the next Chapter the data collected is given and analysed.

Chapter 6 ‒ Results

6.1 Keyword frequencies

The data collected from the video recordings of the sixteen analysed lessons were transferred onto the data analysis software program Transana 2.1. The researcher chose ten keywords to search for during the lessons. The frequency of occurrences of each keyword is shown in Table 6.1 and Figure 6.1, which record the number of total *camera* incidents as 27, *dependence on peer* as 68, *dependence on teacher* as 216, *independence* as 213, *taking on the role of teacher* as 69, *loud* incidents as 112, *aggression* as 196, *active participation* as 813, *non-participation* as 226 and *passive participation* as 135.

Table 6. 1 *Overall frequency of keywords*

Keyword	Frequency of keyword
Camera	27
Dependence on peer	68
Dependence on teacher	216
Independence	213
Taking on the role of teacher	69
Loud children	112
Aggression	196
Active participation	813
Non-participation	226
Passive participation	135
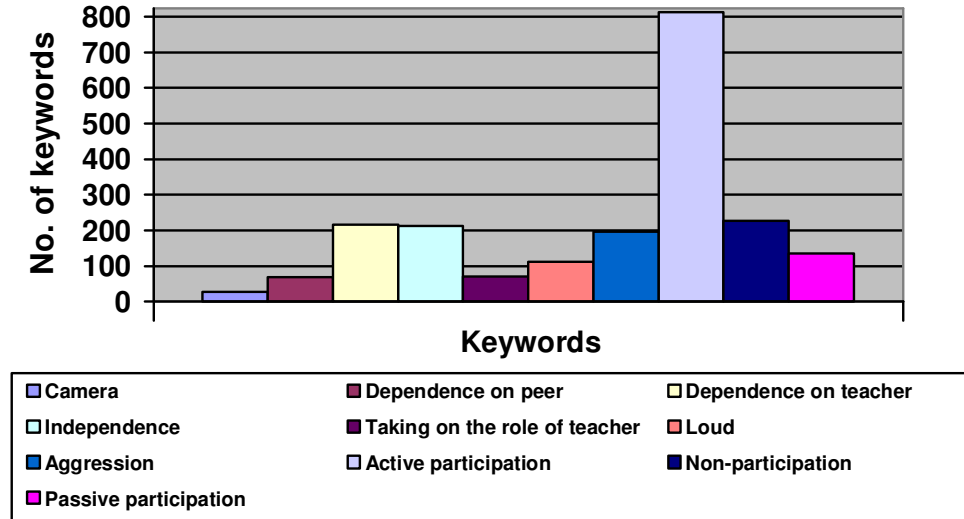
Figure 6. 1 Frequency of keywords

These results were cross referenced using the keyword maps compiled by the software and the transcripts written by the researcher (see Figures 6.2 ─ 6.17 for sample keyword maps and Figure 6.18 and Appendix C for sample transcripts). The data from the video taping, in conjunction with the teacher's field notes, were used to pinpoint and decide the change of groupings. The researcher found as the first grouping of lessons progressed that it was the children displaying passive behaviour who became isolated from actively participating in the task at hand. The non-participating children who were not passive almost always went back on task. The researcher attributes this lack of concentration to the young age and therefore short attention span of the selected class. The non-participators who were also given to displaying passive behaviour were the children experiencing difficulties with active engagement with the lessons. Due to the realisation that these children were the group likely to gain the least from the science lessons it was decided to target them and observe if the changes in groupings facilitated more learning of science for them and as a result to discover which grouping optimised the participation levels in the science lessons. The researcher inserted arrows indicating

the occurrences of passive behaviours on the keyword maps, Figures 6.2 – 6.17, in order to chart the changes in the pattern of passive actions and to take these changes into account when changing the type of groupings for each lesson.

In Lesson 1 (see Figure 6.2) there was only one instance of the keyword *camera*. There was some *dependence on peer* at the beginning of the lesson. *Dependence on the teacher* and examples of *loudness* continued throughout the lesson. *Independence* was quite high at the beginning of the lesson and less so in the middle and end sections. There are examples of *taking on the role of teacher* throughout the lesson. A lot of *aggression* was seen all through the lesson. The instances of *active participation* are very high. *Non-participation* is evident during the beginning, middle and end stages. *Passive participation* is found only at the beginning stage and is demonstrated by the arrow in Figure 6.2. The extent of *passive* incidents and specifically passive children were important for ascertaining the effectiveness of a particular grouping. Thus these arrows facilitated the pinpointing of concentrations of *passive participation*. The timing of all occurrences of keywords in Lesson 1 is found on Table 6.2.

Lesson 2, see Figure 6.3, has widespread occurrences of *Camera* tricks. *Dependence on peer* is evident at the beginning and the middle stages. *Dependence on the teacher* continues through the lesson. *Independence* is also evident at each stage of the lesson. *Taking on the role of teacher* is observed in the beginning and middle stages. The *loud* incidents are present at the beginning of the lesson. *Aggression* is observed throughout as is *active participation*. Incidents of *non-participation* are very common. *Passive* occurrences are arrowed in the beginning and middle sections of Figure 6.3. Table 6.2 summarises the occurrence of the key events for all lessons.

Dependence on the teacher is high in the beginning of Lesson 3 (see Figure 6.4) and through parts of the middle section. *Taking on the role of teacher* is also evident in these sections. The beginning and middle sections are very *loud*. This is when most *aggression* occurs also. *Active participation* and *non-participation* continues through the whole lesson. *Non-participation* is not as widespread. *Passive participation* is low in this lesson and only occurs twice (see arrows on Figure 6.4).

Lesson 4 contains many *camera* incidents. There are a few incidents of *dependence on peer* dotted through the lesson. *Dependence on the teacher* is very frequent. Large incidents of *independence* are evident. There is one occasion of *taking on the role of teacher* in the beginning stage. *Loudness* is concentrated in the middle section. *Aggression* is common at the beginning and the early middle stage. *Active participation* is frequent throughout. *Non-participation* is observable through the stages also. *Passive participation* is particularly high in the middle stage and is indicated by an arrow on Figure 6.5.

Lesson 1

Series: Lessons   Episode: Lesson 1.1   File: Lesson 1.10002.mpg

0:00   2:00   4:00   6:00   8:00   10:00   11:49

Camera tricks : camera
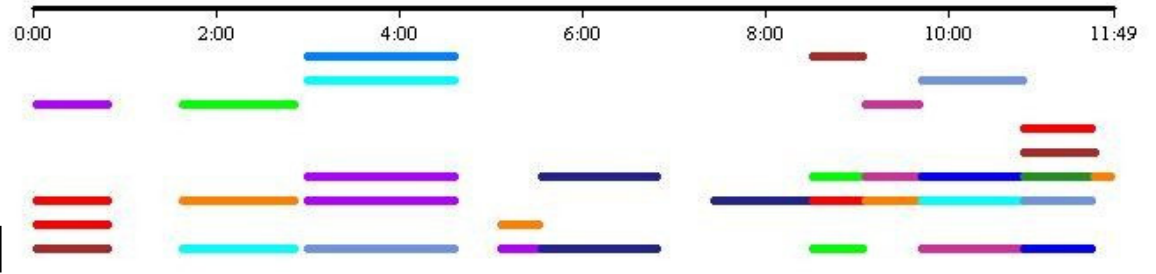Learning styles : DP: Dependence on peer
Learning styles : DT: Dependence on teacher
Learning styles : I: Independence
Learning styles : TR: Taking on the role of teacher
Loud children : Loud
Participation roles : AG:Aggression
Participation roles : AP:Active participation
Participation roles : NP:Non-participation
Participation roles : PP: Passive participation

→
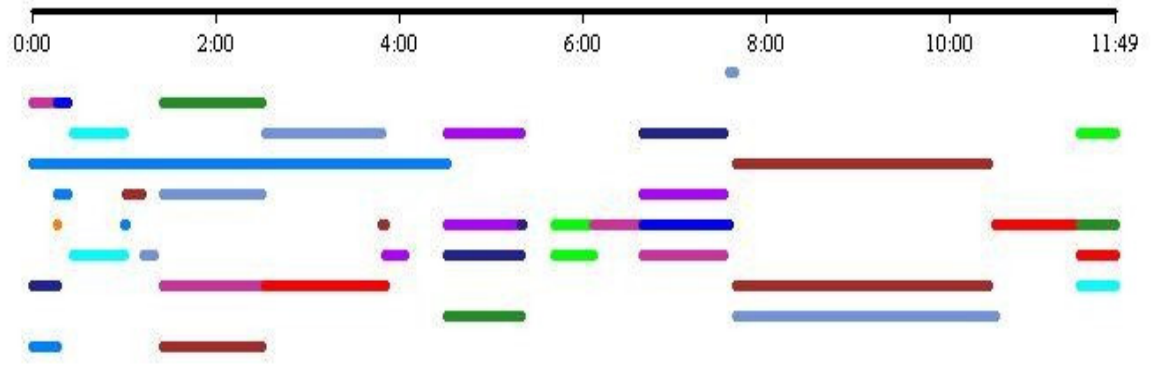
Series: Lessons   Episode: Lesson 1.2   File: Lesson 1.20001.mpg

0:00   1:00   2:00   3:00   4:00   5:00   5:37

Learning styles : DT: Dependence on teacher
Learning styles : I: Independence
Learning styles : TR: Taking on the role of teacher
Loud children : Loud
Participation roles : AG:Aggression
Participation roles : AP:Active participation
Participation roles : NP:Non-participation
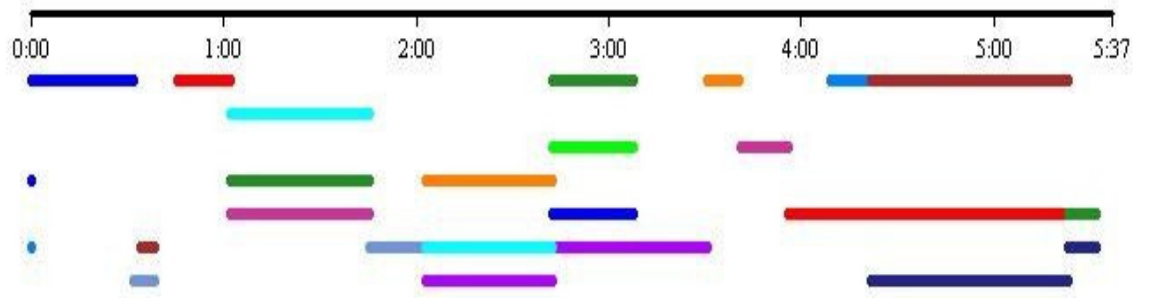
Figure 6. 2 Keyword maps of Lesson 1 ─ Floating and sinking

67

Lesson 2

Figure 6. 3 Keyword maps Lesson 2 ─ Light and shadows
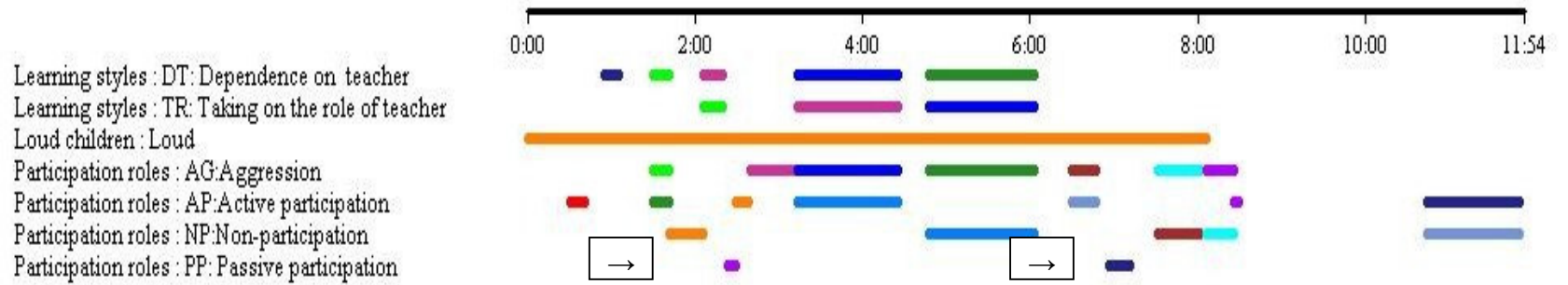
Lesson 3

Figure 6. 4 Keyword map Lesson 3 ⎯ Properties and characteristics of materials

Lesson 4

Figure 6. 5 Keyword maps Lesson 4 ─ Pushing and pulling

Lesson 5

Figure 6. 6 Keyword maps Lesson 5 ─ Magnetism

Lesson 6
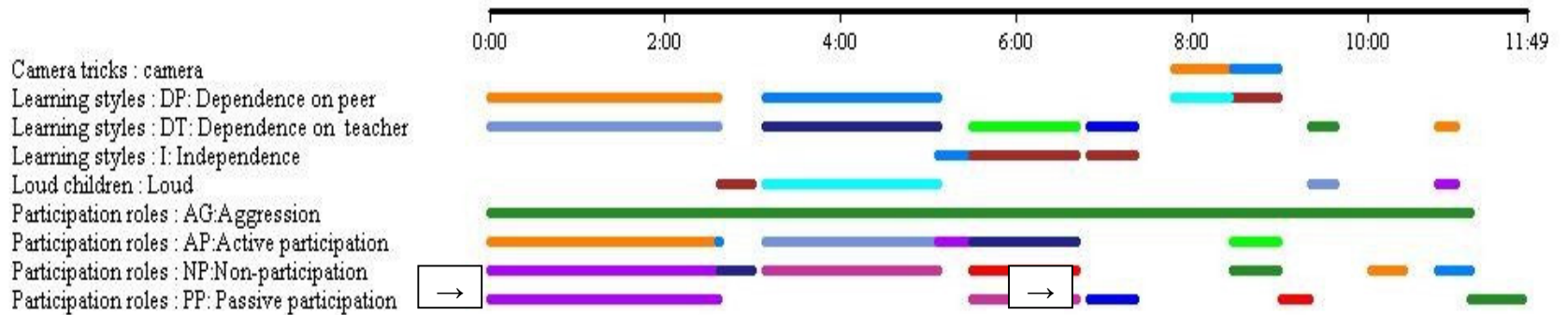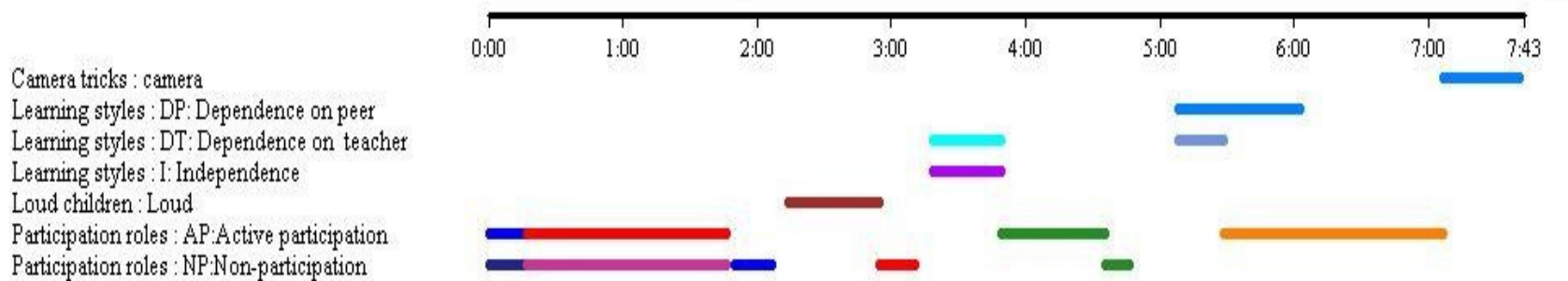
Figure 6. 7 Keyword maps Lesson 6 ̶ Mapping- litter/Plans

72

Lesson 7

Figure 6. 8 Keyword maps Lesson 7 ─ Magnetism/Reactions

Lesson 8

Learning styles : DP: Dependence on peer
Learning styles : DT: Dependence on teacher
Learning styles : I: Independence
Learning styles : TR: Taking on the role of teacher
Loud children : Loud
Participation roles : AG:Aggression
Participation roles : AP:Active participation
Participation roles : NP:Non-participation
Participation roles : PP: Passive participation

Learning styles : DP: Dependence on peer
Learning styles : DT: Dependence on teacher
Learning styles : I: Independence
Learning styles : TR: Taking on the role of teacher
Loud children : Loud
Participation roles : AG:Aggression
Participation roles : AP:Active participation
Participation roles : PP: Passive participation

Figure 6. 9 Keyword maps Lesson 8 ‑ Body parts

74
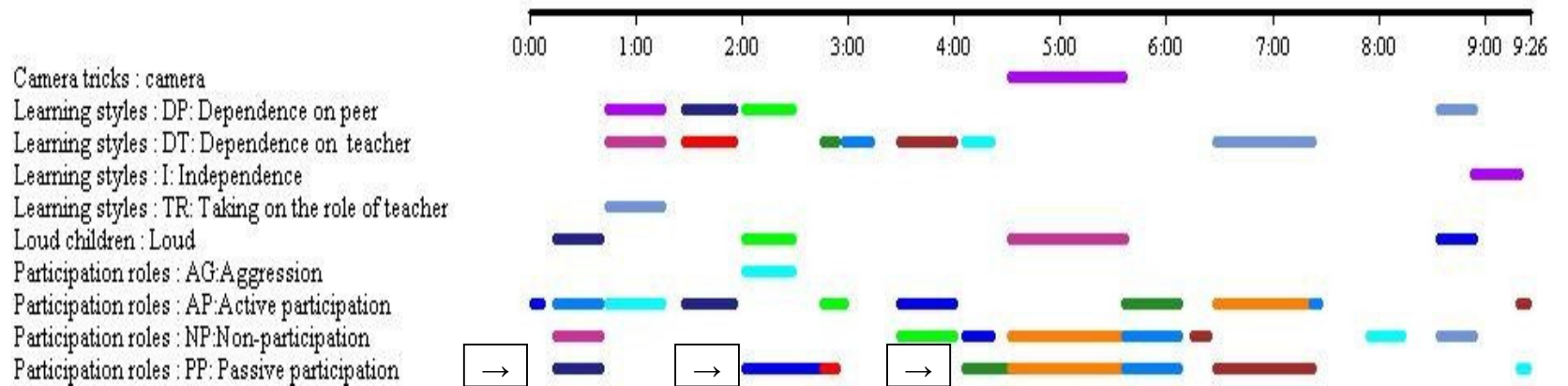
Lesson 9

Figure 6. 10 Keyword map Lesson 9 ─ Look outside

Lesson 10

Figure 6. 11 Keyword map Lesson 10 ─ Planting

Lesson 11

Figure 6. 12 Keyword maps Lesson 11 ─ Construction

Lesson 12

Episode: Lesson 12.1

File: Lesson 11.10001.mpg

Learning styles : DP: Dependence on peer
Learning styles : DT: Dependence on teacher
Learning styles : I: Independence
Learning styles : TR: Taking on the role of teacher
Loud children : Loud
Participation roles : AG:Aggression
Participation roles : AP:Active participation
Participation roles : NP:Non-participation
Participation roles : PP: Passive participation

Series: Lessons

Episode: Lesson 12.2

File: Lesson 11.20001.mpg

Learning styles : DP: Dependence on peer
Learning styles : DT: Dependence on teacher
Learning styles : TR: Taking on the role of teacher
Loud children : Loud
Participation roles : AG:Aggression
Participation roles : AP:Active participation
Participation roles : NP:Non-participation
Participation roles : PP: Passive participation

Figure 6. 13 Keyword maps Lesson 12 — Colours

78

Lesson 13

0:00   2:00   4:00   6:00   8:00   10:00   11:49

Learning styles : DP: Dependence on peer
Learning styles : DT: Dependence on teacher
Learning styles : I: Independence
Learning styles : TR: Taking on the role of teacher
Participation roles : AG:Aggression
Participation roles : AP:Active participation
Participation roles : NP:Non-participation
Participation roles : PP: Passive participation

→
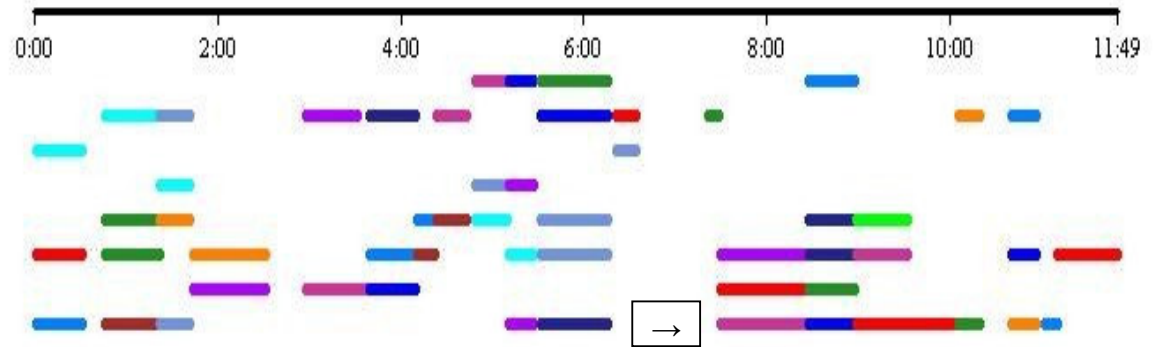
Series: Lessons   Episode: Lesson 13.2   File: Lesson 12.20001.mpg

0:00   1:00   2:00   3:00   4:00   4:38

Camera tricks : camera
Learning styles : DP: Dependence on peer
Learning styles : DT: Dependence on teacher
Learning styles : I: Independence
Loud children : Loud
Participation roles : AG:Aggression
Participation roles : AP:Active participation
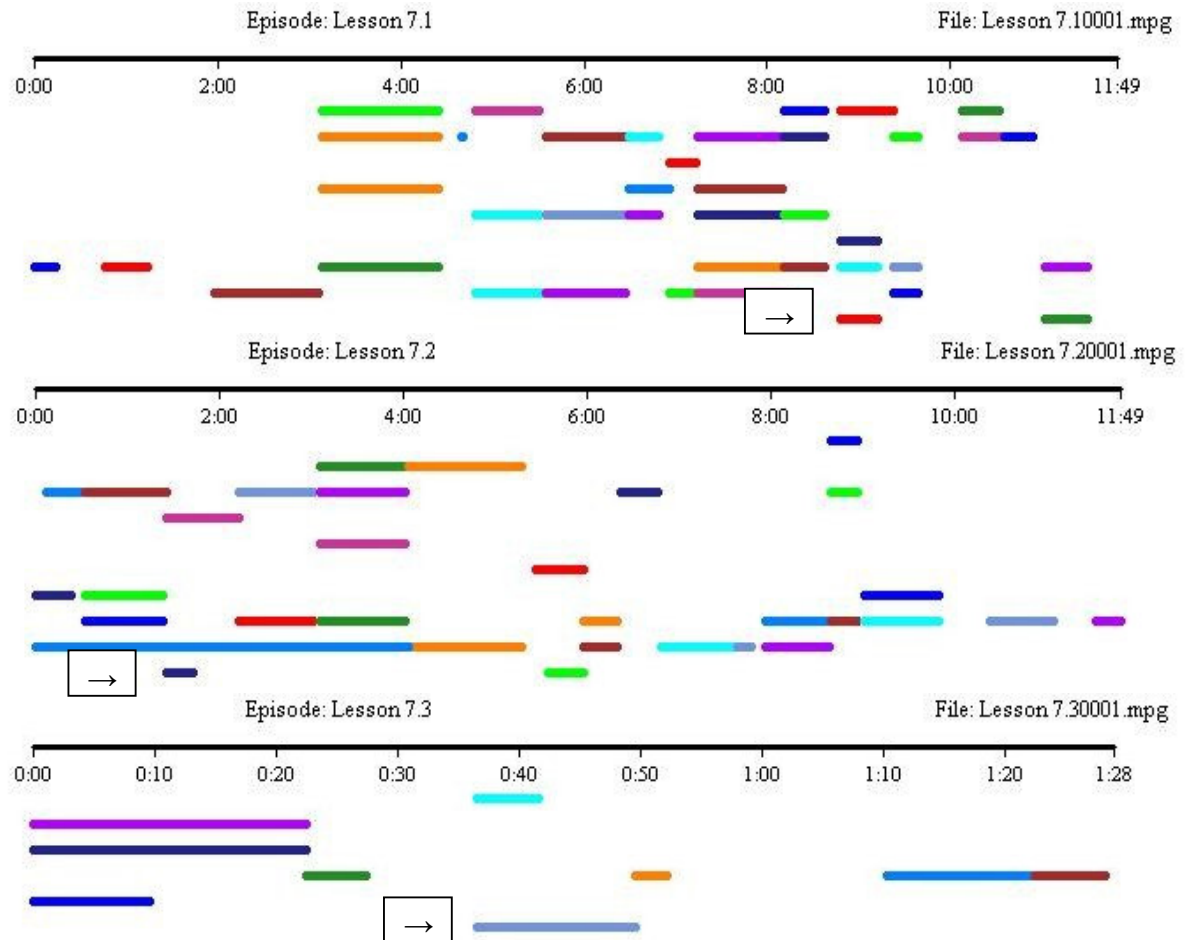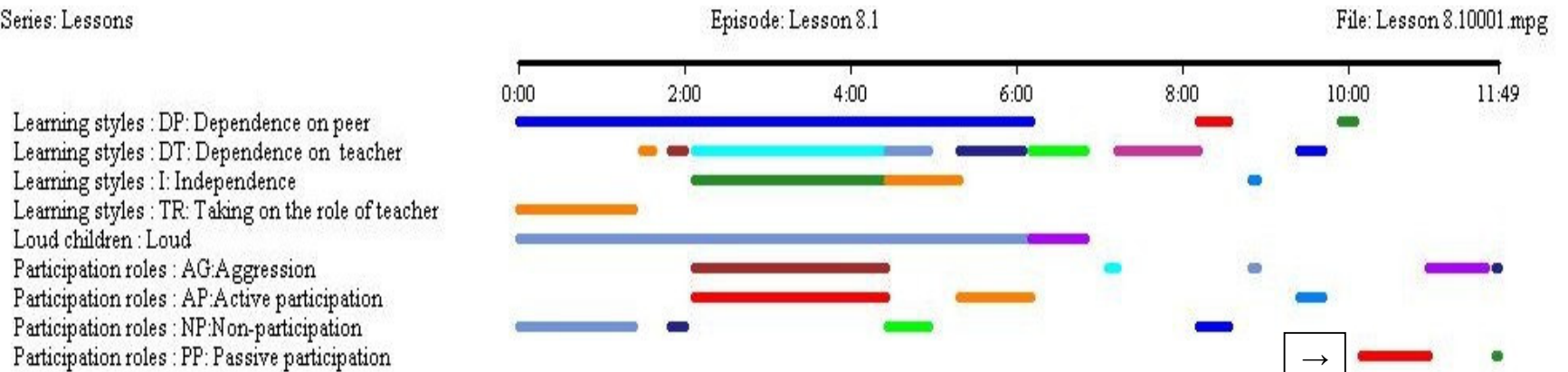Participation roles : NP:Non-participation
Participation roles : PP: Passive participation
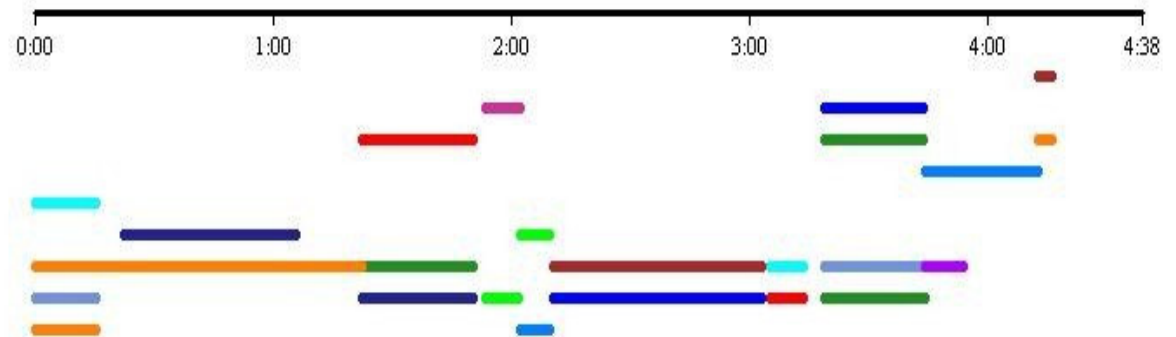
Figure 6. 14 Keyword maps Lesson 13 ─ Sounds

Lesson 14
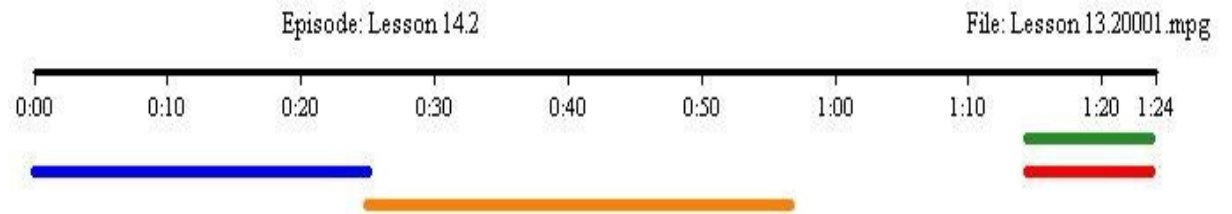
Figure 6. 15 Keyword maps Lesson 14 — Air

Lesson 15

Figure 6. 16 Keyword maps Lesson 15 ─ Minibeast hunt

Lesson 16
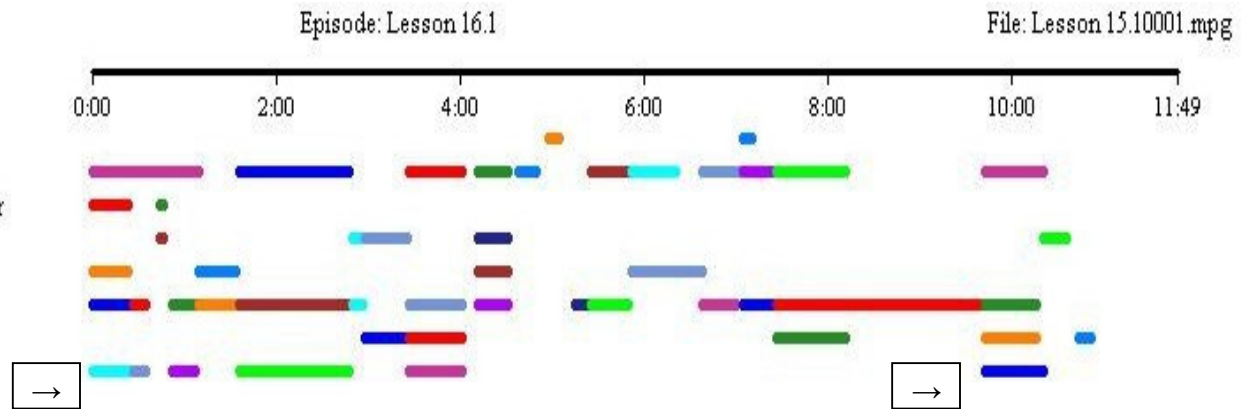
Figure 6. 17 Keyword maps Lesson 16 — Minibeast collection

Table 6. 2 *Timing of keyword occurrences during the lessons*

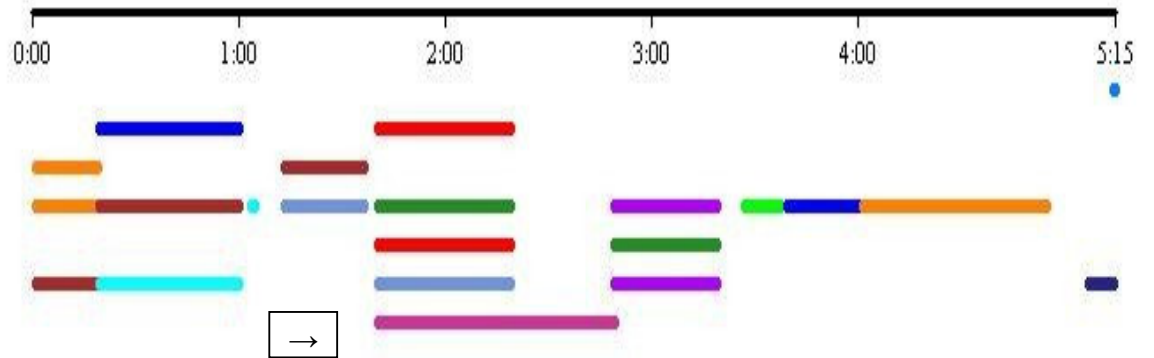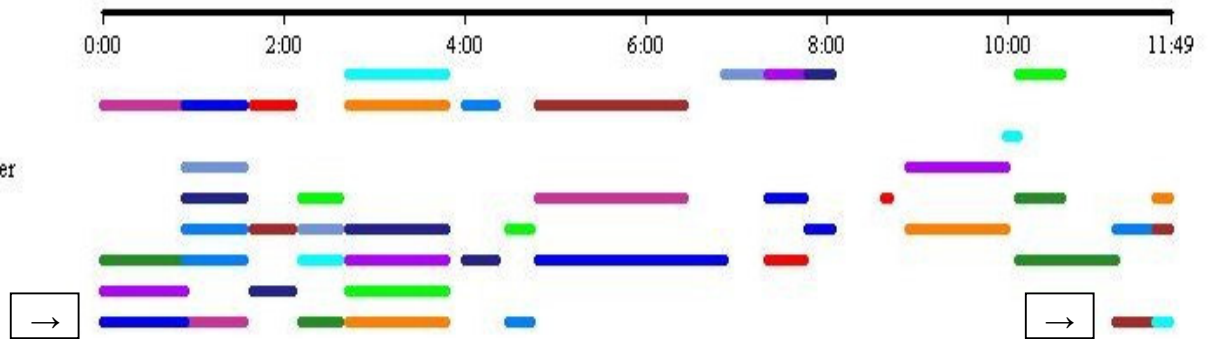| Lesson	Camera	Dependence on peer	Dependence on teacher	Independence	Teacher role	Loud	Aggression	Active participation	Non-participation	Passive participation
1. Floating & sinking	Middle	Start	All through	All through	All through	All through	All through	All through	All through	Start
2. Light & shadows	All through	Start and middle	All through	All through	Start and middle	Start	All through	All through	All through	Start and middle
3. Properties & characteristics of materials	None	None	Start and middle	None	Start and middle	Start and middle	Start and middle	All through	All through	Start and middle
4. Pushing & pulling	All through	All through	All through	Start and middle	Start	Middle	Start and middle	All through	All through	Middle
5. Magnetism	None	All through	All through	Start and middle	All through	Middle	All through	All through	Start and middle	Start and end
6. Mapping – litter/Plans	Middle and end	Start and end	All through	Start and end	None	All through	Start and middle	All through	All through	Start and middle
7. Magnetism / Reactions	End	Start and middle	All through	Start and middle	All through	Start and end	All through	All through	All through	Middle and end
8. Body parts	None	All through	All through	Start and end	Start and end	Start	All through	All through	Start and end	End

Table 6. 2 *(cont.) Timing of keyword occurrences during the lessons*

Lesson	Camera	Dependence on peer	Dependence on teacher	Independence	Teacher role	Loud	Aggression	Active participation	Non-participation	Passive participation
9. Look outside	Middle	Start	Start and middle	End	Start	All through	Start	All through	All through	All through
10. Planting	None	None	None	End	Start and middle	Start and middle	All through	Middle	All through	Middle
11. Construction	None	All through	All through	Middle	All through	All through	All through	All through	All through	All through
12. Colours	None	Start and end	Start and middle	Middle	All through	Start and middle	Start and middle	All through	Start and end	All through
13. Sounds	End	All through	All through	All through	Start	End	All through	All through	All through	All through
14. Air	None	Start and middle	Start and middle	Middle	Start and middle	Start and middle	Start and middle	All through	All through	Start and middle
15. Minibeast hunt	Start	Start and end	All through	Middle	All through	End	Start and end	All through	Start and end	Start and end
16. Minibeast collection	Start and middle	End	All through	End	Start and end	All through	All through	All through	All through	Start

Figure 6.6 shows that *dependence on peer* is evident throughout Lesson 5. *Dependence on the teacher* is slightly more widespread. *Independence* is observable in the beginning and middle stages. High incidence of *taking on the role of teacher* is noticeable in this lesson. *Loudness* is apparent in the middle section. *Aggression* is very frequent. High levels of *active participation* are throughout as represented in Table 6.2. *Non-participation* is evident in the beginning and middle sections. *Passive participation* is in abundance in the beginning stage and less so in the end stage.

There are a few *camera* incidents in Lesson 6 (see Figure 6.7). *Dependence on peer* is at its highest in the beginning and end sections. *Dependence on the teacher* runs through the lesson. *Independence* is observable in the beginning and end sections. *Loud* events are recorded in each section. This lesson has a lot of *aggression* in the beginning and middle stage. *Active participation* is obvious at all stages and the *non-participation* rates almost mirror these. *Passive participation,* which is arrowed in Figure 6.7, is throughout the beginning and middle stages.

There is one *camera* incident in the end section of Lesson 7 (see Figure 6.8). *Dependence on peer* is high in the beginning and middle sections. *Dependence on the teacher* is widespread in the lesson. There is some *independence* shown in the beginning and middle sections. *Taking on the role of teacher* is in all stages. There is a very loud period in the beginning section and a fewer incidents near the end. *Aggression* is at its highest in the beginning stages but is in evidence at all stages. *Active participation* runs throughout. There is high incidence of *non-participating* children in this lesson. Small incidents of *passive participation* are in the lesson also as indicated by arrows in Figure 6.8.

There is evidence of a high *dependence on peer* and *dependence on the teacher* in Lesson 8 which is recorded in Figure 6.9. *Independence* is strong at the beginning of the lesson. *Taking on the role of teacher* occurs at the beginning and also at the end of the lesson. There is a period of *loudness* in the beginning. Different incidents of *aggression* run throughout. *Active participation* is in evidence during the beginning and middle section. Only a small amount is apparent in the end segment. *Non-participation* is most evident at the beginning and middle section. *Passive incidents* only begin in the end section. It is unusual for these to begin in the end section and thus they are indicated by arrow on Figure 6.9.

During the middle section of Lesson 9, see Figure 6.10, there is a period of *camera* activity noticeable. *Dependence on peer* is highly concentrated at the beginning of the lesson, as is *dependence on the teacher*. However dependence on the teacher extends into the middle section as well. *Independence* is noted at the end of the lesson. There is only one incident of *taking on the role of teacher*. This is found in the beginning stage. *Loudness* is apparent at various stages through the lesson. There is one act of *aggression* found in the beginning section. *Active participation* is at its height in the beginning and middle stages. It is not as prevalent in the end section. *Non-participation* peaks in the middle section as does *passive participation*. *Passive participation* is common in the lesson.

Independence, as represented on Figure 6.11 and Table 6.2, is noted at the end of the Lesson 10. *Taking on the role of teacher* is found in the beginning and middle sections. *Loud* incidents occur in the beginning and middle sections also. *Aggression* is extremely high in this lesson. *Active participation* occurs in the middle segment. *Non-participation* is observable in the beginning, middle and end sections (concentrated in the beginning). *Passive* incidents are found only in the middle section (see arrows in

Figure 6.11). The non-occurrence of passive behaviour during the beginning and end sections is notable.

As shown on Figure 6.12 there is *dependence on peer* evident all through Lesson 11 (see also Table 6.2). *Dependence on the teacher* is widespread during the beginning and middle stages but less so in the end section. *Independence* is notable in the middle section and there is an incident of *taking on the role of teacher* in each of the sections. The lesson contains a high amount of *loud* incidents in the beginning and middle stages. There is a concentration of *aggression* in the beginning. *Aggression* is found in the other sections also but in less concentrated occurrences. *Active participation* is at its height in the beginning of the lesson but is present throughout. *Non-participation* occurs mostly at the beginning but there are incidents at all stages. *Passive participation* is mainly evident at the beginning but it also occurs in the other two sections and these are highlighted by the arrows on Figure 6.12.

Dependence on peer is low in Lesson 12 and occurs in the beginning and end segments as represented in Figure 6.13. *Dependence on the teacher* is widespread in the beginning and the middle sections. *Independence* is shown in the middle of the lesson. *Taking on the role of teacher* is high throughout the stages. There are *loud* incidents in both the beginning and middle stages. *Aggression* is concentrated there also. *Active participation* runs almost parallel to *aggression* in the beginning and middle sections but is more widespread in the end section. *Non-participation* is noticeable in the beginning and end segments. *Passive* occurrences are dotted all the way through as indicated by the use of arrows on Figure 6.13.

There is one occurrence of the *camera* keyword at the end of Lesson 13 (see Figure 6.14). *Dependence on peer* is located in the closing minutes of the beginning

stage and continues through the middle stage. It also occurs at the end of the lesson. *Dependence on the teacher* is mainly in the beginning section but it is found all through the sections. *Independence* is shown in all stages. *Taking on the role of teacher* only occurs in the beginning of the lesson. A*ggression* is concentrated at the beginning however it is also found through all the sections. *Active participation* is very high during the three stages of the lesson. *Non-participation* occurs in all sections but becomes magnified in the latter stages. Most *passive participation,* which is arrowed on Figure 6.14, is located in the middle stage and is highly concentrated with many different instances (see Table 6.2 for overall timing of keywords).

Dependence on peer is found in low frequency in the beginning and middle stages of Lesson 14 (see Figure 6.15). *Dependence on the teacher* is extremely high in the beginning and continues to remain high in the middle stage. It is also evident at the very end of the lesson. *Independence* occurs in the middle of the lesson. *Taking on the role of teacher* is highly concentrated at the beginning and it is still very much in evidence in the middle stage. The beginning and middle stages allow for the appearance of *loud* and *aggressive* incidents. *Active participation* is extremely high throughout this lesson. Furthermore *non-participation* is also found in very high incidence right the way through. The small number of *passive* incidents is mainly confined to the beginning and middle stages and are clearly marked by the arrows in Figure 6.15.

During Lesson 15 (see Figure 6.16 and Table 6.2) one *camera* incident is noted. *Dependence on peer* is extremely high for the beginning section. It reoccurs in the end section. *Dependence on the teacher* is high right through the lesson. *Independence* is noted in the middle section. *Taking on the role of teacher* is widespread. *Loud* incidents are frequent at the beginning and continue to the middle section. There is one *loud* incident at the end of the lesson. *Aggression* is most common at the beginning and end

of the lesson. *Active participation* runs through the stages. *Non-participation* is at its highest in the beginning and end stages. *Passive* behaviour is extremely high at the beginning. It recurs in the end segment as indicated by the arrows in Figure 6.16.

There are two *camera* incidents, one in the beginning and one in the middle section of Lesson 16 as shown in Figure 6.17. *Dependence on peer* only occurs in the end stage. *Dependence on the teacher* is frequent in this lesson. *Independence* is shown in the end section. *Taking on the role of teacher* occurs at the beginning and incidents become numerous in the end stage. *Loudness* and *aggression* occur throughout. High levels of *active participation* are observed in the beginning and middle stages. *Non-participation* is present in each section but it is concentrated in the end stage. *Passive* incidents are common in the beginning section with only one occurrence in the middle section. These are arrowed on Figure 6.17.

After each lesson is transported into the Transana 2.1 database, the transcript is written by the researcher and from this transcript portions of video, or clips, are assigned keywords. Next a report compiling the lesson name, the name of the child and the keyword that was found is created. The software also compiled a keyword usage report of each lesson. These two sources of information were used to cross check the number of occurrences of a particular keyword and to check if any child's name was appearing regularly in a particular keyword (see Figure 6.18 and Figures 6.19 – 6.23).

Lesson 9 – Look outside (Transcript 9.1)

```
¤<1805>AP: Ellen finds the 1st hoop. Jack runs on to the other. Tom
and Ellen call him back. They begin right away. ¤<7221>
¤<14981>AP: Chris looks for the number.
NP: Bob runs headlong.
L: Tim starts shouting.
PP: Lara follows Chris as does Bob.
AP & PP: Chris runs to the next hoop. Tim and Bob follow.
AP: Lara remains as it is the correct hoop. The boys realise their
mistake and go over to Lara.
AP: Lara, Chris and Tim begin. ¤<39714>

¤<44703>AP: All run over together.
DT: Eve, "There's a lot of stuff in it!"
AP: Eve sits down and the rest follow.
PP & DP: Chris, Lara and Tim all work away. Bob looks at Lara's sheet.
TR: Eve gestures with her hand to the hoop. (May asked her
something)¤<74615>

¤<88349>AP: All 1st/2nd run off.
DT: John, "Miss look what I found!"
AP: Pat and Donal wander around independently having a good look at
different areas.
AP: Ann finds a spot away from everyone and sits down. She looks at it
but doesn't use her hoop. Tara finds a spot. Jen wanders over to her
but doesn't stay.


DP: Pat shouts at Donal.
DT: John asks if he can do it another time when he is finished.
¤<115533>

¤<122084>PP: Donal and Jen are still wandering.
L & DP: Pat shouts to Donal.
PP: Donal goes over beside Tara.
Ag: Tara tells him to go down a bit which he does.
PP: Ann appears and goes over too. She eventually puts her hoop down
in between the both of them. ¤<148628>

¤<166388>PP: Pat and Jen have put their hoops down together and are
working away.
DT: Eve and May come to say they have done a "Wee accident". They have
copied and both drawn in the wrong hoop.
AP: Beth and Tony are concentrating. ¤<173734>

¤<178113>DT: Chris, "Did you put a stick in?"
DT: Tara, "Miss can't you not move again?" She is annoyed that Ann has
come beside her. ¤<193155>

¤<209403>NP: Chris messes.
DT: Jen, "Miss is that okay?"
AP: Jack, Ellen and Tom all focused.
AP: Jen wants another task. ¤<239488>

¤<246708>NP: Donal messes with his hoop.
DT: John questions the teacher about the task.
PP: Ellen complains that Jack is copying. ¤<261152>
```

Figure 6. 18 Sample Transcript

Lesson 9 - Look outside (Transcript 9.1 cont.)

```
¤<271983>PP: Ann looking around instead of counting.
NP: Pat messes with the hoop despite being told not to.
NP: Chris messes with his sheet.
Pat waves to the camera.
NP: Bob is lost. His team has moved but he wasn't listening. Tim calls
him over.
L: Chris calls to Bob to come over. T has to tell him to move.
¤<335767>

¤<336368>AP: John and Pat discuss their findings.
*AP & PP: Lara and Tim draw. Bob sits watching.
NP: Chris stands and is off task. He throws his paper. ¤<367056>

¤<375481>NP: Jack jumps up and down. ¤<383905>

¤<388373>AP & PP: Each time the teacher looks at Tara and Ann, Tara is
counting and Ann is sitting silently.
DT: Tara is having problems counting. She asks for advice.

¤<442875>AP: Lara is worried because she didn't get to do all her
flowers. ¤<446484>

¤<475046>NP: Chris is not trying any of the task now. ¤<492818>

¤<513952>L: Tom screeches (still filling sheet)
DP: Ellen looks at Tom's sheet.
NP: Tom lifts the hoop. ¤<533135>
I: Children mainly independent in this lesson.
¤<559537>AP: Tara complains that she keeps going off count in the
daisies. In the end the teacher helps her.
PP: Ann stands watching. ¤<563823>
```

Figure 6. 18 (cont.) Sample Transcript

The symbol and number at the beginning and end of each clip noted in transcript *e.g.*,

```
¤<1805>AP: Ellen finds the 1st hoop. Jack runs on to the other. Tom
and Ellen call him back. They begin right away. ¤<7221>
```
, refers to the time

codes which were inserted by the researcher in Transana 2.1 in order to mark where in

the video an incident occurred. The number relates to a specific point within the

recording.

*Abbreviations as given in Table 6.5 *e.g.* AP. = Active participation *etc.*

91

Keyword Usage Report

Episode: Lesson 9

Collection: AP 9, Clip: Ellen Jack etc	(0:00:01.8 - 0:00:07.2)
Participation roles : AP:Active participation	
Collection: AP 9, Clip: Chris	(0:00:15.0 - 0:00:39.7)
Participation roles : AP:Active participation	
Collection: AP 9, Clip: Chris 2	(0:00:15.0 - 0:00:39.7)
Participation roles : AP:Active participation	
Collection: AP 9, Clip: Lara	(0:00:15.0 - 0:00:39.7)
Participation roles : AP:Active participation	
Collection: AP 9, Clip: Lara Chris Tim	(0:00:15.0 - 0:00:39.7)
Participation roles : AP:Active participation	
Collection: Loud 9, Clip: Tim	(0:00:15.0 - 0:00:39.7)
Loud children : Loud	
Collection: Non-participation, Clip: Bob	(0:00:15.0 - 0:00:39.7)
Participation roles : NP:Non-participation	
Collection: NP 9, Clip: Bob	(0:00:15.0 - 0:00:39.7)
Participation roles : NP:Non-participation	
Collection: PP 9, Clip: Lara Bob	(0:00:15.0 - 0:00:39.7)
Participation roles : PP: Passive participation	
Collection: PP 9, Clip: Tim Bob	(0:00:15.0 - 0:00:39.7)
Participation roles : PP: Passive participation	
Collection: AP 9, Clip: Eve	(0:00:44.7 - 0:01:14.6)
Participation roles : AP:Active participation	
Collection: AP 9, Clip: Eve group	(0:00:44.7 - 0:01:14.6)
Participation roles : AP:Active participation	
Collection: DP 9, Clip: Bob	(0:00:44.7 - 0:01:14.6)
Learning styles : DP: Dependence on peer	
Collection: DT 9, Clip: Eve	(0:00:44.7 - 0:01:14.6)
Learning styles : DT: Dependence on teacher	
Collection: TR 9, Clip: Eve	(0:00:44.7 - 0:01:14.6)
Learning styles : TR: Taking on the role of teacher	
Collection: AP 9, Clip: 1st2nd	(0:01:28.3 - 0:01:55.5)

Figure 6. 19 Keyword Usage Report (p. 1) — Lesson 9

92

Keyword Usage Report

Episode: Lesson 9

Participation roles : AP:Active participation

Collection: AP 9, Clip: Ann Tara Jen   (0:01:28.3 - 0:01:55.5)
   Participation roles : AP:Active participation

Collection: AP 9, Clip: Pat Donal   (0:01:28.3 - 0:01:55.5)
   Participation roles : AP:Active participation

Collection: DP 9, Clip: Pat   (0:01:28.3 - 0:01:55.5)
   Learning styles : DP: Dependence on peer

Collection: DT 9, Clip: John   (0:01:28.3 - 0:01:55.5)
   Learning styles : DT: Dependence on teacher

Collection: DT 9, Clip: John 2   (0:01:28.3 - 0:01:55.5)
   Learning styles : DT: Dependence on teacher

Collection: AG 9, Clip: Tara   (0:02:02.1 - 0:02:28.6)
   Participation roles : AG:Aggression

Collection: DP 9, Clip: Pat 2   (0:02:02.1 - 0:02:28.6)
   Learning styles : DP: Dependence on peer

Collection: Loud 9, Clip: Pat   (0:02:02.1 - 0:02:28.6)
   Loud children : Loud

Collection: PP 9, Clip: Ann   (0:02:02.1 - 0:02:46.4)
   Participation roles : PP: Passive participation

Collection: PP 9, Clip: Donal   (0:02:02.1 - 0:02:28.6)
   Participation roles : PP: Passive participation

Collection: PP 9, Clip: Donal Jen   (0:02:02.1 - 0:02:28.6)
   Participation roles : PP: Passive participation

Collection: AP 9, Clip: Beth Tony   (0:02:46.4 - 0:02:58.1)
   Participation roles : AP:Active participation

Collection: DT 9, Clip: Eve May   (0:02:46.4 - 0:02:53.7)
   Learning styles : DT: Dependence on teacher

Collection: PP 9, Clip: Pat Jen   (0:02:46.4 - 0:02:53.7)
   Participation roles : PP: Passive participation

Collection: DT 9, Clip: Chris   (0:02:58.1 - 0:03:13.2)
   Learning styles : DT: Dependence on teacher

Figure 6. 20 Keyword Usage Report (p. 2) ─ Lesson 9

Keyword Usage Report

Episode: Lesson 9

Collection: DT 9, Clip: Tara   (0:02:58.1 - 0:03:13.2)
Learning styles : DT: Dependence on teacher

Collection: AP 9, Clip: Jack Ellen Tom   (0:03:29.4 - 0:03:59.5)
Participation roles : AP:Active participation

Collection: AP 9, Clip: Jen   (0:03:29.4 - 0:03:59.5)
Participation roles : AP:Active participation

Collection: DT 9, Clip: Jen   (0:03:29.4 - 0:03:59.5)
Learning styles : DT: Dependence on teacher

Collection: NP 9, Clip: Chris   (0:03:29.4 - 0:03:59.5)
Participation roles : NP:Non-participation

Collection: DT 9, Clip: John 3   (0:04:06.7 - 0:04:21.2)
Learning styles : DT: Dependence on teacher

Collection: NP 9, Clip: Donal   (0:04:06.7 - 0:04:21.2)
Participation roles : NP:Non-participation

Collection: PP 9, Clip: Jack   (0:04:06.7 - 0:04:32.0)
Participation roles : PP: Passive participation

Collection: Camera 9, Clip: Pat   (0:04:32.0 - 0:05:35.8)
Camera tricks : camera

Collection: Loud 9, Clip: Chris   (0:04:32.0 - 0:05:36.4)
Loud children : Loud

Collection: NP 9, Clip: Bob 2   (0:04:32.0 - 0:05:35.8)
Participation roles : NP:Non-participation

Collection: NP 9, Clip: Chris 2   (0:04:32.0 - 0:05:35.8)
Participation roles : NP:Non-participation

Collection: NP 9, Clip: Pat   (0:04:32.0 - 0:05:35.8)
Participation roles : NP:Non-participation

Collection: PP 9, Clip: Ann 2   (0:04:32.0 - 0:05:35.8)
Participation roles : PP: Passive participation

Collection: AP 9, Clip: John Pat   (0:05:36.4 - 0:06:07.1)
Participation roles : AP:Active participation

Figure 6. 21 Keyword Usage Report (p. 3) ─ Lesson 9

Keyword Usage Report

Episode: Lesson 9

Collection: AP 9, Clip: Lara Tim   (0:05:36.4 - 0:06:07.1)
   Participation roles : AP:Active participation

Collection: NP 9, Clip: Chris 3   (0:05:36.4 - 0:06:07.1)
   Participation roles : NP:Non-participation

Collection: PP 9, Clip: Bob   (0:05:36.4 - 0:06:07.1)
   Participation roles : PP: Passive participation

Collection: NP 9, Clip: Jack   (0:06:15.5 - 0:06:23.9)
   Participation roles : NP:Non-participation

Collection: AP 9, Clip: Tara   (0:06:28.4 - 0:07:22.9)
   Participation roles : AP:Active participation

Collection: DT 9, Clip: Tara 2   (0:06:28.4 - 0:07:22.9)
   Learning styles : DT: Dependence on teacher

Collection: PP 9, Clip: Ann 3   (0:06:28.4 - 0:07:22.9)
   Participation roles : PP: Passive participation

Collection: AP 9, Clip: Lara 2   (0:07:22.9 - 0:07:26.5)
   Participation roles : AP:Active participation

Collection: NP 9, Clip: Chris 4   (0:07:55.0 - 0:08:12.8)
   Participation roles : NP:Non-participation

Collection: DP 9, Clip: Ellen   (0:08:34.0 - 0:08:53.1)
   Learning styles : DP: Dependence on peer

Collection: Loud 9, Clip: Tom   (0:08:34.0 - 0:08:53.1)
   Loud children : Loud

Collection: NP 9, Clip: Tom   (0:08:34.0 - 0:08:53.1)
   Participation roles : NP:Non-participation

Collection: I 9, Clip: mostly   (0:08:53.1 - 0:09:19.5)
   Learning styles : I: Independence

Collection: AP 9, Clip: Tara 2   (0:09:19.5 - 0:09:23.8)
   Participation roles : AP:Active participation

Collection: PP 9, Clip: Ann 4   (0:09:19.5 - 0:09:23.8)
   Participation roles : PP: Passive participation

Summary

Figure 6.22 Keyword Usage Report (p. 4) ─ Lesson 9

The numbers shown in the keyword usage reports e.g., (0:09:19.5 – 0:09:23.8) refer to the specific times in the video when these clips occurred.

Keyword Usage Report

Episode: Lesson 9

Camera tricks : camera	1
Learning styles : DP: Dependence on peer	4
Learning styles : DT: Dependence on teacher	9
Learning styles : I: Independence	1
Learning styles : TR: Taking on the role of teacher	1
Loud children : Loud	4
Participation roles : AG:Aggression	1
Participation roles : AP:Active participation	18
Participation roles : NP:Non-participation	11
Participation roles : PP: Passive participation	11

Figure 6.23 Keyword Usage Report Summary (p.5) ― Lesson 9

6.2 Timing and male/female usage of keywords over all sixteen lessons

Utilizing the keyword maps in conjunction with the transcripts and the keyword usage report the data relating to the timing of keywords *i.e.,* the beginning/middle/end sections of each of the sixteen lessons, and the ratio of usage by males and females was collected. This data is tabulated respectively in Tables 6.3 and 6.4 from which it was possible to produce the bar charts Figures 6.24 ― 25. Table 6.5 was compiled using information from the keyword maps and the teacher's field notes. Each occurrence for each child under the keyword headings was inserted. Next any score which was considered much higher or lower that the child's age peers was highlighted (red for high occurrences and blue for low occurrences). Each keyword will now be considered and the main data available from that will be discussed.

96

Table 6. 3 *Timing of keyword usage in lessons*

Keywords	C.	(%)	D.P.	(%)	D.T.	(%)	I.	(%)	T.R.	(%)	L.	(%)	Ag.	(%)	A.P.	(%)	N.P.	(%)	P.P.	(%)
Total occurrences	27		68		216		213		69		112		196		813		226		135	
Beginning	8	(30)	31	(46)	102	(47)	55	(25)	34	(49)	54	(48)	88	(45)	309	(38)	83	(37)	65	(48)
Middle	7	(26)	21	(30)	70	(33)	112	(53)	24	(35)	46	(41)	56	(29)	273	(34)	67	(30)	50	(37)
End	12	(44)	16	(24)	44	(20)	46	(22)	11	(16)	12	(11)	52	(26)	231	(28)	76	(33)	20	(15)
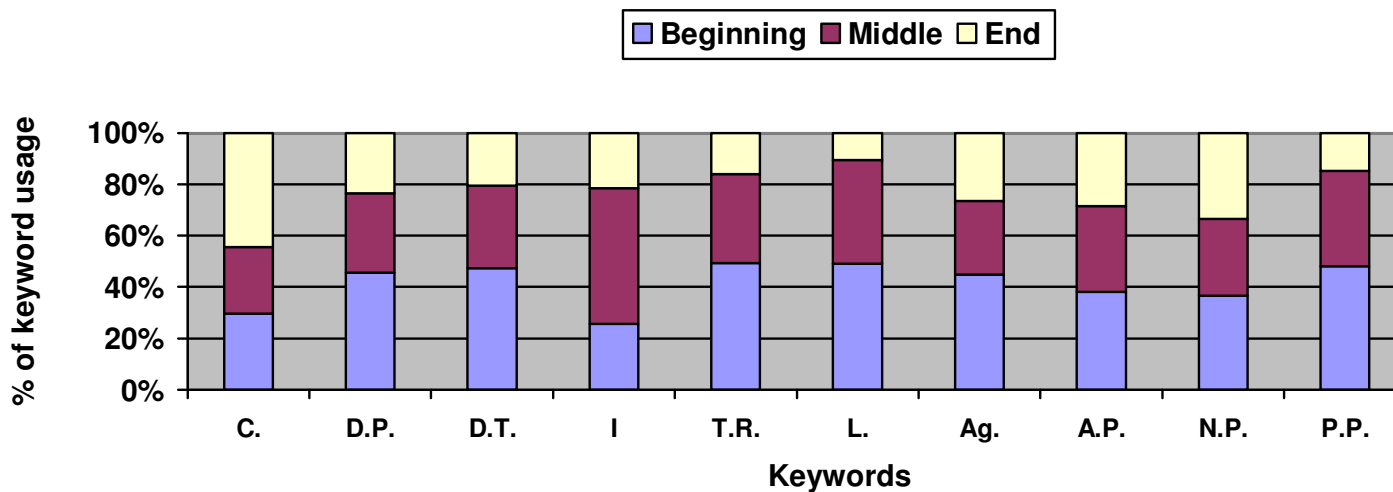
Figure 6. 24 Timing of keyword usage in lessons

*Abbreviations as given in Table 6.5 *e.g.* AP. = Active participation *etc.*

Table 6. 4 *Male/female responses*

Keywords	C. (%)	D.P. (%)	D.T. (%)	I. (%)	T.R. (%)	L. (%)	Ag. (%)	A.P. (%)	N.P. (%)	P.P. (%)
Total responses	27	68	216	213	69	112	196	813	226	135
Male	25 (93)	37 (54)	118 (55)	111 (52)	20 (29)	81 (72)	115 (59)	404 (50)	189 (84)	50 (37)
Female	2	31	98	99	49	31	81	409	37	85
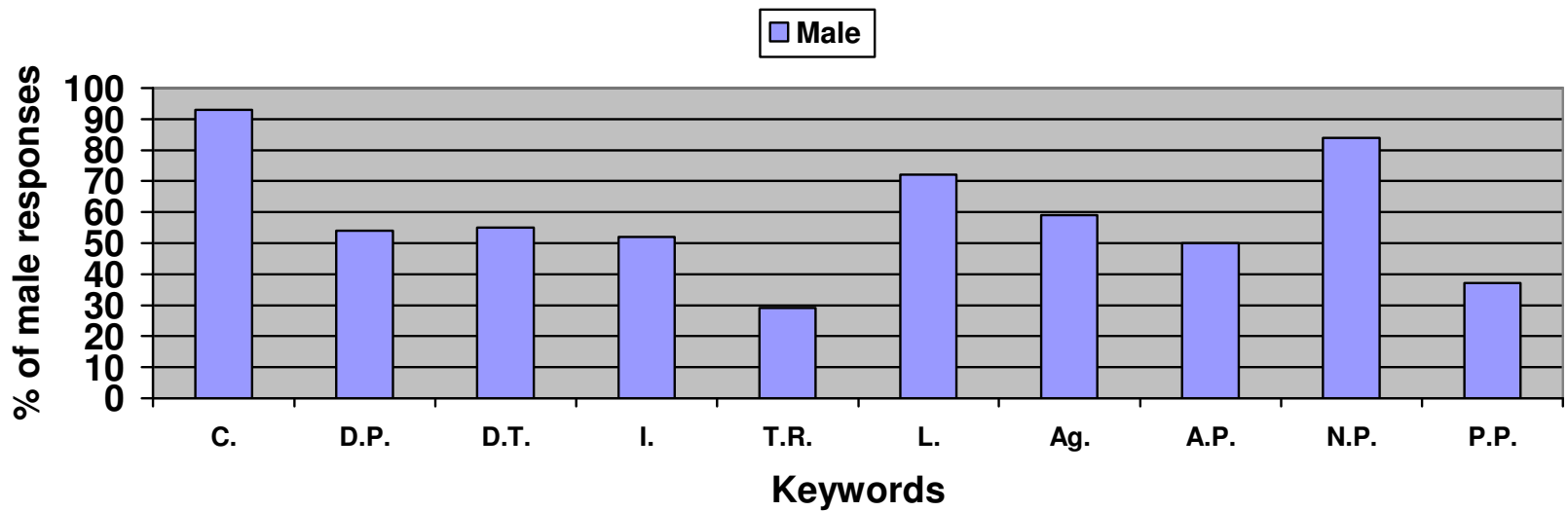
Figure 6. 25 % of male responses over all keywords

*Abbreviations as given in Table 6.5 *e.g.* AP. = Active participation *etc.*

Table 6. 5 *Frequency of keywords for individual children*

🟥 = High occurrences of keyword compared with age peers.
🟦 = Low occurrences of keyword compared with age peers.

	C.	D.P.	D.T.	I.	T.R	L.	Ag.	A.P.	N.P.	P.P.
1st/2nd										
Donal	4	0	14	26	6	4	11	69	10	10
Tara	0	5	49	23	27	13	25	63	6	2
Pat	6	6	10	19	4	7	12	68	16	5
Ann	0	11	15	7	6	4	3	46	12	62
John	6	19	51	19	8	35	45	51	6	5
Jen	0	6	13	20	13	3	34	73	2	11
S.I.										
Kevin	6	0	3	5	0	2	16	22	26	1
Ellen	0	2	3	8	0	2	2	37	0	1
Tom	1	2	3	6	0	18	10	33	22	1
Jack	0	1	4	8	0	0	3	39	5	8
Eve	1	4	9	8	3	0	6	48	4	2
May	0	2	0	8	0	0	2	37	2	4
J.I.										
Tony	0	0	6	6	0	0	6	35	14	3
Beth	1	0	3	8	0	0	5	34	0	0
Bob	0	7	8	6	0	3	2	21	44	13
Tim	1	1	8	9	0	3	6	29	24	4
Chris	1	1	11	8	2	9	4	37	24	0
Lara	0	0	2	8	0	2	0	35	6	1
Mags	0	1	4	9	0	7	4	36	5	2

Abbreviations used:

A.P. = Active participation   Ag. = Aggression   I. = Independence

D.T. = Dependence on teacher   P.P. = Passive participation   C. = Camera

D.P. = Dependence on peer   N.P. = Non-participation S.I.= Senior infants

T.R. = Taking on the role of teacher L. = Loud   J.I. = Junior infants

The first keyword is *camera*. This is the smallest keyword group with only 27 instances over all the lessons. There were higher numbers of male instigators of camera tricks than female in a ratio of 25:2 (Table 6.4). Males account for 93% of the overall occurrences for this keyword (Figure 6.25). The timing of the incidents expressed as a percentage of occurrences throughout the sixteen lessons was as follows: the beginning and middle sections of the lessons had instances of 30% and 26% respectively with 44% in the end segment (Table 6.3). Noted here is the repeated involvement of John, Pat and Kevin. Their involvement is closely followed by Donal's (see Table 6.5).

In the keyword group of *dependence on peer* there was 68 instances recorded. The males exhibited a slightly higher score. They appeared to have a predisposition to inquire and seek advice from their peers in the ratio of (1.2:1) (Table 6.4). Males account for 54% of the overall occurrences for this keyword (Figure 6.25). John displayed a high need for peer approval as opposed to difficulty with the task. Ann, who displayed the next highest level, generally needed support or guidance. Jen was constantly seeking the approval of Tara while Pat was trying to get his peers' attention. Bob, who scored the highest of the infant classes, experienced difficulties and sought help. Donal, Kevin, Tony, Lara and Beth were not recorded displaying this keyword (Table 6.5). The timing of the incidents expressed as a percentage of occurrences was as follows: beginning = 46%, middle = 30% and end = 24%. As is evident the number of occurrences taper off as the lesson progresses (see Figure 6.24).

The results of the keyword group *dependence on teacher* with over 216 instances showed that the boys again demonstrated a higher level in the ratio of (1.2:1.0) (Table 6.4). Males account for 55% of the overall occurrences for this keyword (Figure 6.25). Overall John again displayed the highest amount of incidents. This included a lot of talking to and questioning the teacher. Tara is a close second. The majority of her

instances are questioning and clarifying in nature. Ann displays the third highest levels which are a lot lower than the first two children's levels. It is interesting to note that the majority are in lessons 13, 14 and 15. Jen and Donal demonstrate the next highest levels. However they tend to discuss a topic with the teacher rather than question the teacher. May is the only child not recorded (Table 6.5). The timing of the incidents is again bunched towards the beginning: beginning = 47%, middle = 33% and end = 20% (Figure 6.24).

In the keyword group *independence* which was recorded 213 times, the boys demonstrated marginally higher incidents than the girls in the ratio of (1.12:1.00) (Table 6.4). Males account for 52% of the overall occurrences for this keyword (Figure 6.25). Donal exhibited the overall highest levels of *independence* as he consistently completed tasks on his own. Tara, Jen, John and Pat followed closely. Ann scored much lower than her age peers and it is noteworthy that she scored the majority of her results in the final three lessons. All children are recorded in this keyword section at some stage (Table 6.5). The pattern of the timing of the occurrences for the lessons was as follows: beginning = 25%, middle = 53% and end = 22% (Figure 6.24). This displays a different pattern than the afore mentioned keywords as the concentration of incidents are in the middle section.

The *taking on the role of teacher* keyword group forms different patterns. Out of 69 instances the results show much higher levels of female involvement, over double the male score, male (1:2.5) female (Table 6.4). Males account for only 29% of the overall occurrences for this keyword (Figure 6.25).Tara exceeds everyone else's score as she appears to model her behaviour on the teacher's behaviour. She is patient and tries to encourage younger children rather than completing the task for them. Jen is next with a large portion of her scores coming from trying to instruct John, which is not

always productive. Ann scores mostly in lessons 13 and 14. Children not recorded are Kevin May, Tom, Ellen, Jack, Mags, Lara, Beth, Tony, Tim and Bob (see Table 6.5). The timing pattern is as follows: beginning = 49%, middle = 35% and end = 16% as shown in Figure 6.24.

Next are the results for the *loud* keyword group in which there were 112 instances. There is a vast difference between male and female results with the males scoring much higher in a ratio of (2.6:1) (Table 6.4). Males account for 72% of the overall occurrences for this keyword (Figure 6.25). John is by far the most frequent *loud* child overall. He is generally on task, talking or discussing it, or trying to get the teacher's or his peers' attention. Tom scores second highest. He generally talks loudly at all times and therefore is easily heard above the classroom noise. He is also mostly on task. Tara is the loudest girl and is usually talking loudly to get the teacher's attention. Unrecorded children are May, Jack, Eve, Tony and Beth (Table 6.5). The following is the timing of the instances:

beginning = 48%, middle = 41% and end = 11% (Figure 6.24).

Over the 196 instances recorded in the *aggression* keyword group the boys again displayed the higher level in a ratio of (1.4:1) (Table 6.4). Males account for 59% of the overall occurrences for this keyword (Figure 6.25). Overall John scores, by far, the highest. He is driven by the need to take the role of the demonstrator and will react to anyone who tries to seize the initiative in the task. Jen is the next highest. She is generally defending her position in the task against John or Tara. Tara also scores highly as she likes to command the tasks. Ann scores significantly lower that her age peers. Her scores are generally for standing to complete a task rather than interaction with her peers. No domination or aggression is noted for Ann. Lara is the only child not

recorded in this section (Table 6.5). *Aggression* is displayed throughout the lessons. The timing is as follows: beginning = 45%, middle = 29% and end = 26% (Figure 6.24).

The *active participation* keyword group is vast with 813 recordings. Roughly the same results were found for males and females in the ratio of (1.012:1) (Table 6.4). Males account for 50% of the overall occurrences for this keyword (Figure 6.25). Overall Jen scored the highest and always appears highly motivated in the lessons. Donal, Pat, and Tara have similar scores. Ann scored the lowest of her age peers. Lowest overall was Bob who appeared habitually distractible. All children are represented in this group (Table 6.5). The timing of the occurrences is as follows: beginning = 38%, middle = 34% and end =28% (Figure 6.24).

In the *non-participation* keyword group there were 226 instances. Males scored the vast majority in this section in the ratio of (5.1:1) shown in Table 6.4. Males account for a high 84% of the overall occurrences for this keyword (Figure 6.25). The overall highest score is Bob's which is elevated compared with the other children's scores as found in Table 6.5. Chris, Tim and Tom are roughly second. The highest scoring female, Ann, is still well below most of the males. It is the infant boys who score the highest in the group. It is interesting to note that Kevin scores highly in spite of being absent from a considerable amount of the lessons. Ellen and Beth are not recorded. The following is the timing: beginning = 37%, middle = 30% and end = 33% (Figure 6.24).

The final group is that of *passive participation* which has 135 instances. Females have a higher level in this group than the males (1:1.7) (Table 6.4). Males account for 37% of the overall occurrences for this keyword (Figure 6.25). Table 6.5 shows that Ann has a dramatically higher amount of scores than anyone else, around six times more than the closest child, Bob. Chris and Beth did not register in this group. The

following is the timing of the instances: beginning = 48%, middle = 37% and end = 15% (Figure 6.24).

6.3 Results in relation to changes in groupings in the lessons

Over the sixteen lessons there are seven grouping changes. The keyword maps and the field notes were cross referenced in order to establish whether or not any changes in individual participation rates were observable following a change in the children's grouping. The occurrences of each keyword in the seven groupings for each child are shown in Tables 6.6 ─ 6.10. Groupings were as follows:

Grouping 1 ─ Class groupings (Lessons 1-3)

Grouping 2 ─ Infants in classes, 1st/2nd separate tasks (Lesson 4)

Grouping 3 ─ Paired in classes (Lessons 5-8)

Grouping 4 ─ Infants by age 1st/2nd individual tasks (Lessons 9-10),

Grouping 5 ─ Same gender and class (Lessons 11-13)

Grouping 6 ─ Mixed gender and age (Lesson 14-15)

Grouping 7 ─ Same gender mixed age (Lessons 16)

*Abbreviations used in Tables 6.6 – 6.10:

1st/ 2nd = 1st and 2nd classes

S.I. = Senior infants

J.I. = Junior infants

Table 6. 6 *Frequency of keywords mapping the group changes (Camera and dependence on peer)*

Grouping 1 ─ Class groupings (Lessons 1-3)
Grouping 2 ─ Infants in classes, $1^{st}/2^{nd}$ separate tasks (Lesson 4)
Grouping 3 ─ Paired in classes (Lessons 5-8)
Grouping 4 ─ Infants by age $1^{st}/2^{nd}$ individual tasks (Lessons 9-10),
Grouping 5 ─ same gender and class (Lessons 11-13)
Grouping 6 ─ mixed gender and age (Lesson 14-15)
Grouping 7 ─ same gender mixed age (Lessons 16)

	Camera							Dependence on peer						
Grouping	G1	G2	G3	G4	G5	G6	G7	G1	G2	G3	G4	G5	G6	G7
$1^{st}/2^{nd}$														
Donal	1	1	1	0	1	0	0	0	0	1	1	0	0	0
Tara	0	0	0	0	0	0	0	0	0	1	0	4	0	0
Pat	1	1	1	2	0	1	1	0	0	3	2	1	0	0
Ann	0	0	0	0	0	0	0	1	3	5	0	2	0	0
John	2	2	2	0	0	0	0	3	2	6	0	4	2	0
Jen	0	0	0	0	0	0	0	0	0	4	0	2	0	0
S.I.														
Kevin	5	0	0	1	0	0	1	0	0	0	0	0	1	0
Ellen	0	0	0	0	0	0	0	1	0	0	1	0	0	0
Tom	0	1	0	0	0	0	0	0	0	2	0	0	1	0
Jack	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Eve	0	1	0	0	0	0	0	0	0	1	0	2	1	0
May	0	0	0	0	0	0	0	1	0	1	0	0	1	0
J.I.														
Tony	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Beth	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Bob	0	0	0	0	0	0	0	0	0	3	2	0	2	0
Tim	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Chris	0	0	1	0	0	0	0	0	0	1	0	0	0	0
Lara	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mags	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Table 6. 7 *Frequency of keywords mapping the group changes (Dependence on teacher and independence)*

Grouping 1 — Class groupings (Lessons 1-3)
Grouping 2 — Infants in classes, $1^{st}/2^{nd}$ separate tasks (Lesson 4)
Grouping 3 — Paired in classes (Lessons 5-8)
Grouping 4 — Infants by age $1^{st}/2^{nd}$ individual tasks (Lessons 9-10),
Grouping 5 — same gender and class (Lessons 11-13)
Grouping 6 — mixed gender and age (Lesson 14-15)
Grouping 7 — same gender mixed age (Lessons 16)

	Dependence on teacher							Independence						
Grouping	G1	G2	G3	G4	G5	G6	G7	G1	G2	G3	G4	G5	G6	G7
$1^{st}/2^{nd}$														
Donal	2	0	5	0	6	1	0	6	4	7	3	4	2	1
Tara	7	6	11	4	13	7	2	5	3	5	3	2	2	1
Pat	1	1	1	1	1	5	1	2	3	6	3	3	2	1
Ann	0	2	0	6	1	7	6	0	0	2	3	2	1	1
John	12	4	17	9	4	5	5	2	4	5	3	3	2	1
Jen	2	0	3	4	5	0	3	4	4	6	3	1	2	1
S.I.														
Kevin	1	0	2	0	0	0	0	0	0	0	2	0	1	1
Ellen	0	0	0	0	2	1	0	0	0	2	3	1	2	1
Tom	0	1	2	0	0	0	0	0	0	0	3	1	2	1
Jack	0	1	1	2	0	1	2	0	0	2	3	1	2	1
Eve	0	0	2	3	1	2	1	0	0	2	3	1	2	1
May	0	0	0	0	0	0	0	0	0	2	3	1	2	1
J.I.														
Tony	0	0	1	1	3	1	1	1	0	2	3	0	2	1
Beth	0	0	1	0	0	2	0	1	0	2	3	0	2	1
Bob	0	2	2	0	1	1	0	0	0	2	3	0	1	1
Tim	0	0	8	0	0	0	0	1	0	1	3	0	1	1
Chris	1	1	3	1	5	0	0	2	0	2	3	0	2	1
Lara	0	1	0	0	0	0	0	1	0	2	3	0	2	1
Mags	0	0	0	0	0	3	0	2	0	2	3	0	2	1

Grouping 1 — Class groupings (Lessons 1-3)
Grouping 2 — Infants in classes, $1^{st}/2^{nd}$ separate tasks (Lesson 4)
Grouping 3 — Paired in classes (Lessons 5-8)
Grouping 4 — Infants by age $1^{st}/2^{nd}$ individual tasks (Lessons 9-10),
Grouping 5 — same gender and class (Lessons 11-13)
Grouping 6 — mixed gender and age (Lesson 14-15)
Grouping 7 — same gender mixed age (Lessons 16)

	Taking on the role of teacher							Loud						
Grouping	G1	G2	G3	G4	G5	G6	G7	G1	G2	G3	G4	G5	G6	G7
$1^{st}/2^{nd}$														
Donal	3	0	1	1	0	1	1	2	0	0	0	2	0	0
Tara	3	0	3	4	10	6	4	1	0	7	0	1	2	1
Pat	0	0	0	1	2	1	1	2	0	1	2	3	0	1
Ann	0	0	0	0	0	6	0	1	0	1	2	0	0	2
John	2	0	1	3	0	2	2	9	1	6	4	9	6	3
Jen	4	1	7	1	0	0	0	1	0	2	0	1	0	0
S.I.														
Kevin	0	0	0	0	0	0	0	1	0	1	0	0	0	0
Ellen	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Tom	0	0	0	0	0	0	0	0	2	4	3	6	3	2
Jack	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eve	0	0	2	1	0	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0	0	0	0	0	0
J.I.														
Tony	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Beth	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bob	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Tim	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Chris	0	0	1	0	1	0	0	3	0	0	2	4	0	0
Lara	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Mags	0	0	0	0	0	0	0	3	0	2	2	0	1	1

Table 6. 9 *Frequency of keywords mapping the group changes (Aggression and active participation)*

Grouping 1 — Class groupings (Lessons 1-3)
Grouping 2 — Infants in classes, $1^{st}/2^{nd}$ separate tasks (Lesson 4)
Grouping 3 — Paired in classes (Lessons 5-8)
Grouping 4 — Infants by age $1^{st}/2^{nd}$ individual tasks (Lessons 9-10),
Grouping 5 — same gender and class (Lessons 11-13)
Grouping 6 — mixed gender and age (Lesson 14-15)
Grouping 7 — same gender mixed age (Lessons 16)

	Aggression							Active participation						
Grouping	G1	G2	G3	G4	G5	G6	G7	G1	G2	G3	G4	G5	G6	G7
$1^{st}/2^{nd}$														
Donal	4	0	3	1	3	1	1	18	4	16	2	10	9	1
Tara	2	0	9	2	12	0	0	11	4	16	6	10	6	1
Pat	1	1	6	1	2	1	1	7	5	19	6	12	9	2
Ann	1	0	0	0	1	1	0	7	5	15	5	10	20	4
John	14	3	11	2	8	7	0	14	6	19	6	13	5	2
Jen	5	2	11	2	11	2	1	15	5	18	6	15	7	1
S.I.														
Kevin	6	4	0	2	0	2	1	9	0	6	2	0	0	1
Ellen	0	0	0	0	0	2	0	8	0	7	5	8	8	2
Tom	0	1	1	0	5	2	0	8	1	8	4	3	9	1
Jack	0	1	0	1	0	1	0	8	1	6	7	3	9	3
Eve	3	0	1	1	1	0	0	8	0	7	3	9	10	1
May	0	0	0	0	1	1	0	9	0	7	3	8	8	0
J.I.														
Tony	0	0	2	2	2	1	2	9	1	8	5	9	5	2
Beth	1	0	0	2	0	2	0	8	1	8	2	8	7	0
Bob	0	0	1	0	0	1	0	5	0	6	2	6	6	1
Tim	1	0	3	1	1	0	0	8	1	7	4	7	4	0
Chris	0	0	0	3	0	1	0	9	1	7	5	9	7	0
Lara	0	0	0	0	0	0	0	8	1	7	5	8	6	1
Mags	0	0	0	2	0	2	0	9	1	10	2	8	7	1

Table 6. 10 *Frequency of keywords mapping the group changes* (*Non-participation and passive participation*)

Grouping 1 ─ Class groupings (Lessons 1-3)
Grouping 2 ─ Infants in classes, $1^{st}/2^{nd}$ separate tasks (Lesson 4)
Grouping 3 ─ Paired in classes (Lessons 5-8)
Grouping 4 ─ Infants by age $1^{st}/2^{nd}$ individual tasks (Lessons 9-10),
Grouping 5 ─ same gender and class (Lessons 11-13)
Grouping 6 ─ mixed gender and age (Lesson 14-15)
Grouping 7 ─ same gender mixed age (Lessons 16)

	Non-participation							Passive participation						
Grouping	G1	G2	G3	G4	G5	G6	G7	G1	G2	G3	G4	G5	G6	G7
$1^{st}/2^{nd}$														
Donal	3	0	2	2	2	2	0	0	1	2	2	4	0	0
Tara	2	0	2	0	2	0	0	0	0	1	0	0	0	0
Pat	3	2	3	1	4	2	0	2	0	1	1	0	0	0
Ann	4	2	2	1	3	0	0	3	3	26	7	16	7	2
John	0	0	4	0	2	2	0	1	1	0	0	2	0	0
Jen	0	0	1	1	1	0	0	0	0	0	3	7	0	1
S.I.														
Kevin	5	6	5	6	0	3	4	0	0	0	0	0	1	0
Ellen	1	0	0	0	0	0	0	0	0	0	1	0	0	1
Tom	1	0	8	5	3	1	4	0	0	0	0	0	2	0
Jack	1	1	1	1	0	1	0	1	2	0	4	0	1	3
Eve	3	0	0	0	1	0	0	0	0	0	2	0	1	0
May	0	0	0	0	0	2	0	0	0	0	4	2	0	3
J.I.														
Tony	0	1	7	0	3	4	0	0	0	0	1	1	0	1
Beth	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Bob	3	0	21	2	6	12	0	1	0	2	4	5	2	0
Tim	3	0	4	2	4	9	2	1	0	0	1	2	0	0
Chris	0	0	5	6	11	0	2	0	0	0	0	0	0	0
Lara	0	0	1	0	1	4	0	0	0	0	1	0	0	0
Mags	1	0	3	0	1	0	0	0	0	0	0	1	1	0

The highlights of the results are given below for each group.

Group 1 (Lessons 1 — 3)

There is a high rate of *camera* incidents in these lessons. This is mainly due to one child, Kevin. All children involved are male and are the oldest in the class overall. John exhibits the highest need for *peer* support and also has the highest *dependence on the teacher*. Tara is second in *dependence on the teacher*. Donal displays the highest *independence* levels and Jen has the highest *teacher role*. John is by far the *loudest* and most *aggressive* child. Donal, Jen and John score the most *active participation*. Kevin and Ann are highest for *non-participation* with Ann also highest in *passive participation*.

Group 2 (Lesson 4)

There is only a small change in the groupings for this lesson. The children remain within their class groups but have individual activities to complete. This lesson contains the highest levels of children involved in *camera* incidents overall, two of these being girls. John and Ann are the only two children exhibiting *dependence on the teacher* for support. Clearly seen is the result that all the $1^{st}/2^{nd}$ class, excepting Ann, demonstrate *independence* in the lesson. Jen is the only child noted to display *taking on the role of teacher*. John remains *loud* with Tom becoming *loud* also. Kevin is now the most *aggressive* child with John and Jen closely following. All $1^{st}/2^{nd}$ classes are *actively participating* at around the same rate. Only Tom and Jack score in senior infants. Bob is the only junior infant not to score. Pat and Ann score *non-participation* in $1^{st}/2^{nd}$ group. Kevin scores a proportionately high number in senior infants while Tony is the only junior infant to score. Overall Ann and Jack have the most *passive* tendencies (see Tables 6.6 — 6.10).

Group 3 (Lessons 5 — 8)

In this group the children remained in their class groupings but they were divided into pairs or threes on the basis of teacher observation of participation styles *e.g.,* passive with passive, dominant with dominant *etc., Camera* incidents are fewer with only the three oldest boys (Donal, John and Pat) scoring. The entire 1st/2nd group demonstrate *dependence on their peers* with John and Ann displaying the highest. Tom and Bob are the highest scorers in infants. John and Tara have very high *dependence on the teacher*. Ann is the only 1st/2nd child not to score. Tim scores an elevated level in the infant group. Donal, Pat and Jen display the most *independence*. Kevin and Tom fail to register a score. Jen and then Tara have the majority of *teacher role* scores. Eve and Chris score the first infant incidents in this group. Tara, John and Tom are the *loudest* overall. John and Jen are the most *aggressive* children with Tara following closely. Ann is the only 1st/2nd class child not to score. Similar patterns of *active participation* are observed between 1st/2nd class and the senior and junior infants. 1st/2nd score higher. Bob has an elevated score of *non-participation*. Tom's score is the next highest. Ann scores an elevated *passive participation* rate. Bob is the only infant to score *passive participation*.

Group 4 (Lessons 9 — 10)

This time the infant children were in age specific groups *i.e.,* four year olds, five year olds and six year olds. 1st/2nd had individual tasks to complete. Pat was the only child to play up to the *camera* and is also the only child in 1st/2nd class to display *dependence on peers*. Ellen and Bob display it in the infants. Tara and John remain *dependent on the teacher*. Eve also displays this. All children show *independence*. Overall Eve is the only child to take on the *role of teacher*. Pat, Tom, Chris and Tim are the only *loud* children. Tara is the only child recorded as being *aggressive*. Donal, Ann, Bob and Mags do not

score *active participation*. Chris and Bob are the highest *non-participators*. Ann and Bob are the most *passive participators* (see Tables 6.6 – 6.10).

Group 5 (Lessons 11 –13)

The children were grouped by gender in twos or threes within their class groupings. No *camera* incidents were noted. Tara, John and Eve show the highest *dependence on peers.* Jen and Donal do not score in 1st/2nd class. Tara, John and Donal demonstrate the highest level of *dependence on the teacher.* Ann does not score. Tony and Chris score highest in the infants' class. Donal, Pat and John are the most *independent.* Tara has high *teacher role* in these lessons. Pat scores also. Chris is the only infant to score. John, Tom and Chris are the *loudest.* No girls score. Tara, John and Jen are *aggressive.* Tom is the most *aggressive* infant. There are similar *active participation* rates in 1st/2nd class. Jack and Tom do not score in infants. Ann is the highest *non-participator* in 1st/2nd class. Bob, Tim and Chris score similarly high in infants. Ann has an elevated score for *passive participation*. Jen is the other 1st/2nd class child to score. Bob scores highly in infants.

Group 6 (Lesson 14 – 15)

This grouping put mixed gender and different age levels together. Similar participation levels were grouped *i.e.,* passive children together *etc.* Pat recorded the only *camera* incident. John is the only 1st/2nd child to display *dependence on peers.* Bob is the highest scorer in infants. Ann and Tara have a high *dependence on the teacher* with Pat and John following. Jen does not score. Mags has the highest score in infants. Similar *independence* is noted overall. Tara and Ann take on the most *teacher roles.* Jen is the only 1st/2nd not to score. No infants score. Tara, John and Tom are the *loudest.* John is also the most *aggressive* by far. Tara, Eve, Tim and Lara do not score. Ann has an exceptionally high *active participation* rate in these lessons. Tim scores the least. Bob

and Tim score elevated *non-participation* levels. Ann is the only *passive* child in 1st/2nd class. Bob and Tom score highest in infants.

Group 7 (Lesson 16)

The final grouping puts children of same gender and mixed age groups together. Pat and Kevin record the final *camera* incidents which are clear in Tables 6.6 — 6.10. Donal and Bob are the only scorers for *dependence on peers*. Ann and John are *dependent on the teacher*. Donal is the only 1st/2nd class not recorded here. Jack, Eve and Tony display *dependence on teacher* in infants. *Independence* levels are similar. Tara and John take on most of the *teacher roles*. Only Ann, in the 1st/2nd class, does not demonstrate this. John and Ann, unusually, are the *loudest*. John and Jen are most *aggressive* in 1st/2nd class. Ann does not score. Chris is the most *aggressive* infant. Similar *active participation* levels are noted. Ann and Jack score unusually highly. Kevin and Tom are high *non-participators*. Ann, Jack and May are the most *passive* children.

The overall change in occurrence of particular keywords after each grouping change was then analysed. From the Tables 6.6 — 6.10, graphs were plotted to show frequency of each keyword in each grouping (Figures 6.26 — 27). They were divided into two graphs to prevent overcrowding of the information. In order to further facilitate analysis of information two of the keywords, Aggression and Passive participation, were scaled up by a factor of three (Figure 6.26).
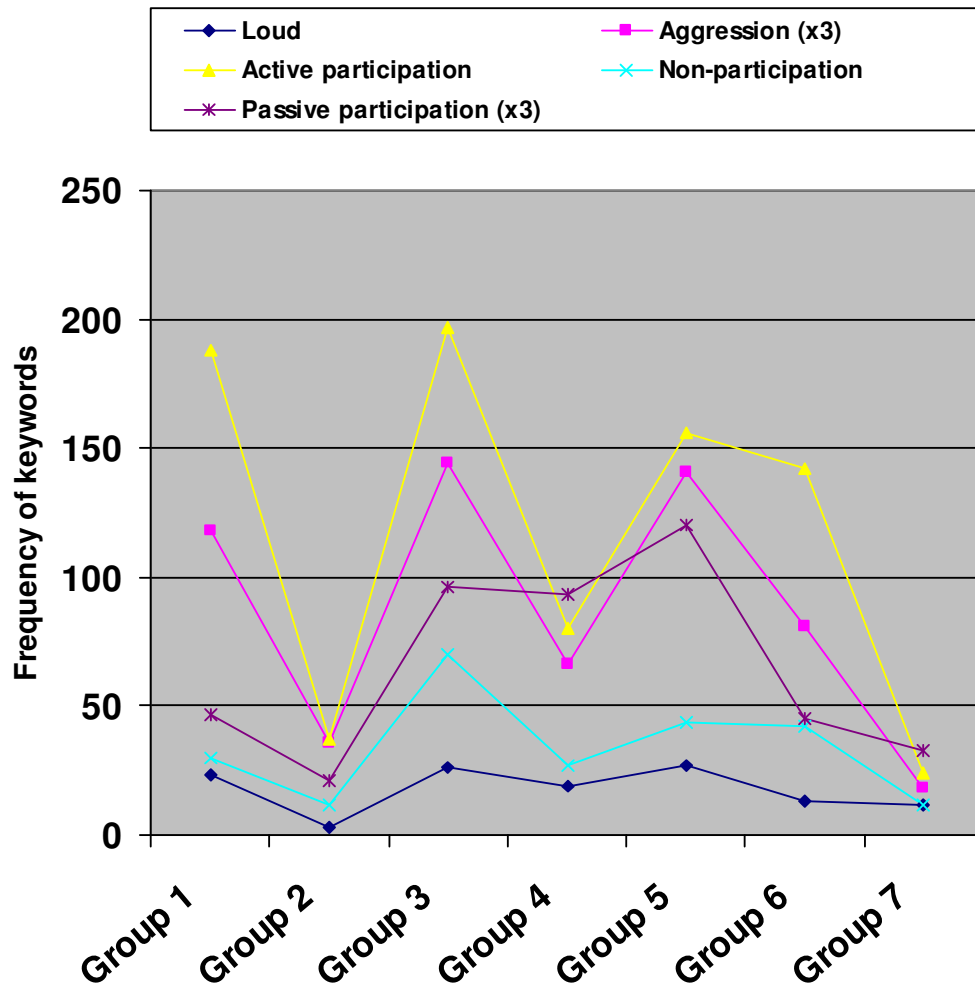
Figure 6. 26 Frequency of keywords relating to loudness, aggression and participation rates with respect to groupings.

On Figure 6.26 low levels of *loudness* is noted in group 2. *Aggression* is at its highest in groups 3 and 5 and at its lowest in group 7. Low levels of *active participation* are noted in groupings 2 and 7. High levels are obvious in groups 1 and 3. *Non-participation* is at its highest in group 3 and its lowest in groups 2 and 7. *Passive participation* peaks in group 5 and is lowest in group 2.
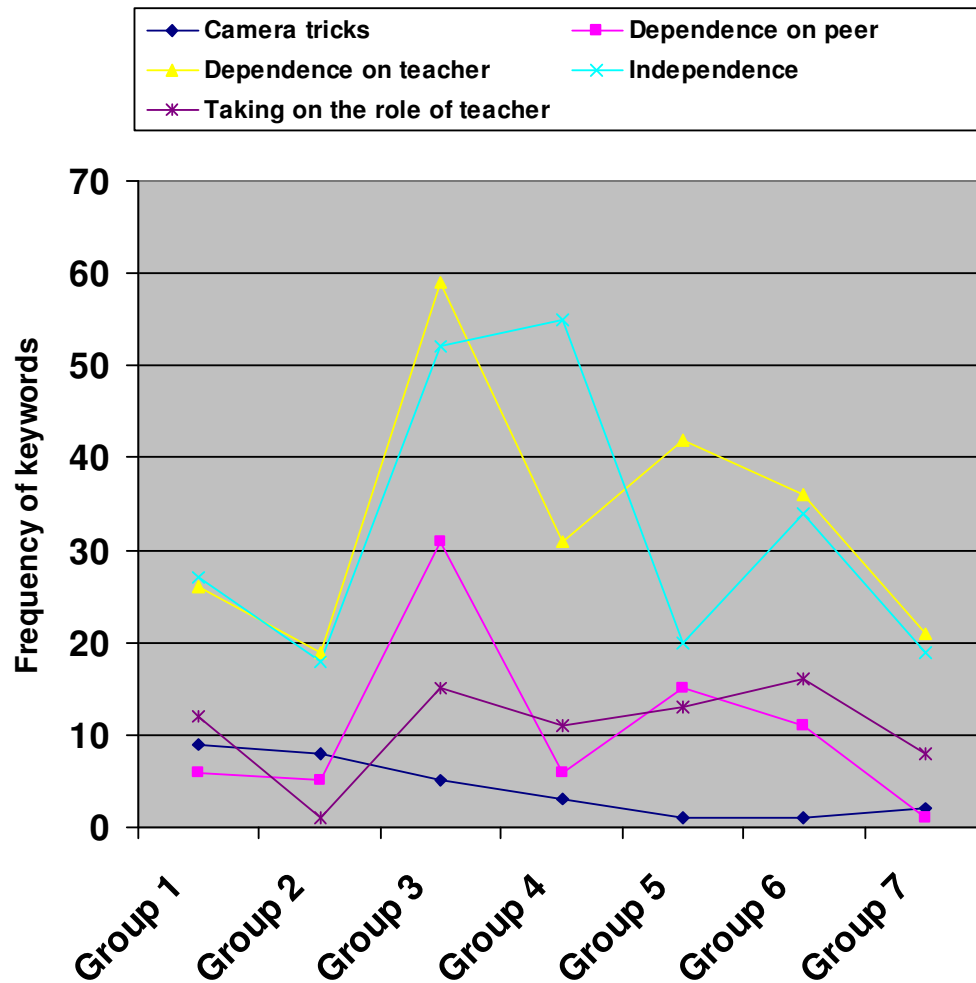
Figure 6. 27 Frequency of keywords relating to camera and learning styles with respect to groupings

On Figure 6.27 the incidence of *camera* tricks is clearly seen to decline towards the end of the lessons. *Dependence on peer* peaks in group 3 and is low in group 7. *Dependence on the teacher* is highest in group 3 also and lowest in group 2. *Independence* is very high in groups 3 and 5. It is at its lowest in group 2. *Taking on the role of teacher* is at its highest in groups 6 and 3 and low in group 2. These results will be discussed in Chapter 7.

6.4 Results from field notes

6.4.1 Question Time

During the course of each lesson a period was set aside for a question time. In this time the teacher posed questions relevant to the lesson or to a previous lesson and noted on a classroom plan if a child was responding or not (see Figure 6.28 for a sample classroom plan).

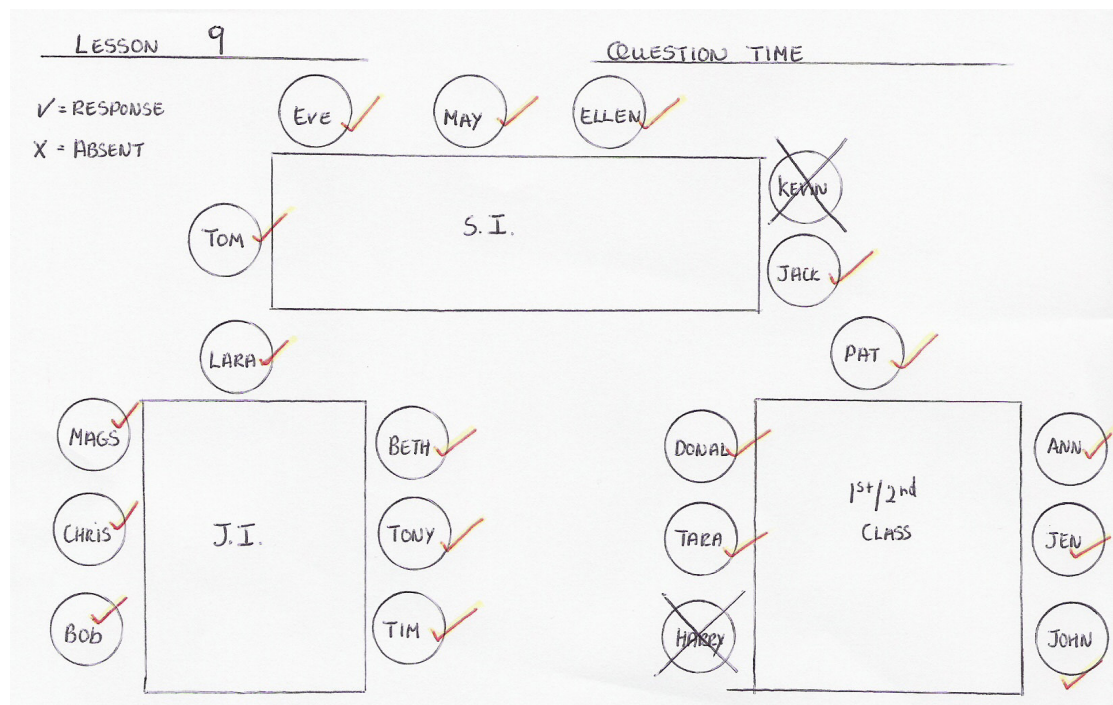## Classroom plan - Lesson 9 Look outside

Figure 6. 28 Sample classroom plan

When a particular child had responded at least once the teacher would indicate by ticking. If a child was absent their name was crossed out (Please refer to section 5.3 groupings, regarding the child Harry). After the sixteen lessons the responsiveness of the children over all the lessons was determined by addition

Table 6. 11 *No. of non-responses during question time (Male)*

Name of child →	Donal	Pat	John	Kevin	Tom	Jack	Tony	Bob	Tim	Chris	Total
Responses	0	1	0	0	4	4	8	7	6	4	34

Table 6. 12 *No. of non-responses during question time (Female)*

Name of child →	Tara	Ann	Jen	Ellen	Eve	May	Beth	Lara	Mags	Total
Responses	1	8	4	5	7	1	0	6	2	34

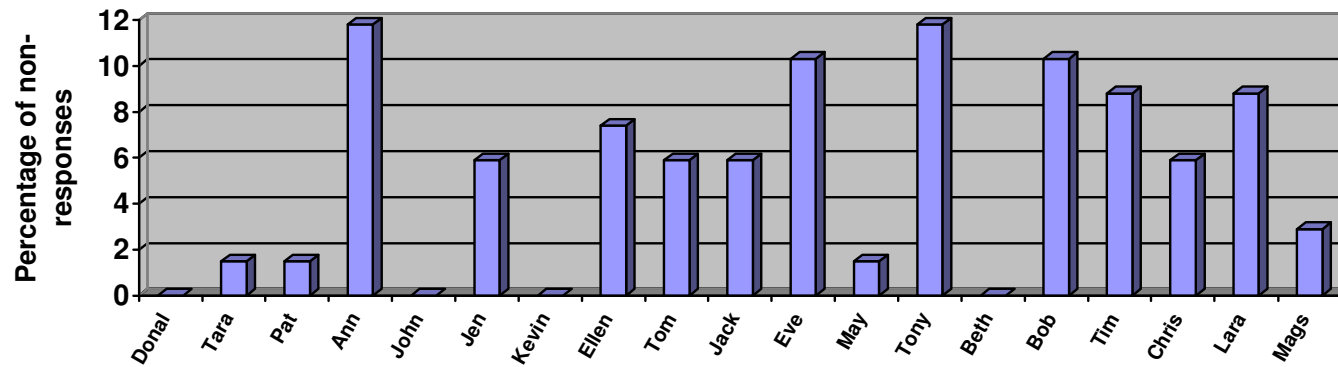**Non-responses to question time as a percentage of overall questions asked**

Figure 6. 29 The percentage of non-responses to question time (total questions = 68)

of the ticks on each individual plan. In total 68 questions were asked. Tables 6.11 and 6.12 show the number of non-responses from each individual.

There were four children who always responded to the question, Donal, John, Kevin and Beth. Ann and Tony were least responsive overall. The percentage of non-response is shown for each child in Figure 6.29.

6.4.2 Field notes

Comprehensive field notes were written by the teacher using notes jotted during the course of the lesson and supplemented with observations made by the researcher when watching the video recordings. These were subsequently used in identifying keywords and children who displayed a specific learning style or participation role (see Figure 6.30 and Appendix A for sample field notes).

6.4.3 Student worksheets and written work

After each lesson examples of the children's written tasks were collected and analysed (Figure 6.31). Information from these was combined with the field notes (Figure 6.30). The following are the results of the children's worksheets compiled by the researcher using the field notes and worksheets (see Appendix A and D respectively). They are the overall results *i.e.*, spanning the sixteen lessons. In order to ascertain if any pattern could be established in the children's individual completion of written tasks the instances of leaving a task blank or indeed completing a task, throughout all the lessons, is given in Tables 6.13 − 6.15 and plotted in Figure 6.32.

Lesson 9 — Look outside

Question time was kept to the end of the lesson today. I simply asked everyone to tell something that they saw or even heard. They are all very responsive. Most notably Tim who interrupts the others with his enthusiasm for telling things. Ellen and May are also animated and recite long lists of things.

Evidence from video clips and teacher observation:
In the $1^{st}/2^{nd}$ group six children were present (Pseudonyms: Donal — 8, Pat — 7, John — 7, Tara — 8, Ann — 7 and Jen — 6. Their task is to work individually and place a hoop anywhere in the grounds and count the number of flowers inside it. There is an accompanying worksheet. We go outside and the teacher tells them to get working. Immediately John throws down his hoop on a nearby flowerbed and says," Miss! Look what I found!" Donal and Pat wander around the wider playground independently, having a good look around. Ann finds a spot away from everyone looks at the flowers in the bed but does not put her hoop anywhere. Tara quickly finds a spot. Jen wanders over to her but does not stay. John asks, "Miss! Do we do this again when we are finished?" Still working. Jen and Donal are still wandering around. Pat finds a place and shouts to Donal. He ignores him and moves beside Tara. Ann then appears in between Tara and Donal (They are very close together.) Tara says to her, "Go down a bit!" Jen and Pat end up beside each other. Tara then calls to me, "Can't you not move again!" complaining about Ann. John keeps questioning about counting. He wants to know if he should count each individual head on the bluebells. Ann is not counting. She has placed her hoop on the ground. Tara tells her what to do. Ann just watches Tara. In the end the teacher goes over to Tara as she has spent too long counting the multitude of daisies. The teacher tells her to count them roughly. Ann has written in some numbers but there has been no evidence of counting.

Analysis of worksheets:
✓   = attempted participation
✓   = correctly answered
X   = no participation

$1^{st}/2^{nd}$	Section 1	Section 2
Donal	✓	✓
Tara	x	✓
Pat	✓	✓
John	✓	✓
Ann	x	✓
Jen	✓	✓

Figure 6.30 Sample of field notes

Junior infants: Seven children were present at this group, three girls and four boys. Mags — 4, Lara — 4, Beth — 5, Chris — 4, Bob — 4, Tony — 5 and Tim — 4.

Senior Infants: Five children were present, three girls and two boys. Tom — 6, Jack — 6, Ellen — 6, Eve — 5 and Sue — 5. They are grouped roughly by their ages in the following manner:

Group 1 —	Lara, 4	Group 2 —	Eve, 5
	Chris, 4		Sue, 5
	Tim, 4		Beth, 5
	Bob, 4		Tony, 5
Group 3 —	Jack, 6		
	Ellen, 6		
	Tom, 6		

Their task was to find whichever hoop roughly told them, they were numbered, and draw onto their sheets everything they could see inside the hoop. They had to be careful to draw into the corresponding hoop on their sheets, also numbered.

Group 1 was the youngest group. The teacher tells them which number to find. Bob runs headlong but then stops. He and Lara follow Chris who has taken off running noisily. Tim follows them but way behind. The group chooses a hoop but then Chris runs to another. Bob and Tim run after him while Lara remains staring at the hoop. Chris realises his mistake and brings them all back to Lara. Lara begins her sheet first. Chris and Tim follow suit. Bob watches Lara for a while. He messes about for a while. So does Chris who throws his worksheet in the air. When it is time to move to the next hoop Bob is lost. He has not drawn anything. His team have moved on but he remained trying to draw something. Chris calls for him to come over. He does. Tim and Chris are now off task. Chris is throwing his sheet up again. Lara watches. Bob sticks his pencil repeatedly in the dirt as does Chris. Then Bob lies in the sun.

Group 2 was the five year olds. When asked to find their hoop the three girls immediately take the lead with Tony following behind. Eve comments, "There's a lot of stuff in it!" She is first to sit down and the rest follow suit. May asks Eve a question and Eve gestures towards the hoop with her hand. Beth and Tony begin also. It is not long before Eve and May realise that they have written in the wrong hoop. They come over to the teacher and rectify their mistake; May goes in for her rubber. Meanwhile Tony and Beth are still

Figure 6.30 (cont.) Sample of field notes

concentrating. At the next hoop May sits down first while Tony and Eve take quite a while to settle.

Group 3 was the six year olds. Ellen finds the hoop first. Jack has taken off, at great speed, towards the other hoops but both Ellen and Tom call him back. Tom begins right away. Jack and Ellen sit down and begin. Tom is now standing but still he is on task. Ellen is concentrating and Jack is copying from her drawing. By the second hoop Jack is beginning to lose concentration. He jumps up and down beside the hoop. At the third circle Jack and Tom are messing at the beginning but return to task after a while. Ellen watches them. Tom becomes increasingly noisy. He begins to pull out the grass. He lifts the hoop and sets it down again. The teacher has to tell him to get back on task. He does so for a while.

Analysis of worksheets:

✓ = attempted participation
✓ = correctly answered
X = no participation

Group 1	Area 1	Area 2	Area 3	Comment
Lara	✓	✓	✓	Very accurate
Chris	✓	✓	✓	Area 1 has little detail.
Bob	✓	✓	✓	Area 2 has little detail. Other sections little detail.
Tim	✓	✓	✓	Little accuracy in areas 2& 3
Group 2				
May	✓	✓	✓	Great accuracy in area 1. Little drawn in area 3.
Eve	✓	✓	✓	Excellent effort in area 1. Good in 2. Less detail in 3.
Tony	✓	✓	✓	Excellent effort.
Beth	✓	✓	✓	Not much detail in area 1.
Group 3				
Jack	✓	✓	✓	Only one flower in area 1.
Tom	✓	✓	✓	Less detail in area 3.
Ellen	✓	✓	✓	Very neat. Less detail in area 3.

Figure 6.30(cont.) Sample of field notes

Worksheets Lesson 9 – Look outside:

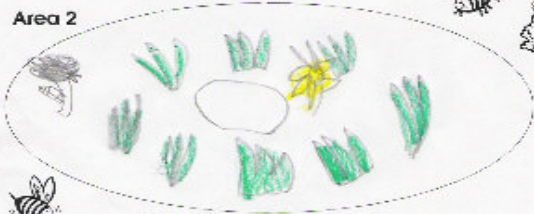Infants   1st/2nd class

Figure 6. 31 Samples of children's worksheets (Lesson 9)

Table 6. 13 *Occurrence of participation in worksheets (1st/2nd class)*

Name of child	Donal	Tara	Pat	Ann	John	Jen
Active participation	13	14	14	6	14	14
Non-participation	1	0	0	10	0	0

Table 6. 14 *Occurrence of participation in worksheets (Senior infants)*

Name of child	Kevin	Ellen	Tom	Jack	Eve	May
Active participation	7	11	12	12	13	12
Non-participation	0	4	3	3	2	3

Table 6. 15 *Occurrence of participation in worksheets (Junior infants)*

Name of child	Tony	Beth	Bob	Tim	Chris	Lara	Mags
Active participation	16	11	10	12	15	13	14
Non-participation	1	3	6	5	1	3	1
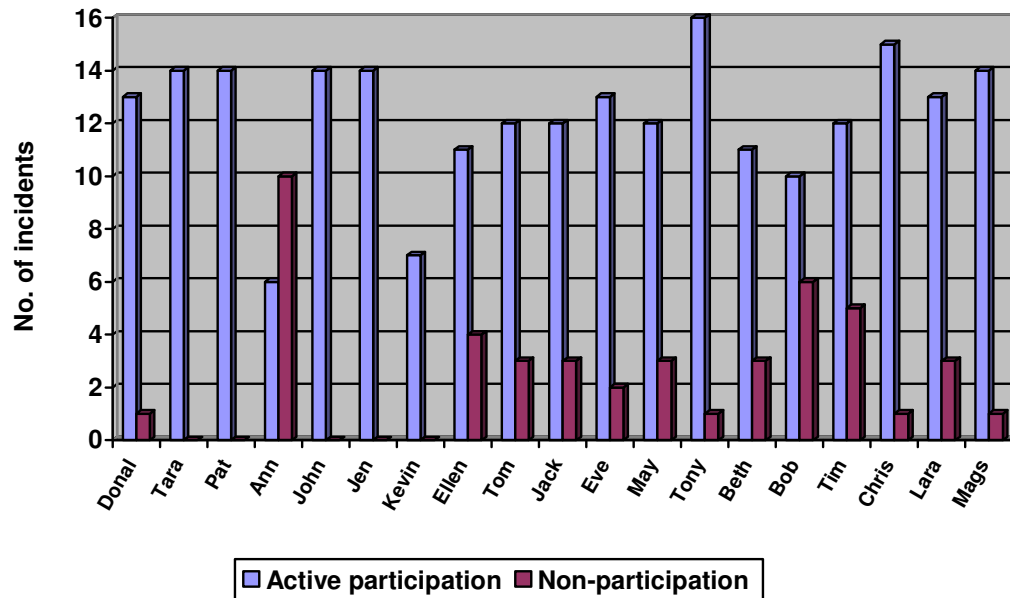
Figure 6. 32 Active participation vs. non-participation (worksheets)

Table 6. 16 *Correct answers vs. incorrect answers on worksheets (1st/2nd class)*

Name of child	Donal	Tara	Pat	Ann	John	Jen
Correct responses	66	58	69	38	63	60
Incorrect responses	8	16	5	36	11	14

Table 6. 17 *Correct answers vs. incorrect answers on worksheets (senior infants)*

Name of child	Kevin	Ellen	Tom	Jack	Eve	May
Correct responses	20	34	43	30	32	31
Incorrect responses	9	19	7	23	21	22

Table 6. 18 *Correct answers vs. incorrect answers on worksheets (junior infants)*

Name of child	Tony	Beth	Bob	Tim	Chris	Lara	Mags
Correct responses	37	44	25	25	44	35	32
Incorrect responses	16	6	28	28	9	18	18

Figure 6. 33 The percentage of correct answers vs. incorrect answers from worksheets where 74 is the total of answers for $1^{st}/2^{nd}$ class and 53 is the total for infants.

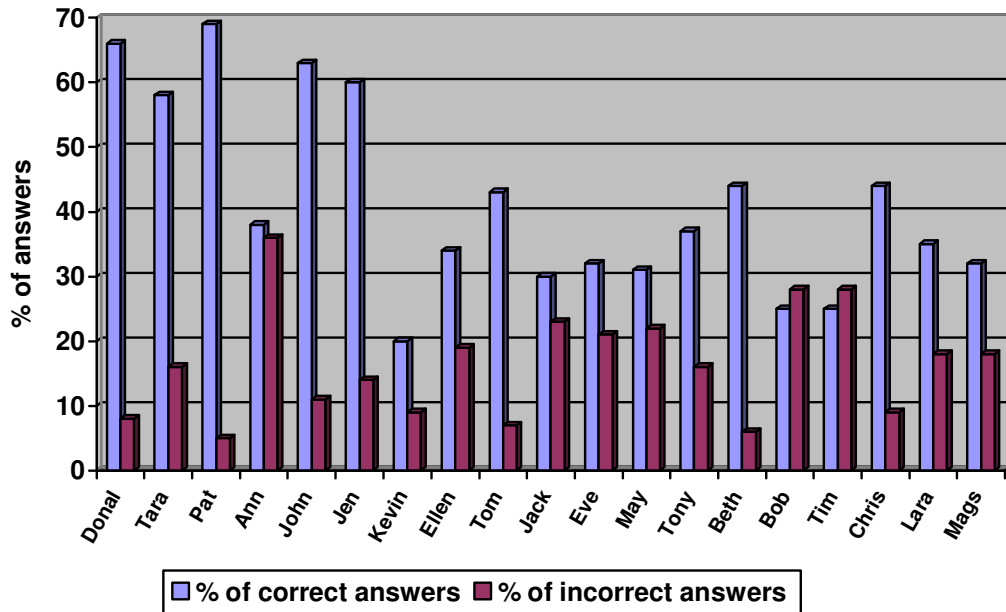$1^{st}/2^{nd}$ display similar participation, in completing worksheets, excepting Ann who has a much lower participation rate. Senior infants also have similar rates as each other, apart from Kevin who has a lower level. Tony has the highest level in junior infants with Bob having the lowest level. Ann scores highly in the non-participation group. Donal scores once. The rest of $1^{st}/2^{nd}$ class do not score. Senior infants again score similarly except for Kevin who does not score at all. Bob and Tim score highest in junior infants. Tables 6.16 – 6.18 and Figure 6.33 show the number of correct versus incorrect answers given on the worksheet indicating whether or not a child has been able to grasp the fundamentals of the task given. This is expressed as the percentage of correct answers. In $1^{st}/2^{nd}$ class the children score highly on the correct answers with the exception of Ann who scores an almost identical incorrect and correct responses. The pattern is repeated for infants with the majority scoring high on the correct responses. Bob and Tim score most incorrect answers and are the only infants to score higher on their incorrect responses. They therefore score low for their correct answers when compared with their peers.

6.5 Combining results of video analysis with the results of the worksheet analysis in the keyword groups of *active participation* and *non-participation*

Each individual child's participation in written tasks was compared to their participation rates in the overall lesson to determine if the results correlated with one another or showed discrepancies.

Table 6. 19 *Participation levels (active, non-) as determined from worksheet results and video analysis (results for 1st/2nd class)*

Name of child	Donal	Tara	Pat	Ann	John	Jen
A.P. (worksheet)	13	14	14	6	14	14
A.P. (video)	69	63	68	46	51	73
N.P. (worksheet)	1	0	0	10	0	0
N.P. (video)	10	6	16	12	6	2
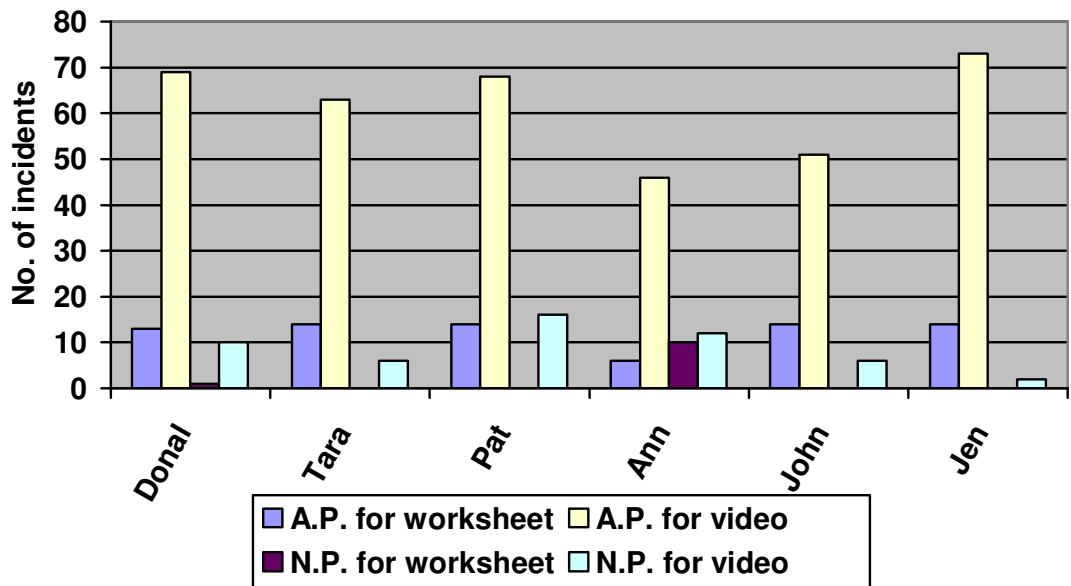
Figure 6. 34 Participation levels (active, non-) as determined from worksheet results and video analysis (results for 1st/2nd class)

Table 6. 20 *Participation levels (active, non-) as determined from worksheet results and video analysis (results for senior infants)*

Name of child	Kevin	Ellen	Tom	Jack	Eve	May
A.P. (worksheet)	7	11	12	12	13	12
A.P. (video)	22	37	33	39	48	37
N.P. (worksheet)	0	4	3	3	2	3
N.P. (video)	26	0	22	5	4	2

Table 6. 21 *Participation levels (active, non-) as determined from worksheet results and video analysis (results for junior infants)*

| Name of child	Tony	Beth	Bob	Tim	Chris	Lara	Mags
A.P. (worksheet)	16	11	10	12	15	13	14
A.P. (video)	35	34	21	29	37	35	36
N.P. (worksheet)	1	3	6	5	1	3	1
N.P. (video)	14	0	44	24	24	6	5

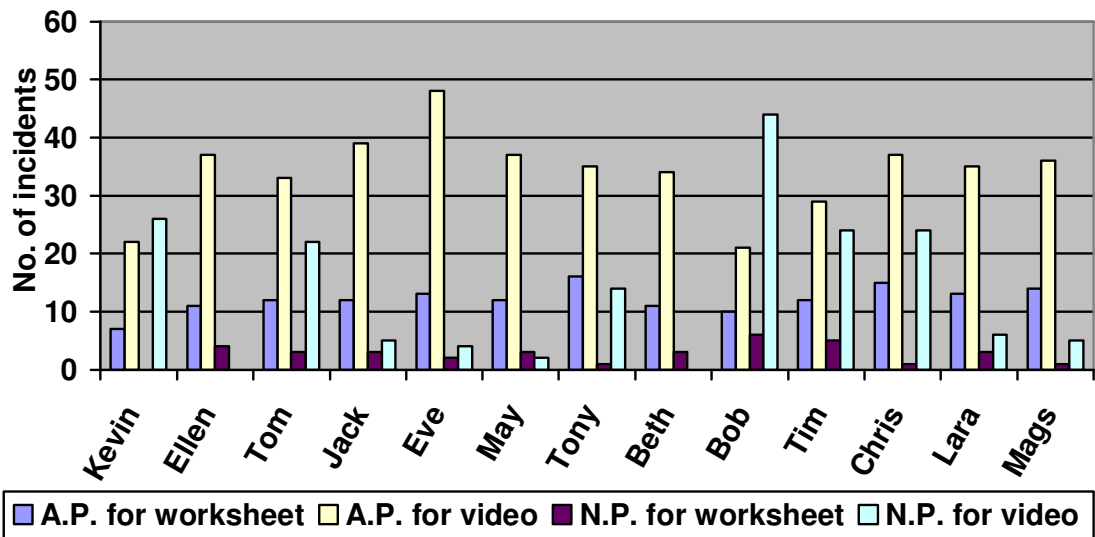
Figure 6. 35 Participation levels (active, non-) as determined from worksheet results and video analysis (results for infants)

The data from 1st/2nd classes indicate that the children have much the same levels of participation from the video data, which included interaction with peers and the teacher and practical tasks, as they did in their written tasks *i.e.,* worksheets. If we look at the information represented in Table 6.19 and Figure 6.34 this pattern can be examined. Donal, Tara, Pat and Jen have very similar *active participation* rates in both rows. John has slightly less under the video column but participates on a par in the worksheet activities. Ann's score is obviously different. She scores consistently less than her age peers for both *active participation* rows. All score *non-participation* in the video row (Jen very few) but the most notable row is the worksheet row. Donal scores only once in the *non-participation* for worksheets and the rest do not have any scores. Ann scores almost as highly as her entire video score indicating her difficulties with written work.

In the infants' data the scores again form a pattern (see Tables 6.20 – 6.21 and Figure 6.35). The children have roughly the same participation rates in the video as they do in the worksheets. The exceptions are Kevin who scores lower than his age peers in the video row and Bob whose scores are noticeably different. He scores lower than his peers in both rows. There are more differences in the *non-participation* information and less of a pattern. Kevin, Tom, Tim and Chris score a high level of *non-participation* in the video row. Bob scores exceptionally highly. All the girls score low in this row. This pattern reappears in *non-participation* for worksheets with the majority of children scoring the same. Bob scores marginally higher than the rest.

6.6 Comparison of children's participation levels compared with ability

Is there a pattern between participation levels and intelligence? In order to analyse this, assessments completed by the children were utilised. The standard procedure for assessments in the primary school is to begin testing children from 1st class onwards in the subject areas of English and Mathematics. Testing is undertaken with standardised tests, in this case, the Drumcondra Reading and Spelling test (Educational Research Centre 1997) for English and the Sigma ─ T test for Mathematics (Wall & Burke 2007). Table 6.22 lists the children's end of year results:

Table 6. 22 *1st/2nd class results*

Name of child	Drumcondra Reading test (Drumcondra Educational Research Centre 1997)	Drumcondra spelling test (Drumcondra Educational Research Centre 1997)	Sigma-T (Wall & Burke 2007)	Teacher summary of results
Donal	95th	94th	77th	Well above average
Jen	97th	99th	93rd	Well above average
Tara	91st	94th	53rd	Above average
John	70th	77th	79th	Above average
Pat	63rd	45th	27th	Average
Ann	19th	16th	21st	Low average

The results of the children's assessment marks were compared with keyword occurrences from Table 6.5. Donal and Jen, who have very high standards of literacy and numeracy, display little *dependence on peers* or on the *teacher*. Donal has the highest levels of *independence* and some instances of *taking on the role of teacher*. Jen has a high level of *independence* and the second highest score for *taking on the role of teacher*. They have low instances of *loudness* compared with their age peers. Donal shows little *aggression* while Jen is the second most *aggressive* child. They have the

highest *active participation* scores. Donal's *non-participation* score is equal to his *passive* score. These are similar to scores of his peers. Jen has the lowest level of *non-participation* in the group. She has some *passive* instances.

Tara and John, who also have high standards of literacy and numeracy, have quite different results. They display more *dependence on peers* and a huge *dependence on the teacher*. Tara scores highly in the *independence* keyword group and has, by far, the highest amount of *taking on the role of teacher*. John displays an average *independence* level and takes on some *teacher roles*. Both are quite *loud* and *aggressive* in completing their tasks. They have high levels of *active participation* and low levels of *non-participation* and are seldom *passive*.

Pat, who scored in the mid to high range in literacy and in the low average in mathematics, showed little *dependence on peers* and on the *teacher*. He was also quite *independent* in his working style. He rarely took on the *role of teacher* and proved quite *loud*. He displays a low amount of *aggression* compared with his peers. He again has a high level of *active participation* and has the highest level of *non-participation* of his peers. He is rarely *passive* in nature.

Ann, who scored well below average in both tests, displays different characteristics. She demonstrates the second highest reliance on her *peers* and the third highest reliance on the *teacher*. She is rarely *independent* in comparison with her peers and seldom takes on *the role of teacher*. She is quiet in nature and is rarely *aggressive*. She has a much lower level of *active participation* than her peers and also scores highly for *non-participation*. Her *passive participation* score is nearly six times greater than the next closest score.

Scoring for the infants is not as straightforward because the standardised tests are not used. The use of the Belfield Infant Assessment (Spelman & McHugh 1994) to confirm or deny the need of learning support for the child in the following school year is used in this school. Only children who encountered academic difficulties during the year were tested, due to time constraints. The teacher utilised another infant reading test (Brimer & Raban 1979) in order to have a complete picture of academic ability. This test had not been previously administered by the teacher and was not intended to replace the Belfield test, but merely to complement the findings and the observations of the teacher. If a child scores below the critical score this generally indicates literacy difficulties. The researcher, as the class teacher, inserted observations for the children for whom no official assessment was carried out. Table 6.23 documents the results.

Table 6. 23 *Infants' results*

Names:	Belfield Infant Assessment (Spelman & McHugh 1994)	Infant Reading Test (Brimer & Raban 1979)	Teacher assessment of early literacy skills
Senior infants			Mean=198 Critical=158
Kevin	N/A	6,5,7,6,7.	High average.
May	N/A	6,5,7,6,7.	Above average
Eve	N/A	5,5,5,4,7.	Average
Ellen	182.5	4,6,5,5,6.	Low average
Jack	182	4,3,6,2,6.	Low average
Tom	143	3,2,7,1,7.	Well below average
Junior infants			Mean=186 Critical=142
Beth	N/A	N/A	Above average
Lara	N/A	N/A	Above average
Tony	N/A	N/A	Average
Mags	N/A	N/A	Average
Chris	N/A	N/A	Average
Tim	138.5	N/A	Below average
Bob	127.5	N/A	Well below average

The results were then compared with the children's individual scoring of keywords as on Table 6.5. Kevin, who is rated as high average in early literacy skills, shows no *dependence on his peers.* He presents an average *dependence on the teacher*

131

and *independence* levels. He does not take on *the role of the teacher*. He is seldom *loud*; however he is by far the most *aggressive* infant. He has an *active participation* rate consistent with his peers but his *non-participation* level is the second highest of the infants. He is not *passive* by nature.

May, Lara and Beth, who scored above average in their assessments, display little *dependence on peers* and on the *teacher*. They are *independent* and do not score in the *role of teacher* and seldom in the *loud* ratings. May and Lara are rarely *aggressive*. Beth scores highly for *aggression*. They all score highly for *active participation* and score low *non-participation*. May is sometimes *passive* in nature. Beth and Lara are seldom *passive*.

Eve, who scored average on her assessments, shows more *dependence on her peers* and the *teacher* than the average infant whereas Tony, Chris and Mags, who also scored average on their assessments, show no *dependence on peers* but a high *dependence on the teacher*. They all score quite highly for *independence*. Eve and Chris are the only infants to take on a *teaching role*. Eve and Tony do not score any *loud* incidents whereas Chris and Mags are both quite *loud*. Eve, Chris and Mags are sometimes *aggressive*. Tony scores higher. They all have high *active participation* for infants. Eve, Mags and Tony have low *non-participation* rates whereas Chris' is as high as his *active participation* rate. They are all rarely *passive*.

Ellen and Jack, who scored below average in their assessments on Table 6.23, show an average *dependence on peers* and on the *teacher*. They score a high rate of *independence* and do not take on the *role of teacher or* display *loudness* or *aggression*. They *actively participate* and do not score in *non-participation*. Ellen is rarely *passive* whereas Jack is the second most *passive* infant.

Tim, who scored below average on his assessments, shows little *dependence on his peers* and quite high *dependence on the teacher*. He scores highly in *independence*. He does not take on a *teacher role*. He is occasionally *loud* and very *aggressive*. His *active participation* is lower than average and his *non-participation* level is very high. He is *passive* in nature at times.

Tom, who scored well below average in the infant assessments, shows average *dependence on peers* and the *teacher* in Table 6.5. Bob, who scored well below average on his assessments (see Table 6.23), shows an elevated *dependence on his peers* and a high *dependence on the teacher*. Tom is quite *independent* whereas Bob's *independence* score was slightly lower than his age peers. Neither takes on the *role of teacher*. Tom is the *loudest* infant by far and the second most *aggressive*. Bob is occasionally *loud* and *aggressive*. They score lower than their peers for *active participation* and both have very high *non-participation* scores. Tom is seldom *passive* whereas Bob's passive *participation* score is also elevated.

Donal, Pat, John and Kevin account for the majority of *camera* incidents. Tom, Eve, Beth, Tim and Chris score once each.

The results of keyword usage in comparison with the children's abilities are seen on Tables 6.24 — 6.26. These results were then graphed to facilitate observing the links, if any, between the children's abilities and their participation levels. There are three bar charts, Figure 6.36 showing the children who were considered to be well above average and above average in literacy and numeracy; Figure 6.37 which shows the high average and average children; Figure 6.38 which shows the low average, below average and well below average children.

Table 6. 24 *Keyword usage of well above and above average children*

Keywords	Donal	Jen	Tara	John	May	Beth	Lara
Camera (C.)	4	0	0	6	0	1	0
Dependence on peer (D.P.)	0	6	5	19	2	0	0
Dependence on teacher (D.T.)	14	13	49	51	0	3	2
Independence (I.)	26	20	23	19	8	8	8
Taking on the role of teacher (T.R.)	6	13	27	8	0	0	0
Loud (L.)	4	3	13	35	0	0	2
Aggression (Ag.)	11	34	25	45	2	5	0
Active participation (A.P.)	69	73	63	51	37	34	35
Non-participation (N.P.)	10	2	6	6	2	0	6
Passive participation (P.P.)	10	11	2	5	4	0	1

Table 6. 25 *Keyword usage of high average and average children*

Keywords	Kevin	Pat	Eve	Tony	Chris	Mags
Camera (C.)	6	6	1	0	1	0
Dependence on peer (D.P.)	0	6	4	0	1	1
Dependence on teacher (D.T.)	3	10	9	6	11	4
Independence (I.)	5	19	8	6	8	9
Taking on the role of teacher (T.R.)	0	4	3	0	2	0
Loud (L.)	2	8	0	0	9	7
Aggression (Ag.)	16	12	6	6	4	4
Active participation (A.P.)	22	68	48	35	37	36
Non-participation (N.P.)	26	16	4	14	24	5
Passive participation (P.P.)	1	5	2	3	0	2

Table 6. 26 *Keyword usage of low average, below average and well below average children*

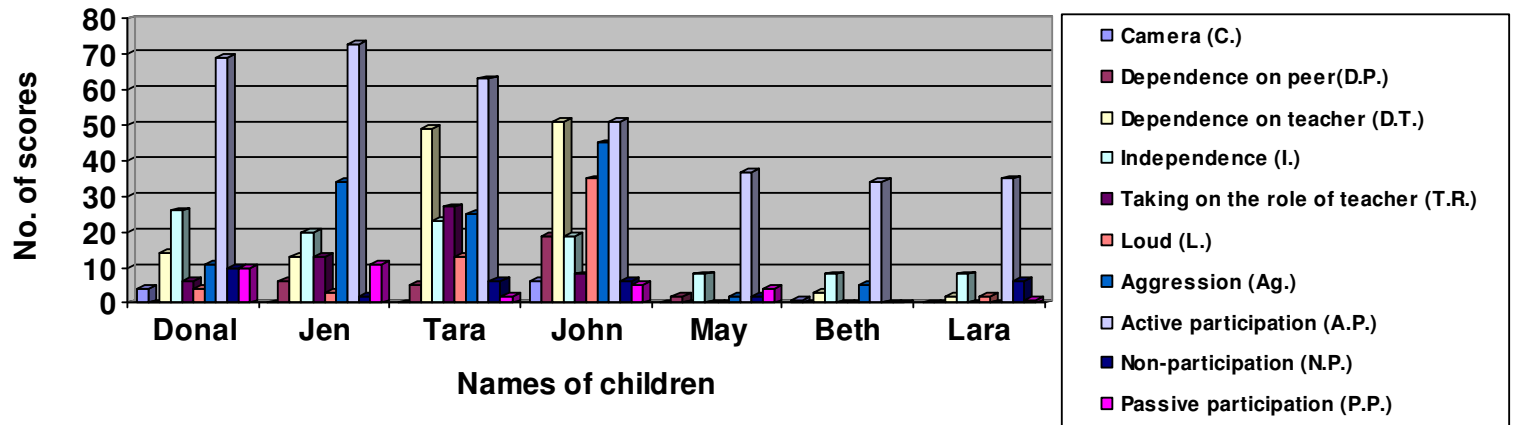| Keywords	Ann	Ellen	Jack	Tim	Tom	Bob
Camera (C.)	0	0	0	1	1	0
Dependence on peer (D.P.)	11	2	1	1	2	7
Dependence on teacher (D.T.)	15	3	4	8	3	8
Independence (I.)	7	8	8	9	6	6
Taking on the role of teacher (T.R.)	6	0	0	0	0	0
Loud (L.)	4	2	0	3	18	3
Aggression (Ag.)	3	2	3	6	10	2
Active participation (A.P.)	46	37	39	29	33	21
Non-participation (N.P.)	12	0	5	24	22	44
Passive participation (P.P.)	62	1	8	4	1	13

Figure 6. 36 Keyword usage of well above and above average children
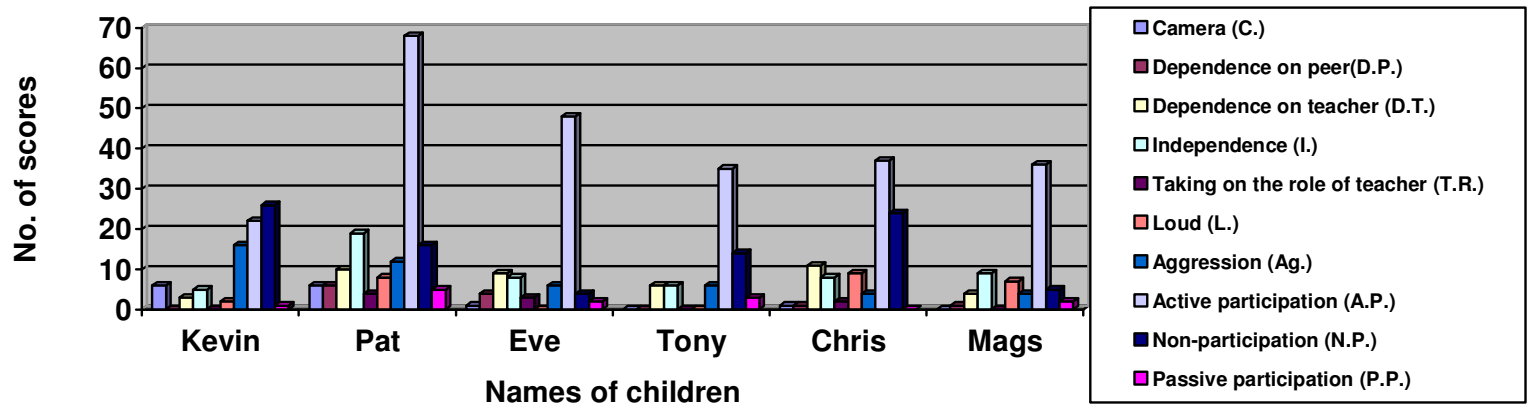

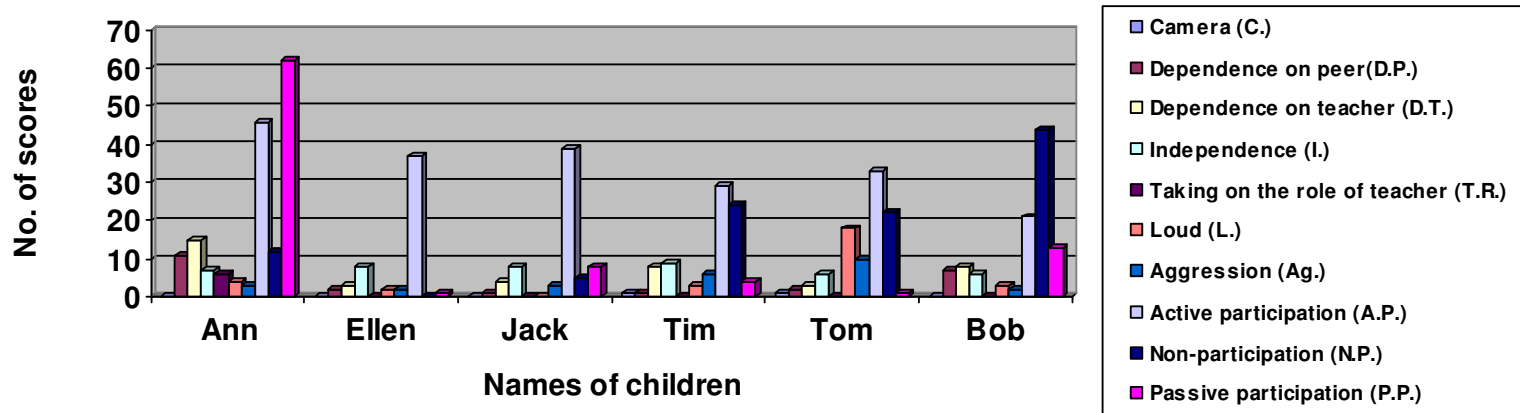Figure 6. 37 Keyword usage of high average and average children

Figure 6. 38 Keyword usage of low average, below average and well below average children

The children, who achieved opposite ends of the bell curve of normal distribution, in this case extremely high achievers and extremely low achievers, were then compared under the ten selected keywords to establish any differences and similarities. Table 6.27 and Figure 6.39 show the results.

Table 6. 27 *Comparison of keyword usage by well above average (Donal & Jen) and well below average children (Tom & Bob)*

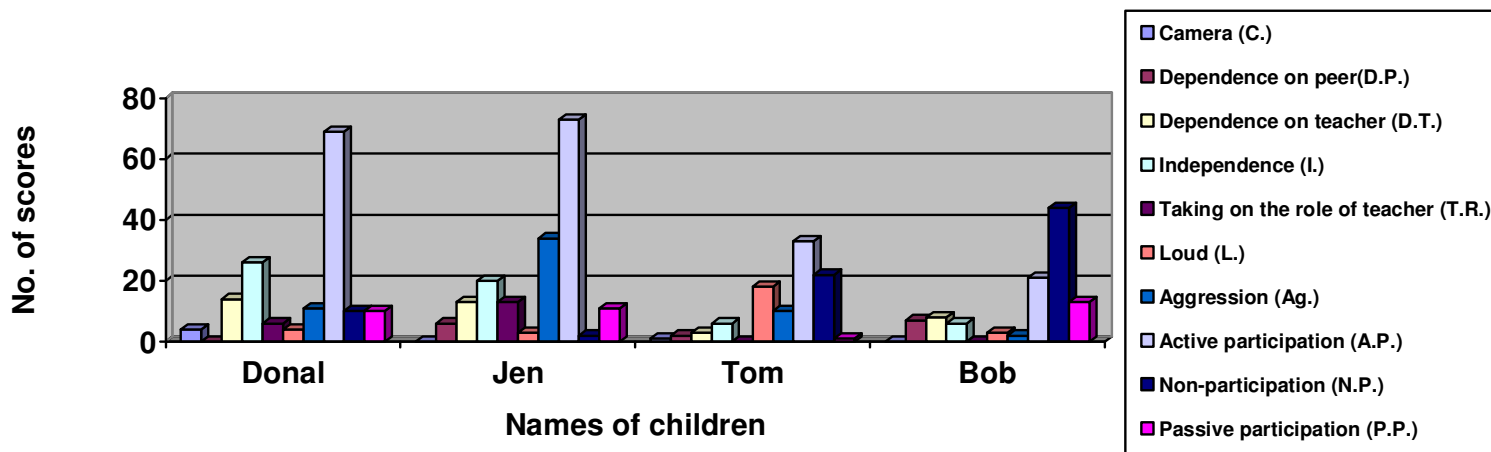| Keywords	Donal	Jen	Tom	Bob
Camera (C.)	4	0	1	0
Dependence on peer (D.P.)	0	6	2	7
Dependence on teacher (D.T.)	14	13	3	8
Independence (I.)	26	20	6	6
Taking on the role of teacher (T.R.)	6	13	0	0
Loud (L.)	4	3	18	3
Aggression (Ag.)	11	34	10	2
Active participation (A.P.)	69	73	33	21
Non-participation (N.P.)	10	2	22	44
Passive participation (P.P.)	10	11	1	13

Figure 6. 39 Comparison of keyword usage by well above average (Donal & Jen) and well below average children (Tom & Bob)

The results of the above Table 6.27 and Figure 6.39 are discussed in detail in Chapter 7, section 7.7.

Chapter 6 has represented an accurate compilation of the participation levels displayed by the children involved in the study. The results were related to groupings, gender, worksheet completion, information from field notes and to children's academic abilities. These results are discussed in the next chapter.

Chapter 7 – Discussion

7.1 Keywords and keyword maps

The frequency of keywords which are shown on Table 6.1 and Figure 6.1 demonstrate high levels of active participation in the lessons. This indicates that the strands and strand units selected by the researcher to promote a curiosity and enjoyment of science have promoted participation at least. In order to discuss the effectiveness of individual lessons the results from the keywords maps Figures 6.2 – 6.17 were analysed. At this point the keyword group of camera is discounted as it was thought to bear no relevance to the lesson content.

The main pattern running through the majority of the lessons is that there is *dependence on peer* at all stages but particularly at the beginning when a child is starting the task (see Figures 6.2, 6.3, 6.7 & 6.8 for examples). *Dependence on peer* occurred at the beginning of all but three of the lessons (see Figures 6.4, 6.11 & 6.17). It is surprising at this stage *i.e.,* the junior end of primary school, that two of these lessons have no instances of *dependence on peer* at all (see Figures 6.4 & 6.11). These two lessons on the topics of "Properties and characteristics of materials" and "Planting" appear to have promoted the children's self-reliance to the utmost, due to the content of the lessons which contained subject matter relevant to every child, no matter what their background, gender or intelligence *e.g*., Lesson 3 – soaking or non-soaking materials from the classroom. Thus promoting confidence for success with the task. These lessons also promoted the enjoyment factor to its fullest and the exuberance of the children to participate was palpable (Lesson 10 – Planting).

On the other hand it would appear that the content of Lessons 8 and 11, Body parts and Construction, had the opposite effect and the children demonstrated an over reliance on their *peers* (see Figures 6.9 & 6.12). Lesson 8 required a higher level of competence in utilising and completing a puzzle in the form of a worksheet. For the older children this required a small amount of reading which proved difficult for some children. The increased *dependence on peer* in Lesson 11 is easily explained by the groupings which were in pairs or in threes leading to a structure of dependence in the lesson.

The fact that this is research compiled using children from four years old to eight years old means that it is not surprising that the pattern of *dependence on the teacher* is one of high dependence (see Table 6.2). The high level of *dependence on the teacher* was expected due to the presence of very young children and therefore does not reflect the suitability of the lesson. The only lesson which is an exception to this pattern is Lesson 10 ─ Planting (see Figure 6.11). The children were very excited and focused during planting flowers and felt comfortable in their ability to complete the activity independently.

Independence, as a keyword group, was mainly assessed by the researcher at a quiet period in the lesson when the children were busy at the task. If there was not a period in the lesson were the teacher could find time to record notes evidence from the video recordings was analysed. There is evidence for *independence* in every lesson except for Lesson 3 ─ "Properties and characteristics of materials" (see Figure 6.4). At first glance this bodes badly for the lesson content but on closer inspection there are contributing factors. These include the high level of pupil involvement in groupings and the task. The children were required to test various materials in rotation with their group peers which meant there was little opportunity to observe individual *independence*.

Another contributing factor to the lack of *independence* is that the children did not have an individual written task to perform and therefore it was difficult to assess the actual *independence.*

Taking on the role of teacher was expected to be found at the beginning of the lessons. This normally occurs when a child is unsure of the task and his/her peer helps them out. There is a definite pattern in agreement with the above statement (see Figures 6.11 – 6.13). However one lesson, Lesson 6 – "Magnetism/plans" did not register any. This lesson is different to the other lessons in that the infants and 1st/2nd class were working on different topics. Each task was specifically selected for suitability to age and the child's ability. The evidence for this is the absence of need for any peer tutoring in the task. It is a common social trait to learn from our peers and therefore it is not unusual to see it quite widespread throughout the lessons.

Through the researcher's previous classroom experience, loudness in the classroom normally indicates one of two things; (i) the children are highly motivated by the task and are competing to be heard, or (ii) the children have lost interest in the task completely. The expectation would be that the former would occur in the beginning stages whilst the latter would be evident in the end section. The pattern for these lessons was the majority of instances happening at the beginning of the lessons indicating a high level of involvement (see Figures 6.2 – 6.17). The surprising thing to note is that the high levels continued through the middle section also; thus indicating that the children remained interested in the topic for an extended length of time. There were less *loud* incidents recorded during the end section (see Table 6.2) which underlines the capacity of the Revised Primary Science guidelines (D.E.S. and N.C.C.A., 1999), and the researcher's choice of Strands and Strand units, to hold the children's interest throughout the duration of a lesson.

The expected pattern of *aggression* is to have a concentration at the beginning of the lesson when there may be competition for tasks *etc.* A*ggression* might manifest itself in the form of shouting, bickering, snatching materials, standing up *etc.* The pattern is true of the researcher's lessons but it must also be said that there is *aggression* in high amounts in the middle sections (see Figures 6.2 – 6.17). Based on the researcher's experience this has more to do with the grouping of the children than the actual content of the lesson. However it must be said that the majority of the lessons contain activity packed tasks which require interaction with peers. It may be true to say that this contributed to the high levels of *aggression.* Lesson 10 – "Planting" seems to confirm this as true. In this lesson the children display extremely high levels of *aggression.* They are so enthusiastic about planting flowers and vegetables that they become overly competitive with each other. Their voices become raised and they are territorial and complain when other children appear to infringe on their space for planting. When filling the boxes with compost the children compete to try to get the most compost into their box which results in an increase in complaints to the teacher (see Figure 6.11).

Active participation is the highest scoring keyword by far overall. It is present in every lesson at almost every stage (see Table 6.2). This is representative of the fact that the lesson content chosen is of great interest and relevance to the children and in turn has encouraged a high level of *active participation.* Thus the video analysis can be used to maintain the active participation rather than the teacher making a tacit assumption.

Non-participation is found in most of the lessons at the various stages (see Figures 6.2 – 6.17). It must be reiterated that the children are of a young age and do not have a long attention span, particularly infants. It is interesting to note that *non-participation* is present in every lesson in the beginning stages (see Table 6.2). The

researcher equates this to a small number of children who are unmotivated for periods in most lessons. They repeat a pattern of *non-participation* as they find it difficult to concentrate for any period of time and therefore go off task quite regularly regardless of lesson content thus elevating the levels of *non-participation*.

The lessons involved were hand-picked because of their accessibility to all children according to the Revised Science Curriculum guidelines (D.E.S. and N.C.C.A., 1999). It is evident that the lesson content did encourage children to participate as indicated by the extremely high levels of *active participation* recorded (see Figures 6.2 − 6.17). However despite the suitability of the lessons there is still evidence of *passive* behaviour. This behaviour is mainly found in the beginning stage of the lesson (see Table 6.2) where a child lacking in confidence tries to copy his/her peer. In choosing the lessons the researcher based the choice of a lesson on its suitability for the group of children who would be performing the task and attempted to reduce the chance of *passive* behaviour by age-appropriate materials. It is fair to say that the lesson content should not be a contributing factor to passivity. This is reinforced by the presence of *passive participation* in every lesson, see Figure 6.2 − 6.17, and will be discussed in depth in relation to intelligence and grouping.

7.2 The timing of keyword usage in the lessons

On first glance at Figure 6.24 it is interesting to note that the groups of *aggression, active participation* and *non-participation* are all quite evenly balanced between the beginning, middle and end of the lessons indicating that these keywords are always present throughout the lesson regardless of what is happening in the lesson. This was surprising as the researcher expected slightly lower levels of *active participation* and *aggression* in the end segments due to the lesson drawing to a close and expected higher

levels of *non-participation* as the children's interest waned. The continued levels of active participation may be due to the choice of lesson content.

Most *loud* incidents and *passive participation* occur when the teacher has given the instructions and left the children with the task (see Figure 6.24). The largest proportion of these is in the beginning segments. There is also a sizeable portion in the middle of the lessons but this is greatly reduced in the end stages. This indicates that as the lesson progresses the need for *loudness* decreases *i.e.*, the children are not competing to give opinions on how to proceed with the task or indeed to vie for equipment. The same is true for the *passive* incidents in that passive children who may have had to copy or get instruction during the task no longer require help as the task is completed.

The keywords of *dependence on peer, dependence on teacher* and *taking on the role of teacher* form the following pattern; they have the largest proportion of activity at the beginning, half the activity in the middle and less again at the end (see Figure 6.24). This can again be explained by the format of the lesson, as it progresses the tasks become completed.

The keyword of *independence* forms a different pattern. The majority of *independence* is noted in the middle section and two smaller sections at the beginning and end of the lessons (see Figure 6.24). The children need more support in the beginning sections, can work more independently in the middle sections as help has been given and are finishing and perhaps interacting with the teacher in the end sections. The majority of *camera* incidents occur in the end sections when children are at the teacher's desk with their completed work (see Figure 6.24). The camera is positioned there and curiosity is aroused.

It is important to note from the data that the bulk of interaction and communication occurs in the beginning stages of lessons and this is the stage in which most data are collected. The most notable exception to this is the *independence* group which has more incidents in the middle section. However the findings for the keyword of *independence* still support the preceding statement as the children are more involved with their own task at this stage and are having less communication with others.

7.3 Results for gender

The next results for discussion are in relation to gender. The gender ratio of boys to girls was 10:9 and as it was almost equal it facilitated the observation of any consistent patterns of participation between the two genders.

Figure 6.25 shows that in most keyword groups, the pattern of male/female response ratio is consistent with the overall gender ratio *i.e*., the boys score marginally higher than the girls. This is true in the groups of *dependence on peer, dependence on the teacher, independence* and *active participation* which is in direct conflict to research carried out by Kahle (1991) and Whyte (1986, in Kahle, 1991) who both observed consistently lower numbers of girls, than boys, participating in tasks and also noted male domination of tasks. The apparent balance in relation to gender could be attributed, partly, to the fact that the researcher took account of the gender balance of the classroom through the careful selection of specific lessons. The researcher ensured that the lessons involved the need for the children to test and become involved in the tasks personally *i.e*., there was a valid role and an opportunity given to each child to participate individually, and at times, co-operatively in the task; thus the researcher kept the balance level. As a result of these careful selections by the researcher the enquiry method of teaching advocated for girls by Galton (in Kahle, 1991) where all children

are given opportunities to maintain and conduct experiments and to test hypothesis was brought into use.

However on looking at the other groups a dissimilar pattern emerges. Out of twenty seven incidents of *camera* tricks only two are by females (see Figure 6.25). The females largely ignore the camera whereas some boys are fascinated by it. The camera proves a small distraction as stated by Hopkins (2002) but does not prove detrimental to the children's learning.

In the area of *taking on the role of teacher,* the females have over double the male score indicating that females model and demonstrate tasks, usually to younger children, more freely than males (see Figure 6.25). This concurs with Sjøberg and Imsen (1991) who found females more likely to display orientation and empathy towards others.

In both the *loud* and *aggression* groups the males score much higher than the females (see Figure 6.25). They discuss loudly and forcefully and although they are mostly on task they tend to dominate the task if allowed by their peers. Howe (1997) found this pattern existed and indicated that teachers tend to pick boys more than girls to perform tasks. The latter part of Howe's findings is not applicable here.

The pattern of boys achieving higher levels than the girls is true of the *non-participators* also. The males have a much higher score than the females (see Figure 6.25). They are much more likely to lose concentration and less likely to try to get back on task than the girls. This is discussed in context of the ability of the children in Section 7.7 analysis of children's participation levels compared with ability levels.

In *passive participation* the females have more scores than the males (see Figure 6.25). This concurs with the above findings that females are more likely to try and find some way of continuing the task, be it copying or asking for help, rather than to stop altogether. It also agrees with Hall (1982, in Brown University, 1996) who recorded females as taking longer to formulate and put their plan of action into use.

Looking at the responses to question time we observe that the ratio of male/female responses is equal at 34:34 (see Tables 6.11 & 6.12) demonstrating an identical amount of responses for both sexes. In *active participation* versus *non-participation* pertaining to worksheets there again is no common obvious difference between the sexes (see Figure 6.32).

7.4 Frequency of keywords for individual children

Table 6.5 shows the frequencies of keyword use by each child. Any high or low occurrence was marked and it is these that are discussed below. It must be noted that Kevin was present for eight out of the sixteen lessons and enough data were collected to include the findings. The number of lessons missed must be taken in to account when discussing his results in comparison with his peers.

It is the oldest boys in the classroom overall who are distracted by the *camera* and become off-task because of it. The three oldest children Donal, Pat and John return to task after initially messing whereas Kevin becomes transfixed with the workings of the *camera* and always needs direction from the teacher to go back on task.

Out of the 1st/2nd class group John shows the most *dependence on his peers.* However this is not always for help, rather he likes their attention and is constantly seeking approval from them. This is in conflict with Hammrich (2001) who found that females were more reliant on their peers' opinions. The direct opposite is true for Donal

who does not score. He works independently from his peers and demonstrates high levels of detachment from his peers. Ann has a high score also but she has scored mostly because of copying and a high reliance on her peers for help. The same could be said for Bob in the infants' group. He scores much higher than his peers and is heavily reliant on them for help to complete tasks (see Table 6.5).

John again has the highest score in *dependence on the teacher*. John mirrors his behaviour in the preceding group and when he does not get attention from his peers he tries to talk to the teacher. He is highly motivated and is on task most of the time. His behaviour concurs with research carried out by Sjøberg and Imsen (1991) who suggested that males, when allowed, become overbearing and dominate the proceedings. However here, the other children continue with their tasks and by and large ignore John's attention seeking antics. We also see that Tara scores highly too. She is very capable of doing tasks independently but opts to check everything with the teacher and is almost too cautious to proceed on her own initiative. She bombards the teacher with questions in the initial stages of the task. The fact that she does this is in conflict with Sjøberg and Imsen (1991) who suggested that it is the males who initiate questioning. In the infants' group, Eve is also very cautious and reluctant to proceed independently with tasks. She seeks reassurance from the teacher but is capable of proceeding on her own. Chris scores highly but many of his scores are from talking with the teacher and checking or giving his opinion of a task. May shows no *dependence on the teacher* and proceeds independently. Lara displays little dependence also.

Donal and Tara, the two oldest children demonstrate the highest levels of *independence* in Table 6.5. *Independence* levels were expected to increase with age as maturity levels increase. Tara, who shows great *dependence on the teacher* in the initial stages of the lessons, is very *independent* at other times. Ann, in stark contrast, shows

independence levels on a par with infants rather than 1st/2nd class. In actual fact Tim, who is the most *independent* infant scores higher than her. The researcher believes that the lack of *independence* is connected with ability which is discussed in Section 7.7 analysis of children's participation levels compared with ability levels.

Tara demonstrates the most, by far, of *taking on the role of teacher*. She models this on her teacher and tries to instruct children who are younger than her. Jen also scores highly. The difference being that she tries to instruct anyone, regardless of age, who needs direction. Eve and Chris are the only infants to score and help their age peers who have difficulties. The majority of children who empathise with their peers are females which is in agreement with the findings of Sjøberg and Imsen (1986, in Sjøberg and Imsen, 1991).

John again scores the highest in the group of *loud*. He is constantly talking loudly to whoever will listen. He remains on task but occasionally distracts others. Tom and Chris follow this pattern also, concurring with research documenting the attempted dominance of males in groupings (Sjøberg and Imsen, 1991).

John and Jen show similar *aggression* totals. They are constantly debating over who gets to execute activities and experiments. Neither of them acquiesces to the other. It is interesting to note that previous studies did not find that females could be equally as *aggressive* and competitive as the males. Ann barely scores in this category and is habitually quiet, barely communicating which is demonstrated by her score in Table 6.5. Kevin and Tom, the two oldest infant boys, are the most *aggressive* infants. Kevin tries to push and shove the other children and put them off-task. Tom, generally, is talking about the task to others which causes a distraction also.

Jen has the highest *active participation* in 1st/2nd class. She is always involved in the action and is highly motivated. Ann is in contrast to this and does not score as highly. She attempts to participate but is reluctant to push herself forward in any activity which is performed in the group. She allows the more dominant children to take over. Eve, Chris and Lara are motivated and join in actively in the lessons. Bob does not take on such an active role and is passive at times when a task is being completed.

Pat, Kevin and Bob are the highest *non-participators*. Pat and Bob tend to lose concentration and drift off in a dream when the task is uninteresting to them. Kevin, who usually gets his task completed, has problems interacting with his peers and tries to distract them rather than get on with the task. Jen, Ellen and Beth show low to no incidents of *non-participation.*

In Table 6.5 Ann demonstrates a huge amount of *passive* incidents. These are mainly copying and allowing her peers to take over. Bob has the same pattern showing no obvious difference in male/female incidents. Tara, Beth and Chris show low to no incidents and are highly independent of their peers.

7.5 Results of keywords in relation to changes in groupings for the lessons

Firstly the findings of Figure 6.26 showing the frequency of keywords relating to loudness, aggression and participation rates with respect to groupings and Figure 6.27 showing the frequency of keywords relating to camera and learning styles with respect to groupings are discussed relative to their specific groupings. Grouping 2, which has all children in their class groupings, scores the least *loudness* and low *active participation.* However it must be made clear that this is a single lesson grouping and therefore the levels should be seen as lower than the average but not dramatically as first appears. *Aggression* is at its highest in groupings 3 and 5 where children are in pairs or in threes

with their age peers. Competition is high but it appears constructive as high *active participation* is also evident. Low levels of *aggression* are found in group 7 which has same gender and mixed age children of similar participation rates. The single lesson groupings of 2 and 7 score the lowest *active participation* and also *non-participation* as expected due to their single lesson status. The highest *active participation* and *non-participation* is recorded in groupings 1 and 3 when the children are in their regular class groupings and in pairs with their regular class groupings. However *non-participation* is also at its highest in group 3 where children are paired in their classes. It appears that this allows the more dominant child to control the task leaving the more passive child idle. *Passive* behaviour peaks in group 5 where the children are in same gender groups within their class groupings, leading to the assumption that certain children dominate others.

Secondly in Figure 6.27 it is noted that the incidents of *camera* tricks decline as the children lose interest in the machine. *Dependence on peer* is, unsurprisingly, highest in group 3 where the children are paired and therefore reliant on each other's opinions. *Dependence on the teacher* is also high in group 3 indicating competition for the teacher's attention between age peers. *Independence* is high in groups 3 and 5 where the children work in small groups within their classes. More children than usual take on the *role of teacher* in groups 6 and 3 when the groupings are small and they feel as though their partner needs direction.

When the children are grouped with children of their own age the most dominant children are easily spotted. The purpose of the changes in groupings was to observe if the children took on different status or roles within each grouping or if they always retained their same modus operandi. Discussed overleaf are the consequences,

if any, that the change in groupings affected on the individual children and the dynamics of the group as shown on Tables 6.6 — 6.10.

Donal shows little *dependence on his peers* throughout the lessons. He becomes more *dependent on the teacher* when grouped with either Tara or John and Pat. He is highly *independent* in his class grouping and takes on the most of his *teacher roles* here and less so in the other groups. He is *loudest* in his own class grouping and with John and Pat. The same is true for his *aggression* levels which are also higher when paired with Tara. It is in his class group and with Tara that he shows most *active participation*. There are no great differences in *non-participation* as his scores are all low. He shows most *passive participation* when grouped with John and Pat. From these results it is clear to see that changes in groupings do not cause a great difference to Donal's behaviour. He responds to the children with whom he needs to be *active* and compete with in order to be a participant in the lesson. He becomes more *passive* with the more dominant males.

As shown in Tables 6.6 — 6.10 Tara exhibits more *dependence on her peers* in the group with Jen and Ann. She *depends on the teacher* most when grouped with Jen and Ann, but also when grouped with Donal and least when completing an individual task. She is very *independent* when in her class grouping. She has high levels of *taking on the role of teacher* with Jen and Ann and the younger children. She is extremely *loud* and *aggressive* when paired with Donal. She is also very *aggressive* with Jen and Ann. She shows the most *active participation* with Donal. There are no noteworthy changes in her *non-participation* and *passive participation*. Tara becomes more competitive when she feels her dominance is under threat *i.e.,* with Donal and Jen.

Pat becomes more *aggressive* and *dependent on his peer* when paired with Ann. He does not exhibit this in group activities. He also displays high *active participation* with Ann who is passive and allows him to dominate the task. He shows high *dependence on the teacher* when he is grouped with younger children. He becomes quite *loud* in the group with Donal and John. There are no other important changes in his participation. This demonstrates that Pat becomes more active when he realises he has more responsibility to the group or is the main achiever for the group.

Ann is *dependent on her peers* when doing an individual task or working with her age peers which can be seen in Tables 6.6 – 6.10. She becomes extremely *dependent on the teacher* when grouped with younger children. These are also the only lessons in which she initiates communication and takes on a *teaching role*. They are also the lessons in which she has her highest levels of *active participation*. Her highest levels of *non-participation* are when she is with her class group. She is most *passive* when in a pair with Pat or when grouped with Tara and Jen. Ann is greatly affected by the changes in groupings. She tends to hold back and copy when with her class and becomes active with the younger children when she feels she is more capable of completing tasks.

John shows his highest level of *dependence on peer* when grouped with Jen. He is *dependent on the teacher* in this group and also when grouped with his class. He is *loud*est when grouped with his class and also with Donal and Pat. He is *aggressive* with his class and with Jen. It is also in these groups that he shows the most *active participation*. He shows the most *non-participation* with Jen. He displays the same pattern as 2nd class children in that if his dominance is threatened he responds by trying harder and becoming louder and more aggressive.

Jen is *dependent* on John in their pairing. She is most *dependent on the teacher* when in her class grouping and when paired with John. She tries to instruct John a number of times when they are together and gets frustrated when he will not listen. She becomes her *loudest* and most *aggressive*. She is also very aggressive when grouped with Ann and Tara. She has most *active participation* with her class and John. She shows uncharacteristic *passive* tendencies when grouped with Tara and gets frustrated again as Tara tries to dominate the task completely. Jen reacts similarly to the majority of her class peers when the groupings are changed.

After analysing 1st/2nd classes' results in Tables 6.6 – 6.10 there is a clear pattern for the majority of children. The general trend for these children, who are highly motivated to learn, is to become more active, loud and aggressive when they feel there is competition for the tasks. Looking at this from a teaching point of view these children probably optimised their learning during the lessons in which they were grouped with their class. They appear to self-motivate in order to achieve success within their class groupings. No one child or group was observed exerting complete control over the experiments and the equipment. Within their own class groupings the girls were capable of protecting their role and controlling their valuable contribution to the lessons. This ability to remain integral to the development of the lesson, rather than deferring to the males, is in contrast to the findings of Sjøberg and Imsen (1991) who found that the boys dominate in situations of freedom, specifically the use of equipment. However it is in agreement with Hollis (1995) who stated that interested and enthusiastic students are more willing learners.

Ann, who is a much more timid child, lacking in self esteem when compared with her peers, seemed to find it impossible to keep up with the relentless competition between the other children. Instead of rising to the challenge she appeared to lose

154

confidence in her ability to complete a task. She gains in confidence when grouped with the younger, lower status, children and appears to become more involved in the lesson. Ann displays more typical female communication styles according to Hall (1982, in Brown University, 1996), who stated that females who are interrupted become hesitant to join in tasks in the future. The researcher's experience suggests that if a child is confident within her abilities *e.g.,* Tara and Jen; they will possess the necessary skills to try, and try again, no matter who is trying to prevent their opinion or participation. Ann who has little self-belief in her abilities displays exaggerated passive behaviour and becomes less likely to initiate participation.

Kevin was not affected by the changes in most of the categories. He is at his most *aggressive* when he is with his own class grouping which is also true of his *active participation.* He takes more of an *active* role when paired with Eve. Ellen's first fluctuation happens when she is grouped with Jen with whom she argues. She scores her first *aggression*. Ellen does not participate well when left alone to complete a worksheet. Tom, when paired with May, shows *dependence on his peer.* He exhibits *dependence on the teacher* in this lesson as well as when he has an individual task to cope with. He is generally *loud* but is quieter when grouped with his class and also when completing an individual task. He is most *aggressive* when paired with Jack with whom he sees the need to compete. He *participates* most when paired with May and John and least when paired with May. Tom is affected by the changes in much the same way as the older children *i.e.,* he gets louder and more aggressive when competition is heightened. He becomes submissive when a more dominant older child is involved *e.g.,* John. There are no major deviations in Jack's patterns. He is most *active* when grouped with his class, Ellen, Pat and Eve. He is most *passive* when paired with Donal and Tony. He acquiesces to Donal. Eve becomes more *aggressive* when with her class. She

participates most when grouped with Pat and Jack and shows most *non-participation* when with her own class. May has most *active participation* in her class group. She scores her only *non-participation* in a grouping with Donal and Beth. She allows Donal to do the work. She displays *passive participation* when completing an individual task and when grouped with Jen and Beth. She follows Jen's lead.

The pattern for the senior infants is not as clear as for the older children. There is not a vast difference in keyword levels from group to group (see Tables 6.6 – 6.10). However the pattern is quite similar to $1^{st}/2^{nd}$ in that the majority of children work better as a class group. They find more difficulties working on an individual task and have various problems such as aggression and being suppressed when working with the older more dominant children. When Howe (1997) talked about the need for effective grouping she stated that the group should be symmetrical, as the class group is. The only exception to having a preference of being grouped in a class setting is Eve who reacts better when grouped with an older child who can direct her. She becomes quite aggressive and overly competitive when with her larger class group. She demonstrates the purpose of a viable asymmetrical group as discussed by Howe (1997); in this case the benefits of peer tutoring are noted.

Tony becomes a lot more *dependent on the teacher* when paired with Tim. He is at his most *aggressive* when in a pairing or small group. He is most *active* when in his class group and when paired with Chris although this grouping also has a very high instance of *non-participation*. Beth is most *aggressive* when paired with Donal and May where she gets frustrated that Donal is doing all the answers and also with Jen and May where the same applies to Jen. She shows most *active participation* when in her class and when paired with Lara and Mags. Bob shows his highest levels of *dependence on his peer* when paired with Tim and later when grouped with Ann and Tim. This is true

of his *active participation* also. His highest level of *dependence on the teacher* comes when undertaking an individual task. He shows elevated *non-participation* when paired with Tim and also high levels when grouped with Ann and Tim. He has high levels of *passive participation* with children of his age *i.e.,* Mags, Lara, Chris and Tim. Tim becomes very *dependent on the teacher* and is most *aggressive* when paired with Bob. He shows his highest total of *active participation* in this pairing along with when he is in his class group. His highest levels of *non-participation* are with Ann and Bob. Chris shows most *dependence on the teacher* and is *loudest* when paired with Bob. He takes on the *role of teacher* with Bob and also with Tony. He is most *aggressive* with Pat and Tom. He shows most *non-participation* when doing an individual task. Lara only displays the keyword *loud* when grouped with Mags and Beth. She *participates* most in her class group and shows high levels of *non-participation* with Tara and Chris. Mags is only *dependent on the teacher* when grouped with John and Tom. She is also *aggressive* as she is when grouped with Tara, Lara and Eve. She is *loudest* in the groupings or pairings. She *participates* most when grouped with Lara and Beth.

Junior infants demonstrate a clear pattern which is found on Tables 6.6 — 6.10. It is undeniable that they show much more participation when left in their normal groupings in the classroom. They feel out of depth with the older children and generally watch rather than actively participate. The females react better when together as do the males. Bob is the one exception to this. He paradoxically participates better when grouped with an older child but also displays his highest *non-participation* (taken into account is the fact that grouping 6 only spans 2 lessons in comparison to group 5 which covers 3 lessons). He already, at such a young age (4), is passive and allows the other children of his age to complete tasks and that he is unmotivated to join in. This mirrors the findings of the senior infant grouping. Green (1995) concluded that non-

participating low achievers participate more in group activities as opposed to individual activities and this appears to be the pattern in this instance also.

From the above data it would be true to say that from the average individual child's perspective it is more beneficial to remain in a class group and to participate in a task through group work. When we look at the keyword levels as a whole, in Tables 6.6 — 6.10, we observe that the highest levels of *active participation* come from class groupings and in groupings which have children with similar participation styles *i.e.,* two passive children, three dominant children *etc.,* Group 3, where the children were grouped in their own class with children of similar participation rates, shows the most *non-participation, independence* and *dependence on peers and on the teacher. Independence* is very high in Group 8 where same gender, mixed age and similar participators are grouped. Group 4, where same age children were grouped together, shows no *aggression*.

This data would seem to suggest that if smaller groupings than class groupings are required it would be the most productive to group children on the basis of their participation rates rather than any other criteria such as age or gender.

7.6 Analysis of video and worksheet data in the keyword groups of *active participation* **and** *non-participation*

It is apparent from the results in Figure 6.34 that motivated children in $1^{st}/2^{nd}$ class follow a pattern of participation. They score similar levels of participation for both the worksheets and overall the tasks. There is a similar low *non-participation* rate in the area of worksheets. Ann, who has a different motivational style, has also a different pattern in these two areas. Her *active participation* levels and *non-participation* for the video follow the same pattern as her peers but have a lower score. The main difference is that she scores highly in comparison to her peers in *non-participation* in worksheets.

This is an ability issue and is discussed in the following Section 7.7 analysis of children's participation levels compared with ability levels.

In the infants' work, Figure 6.35, a similar pattern is formed where the majority of children have similar participation levels for worksheets and overall video. Kevin scores similarly but a lower score as he was absent for some lessons. Bob's scores for participation are much lower than his peers. *Non-participation* is more predominant with the male infants and especially so with Bob.

7.7 Analysis of children's participation levels compared with ability levels

It is noteworthy that $1^{st}/2^{nd}$ class children who have been described as being highly motivated and who have exhibited this quality throughout the lessons are also attaining results in standardised tests which range from average to the well above average category. The child who is least motivated, Ann, is found to be attaining results on standardised tests which fall in the low average range (see Table 6.22 and Figures 6.36 – 38). Throughout all the results the same pattern has occurred that is Ann participates less than her age peers. She demonstrates the highest female percentage of non-responses to question time (see Figure 6.29). The realisation that she is less academically inclined seems to have infiltrated her thinking and involvement in her peer group. This is supported by the findings on Table 6.16 and Figure 6.33 which show Ann achieving a marginally higher number of correct answers when compared with incorrect answers (51% vs. 49%). This is in marked contrast to the scorings of her peers. Her lack of literacy skills perpetuates her feeling of inadequacy when grouped with a class of high achievers. This fact is underlined when we see her participating at her highest levels when grouped with children who are younger and less able than herself. Nuthall (1996) concluded that it is not ability that determines a child's learning but classroom events which are the defining elements. He suggests that a low ability child could learn

more when grouped with high ability children as he/she will be taught more. This is not the case in this study as the low ability child is floundering in the higher ability grouping.

Another interesting result to note is that Tara, who is of high ability, feels the need to get constant reassurance from the teacher and her peers. This is also true of John. Howe (1997) identified this as a female trait but observed in this study is a high ability male exhibiting the trait.

On looking at Figure 6.36 and comparing the well above and above average children and their keyword occurrences it became apparent that there was also a pattern to these children's learning. Their high *active participation* levels were consistent with their age peers in this ability group. Their *non-participation* was similarly low. They were rarely *passive* and displayed a great deal of *independence.* The older children displayed high levels of *aggression* and *dependence on the teacher* while the younger children displayed little. It must be noted that this *dependence on the teacher* was mostly task driven and questioning in nature.

When looking at the high average and average children under *active participation* levels we again see a high level (see Figure 6.37). The exception is Kevin as he was absent a considerable amount of time. *Non-participation levels* are higher in this group. The children are again rarely *passive* in nature. Less *aggression* and *loudness* is displayed from the children and they are not quite as *independent* as the first group. They show low *dependence on the teacher* and on their *peers.*

In the group of low average, below average and well below average we see a different pattern emerging (see Figure 6.38). *Active participation* levels are slightly lower and *non-participation levels* are quite high especially in the males. This group

overall has the most *passive* tendencies. There is little *aggression* or *loudness*. *Independence* is much the same as the average grouping. *Dependence on the teacher* is very low when compared with the above average group with two children showing a high *dependence on their peers*.

After looking at the well above average and well below average groupings and comparing their performances under the keyword groups (see Figure 6.39) it was apparent that the children in the well above average category showed a vastly different pattern of participation than the children in the well below average category. The high ability children demonstrated higher levels of *active participation, independence, dependence on the teacher* and *aggression* than the other group. The well below average children demonstrated higher levels of *loudness* and *non-participation*. There was no obvious difference between genders in the high achievers group's participation levels which is in contrast to Knain (2001) who found that females were less confident than the males. Interestingly two boys, Bob and Tim, who score in the well below average category where the only children to demonstrate more incorrect answers than correct answers on their worksheet activities (see Table 6.18 and Figure 6.33).

Generally speaking we can see that the higher the child's ability the higher his, or her, involvement in the lesson. The lower the child's ability the lower the participation and more frequent the incidents that are *passive* in nature and *non-participating* incidents occur. These results are not gender specific.

7.8 Limitations

It must be pointed out that this research was carried out in a small, rural school with a mixed age and gender class grouping and therefore is not representative sample of a typical primary school in Ireland. The research was classroom based and therefore not

wide enough to create a generalisation on other schools outside the study. The research was intended to gauge the level of participation in similar schools and to act as a base from which other studies may unfold. The lessons were carried out through the course of the school year and most children were in attendance for all the lessons. However it has to be taken into account that some children's results are not over the full sixteen lessons.

During the research the complexity of this area became apparent. There are many influencing factors on the levels of participation in the classroom; too many to fully analyse in such a small scale investigation. One interesting factor which appeared through the study was the apparent equality of the genders in participation in science lessons at this level contrary to the myriad of research by Hammrich *et al.*, (2003); Ryan, (2000); Sharp, (1997) and Shewey, (1997, in Hammrich, 2001) to suggest that males are predominantly participating in science lessons. This area of study could be extended to include children in the senior half of the primary school and to observe the participation levels of the children as they become more involved in and aware of outside influences on their gender status.

Chapter 8 - Conclusions and implications of the research

The results of the investigation prove that participation levels are complex to analyse and require in-depth and thorough exploration. The volume of research undertaken which has tried to identify and categorise what affects a child's participation in science is vast with many different opinions. Kahle (1986, in Kahle, 1991) deems the masculine image of science as consequential; Hammrich *et al.,* (2003) argued that science is not accessible to females; Hall (1982, in Brown University, 1996) underlines the bias that teachers have towards male children in the science classroom; Sjøberg and Imsen (1991) cite groupings and self-concept and value orientation as important influences; Howe (1997) maintains the school has a major part to play in effecting behavioural differences; Knain (2001) mentions motivation in connection with ability; Green (1995) focuses on the learning activities and their appeal to the individual and also refers to the benefits of group work for the low achievers; Howe (1997) advocates symmetrical grouping; Nuthall (1996) intonates that participation has nothing to do with academic ability and all to do with timing of classroom events.

The researcher took all these factors into account before embarking on the research project but it must be noted that this research was carried out in a setting which is entirely different to all the above research *i.e.,* multi-class, mixed gender and in the junior end of the primary sector. The fact that the revisions of the Irish science curriculum were utilised was again a unique aspect of the research.

The findings of the research challenge the notion that science is perceived as a masculine subject as found by Kahle (1986, in Kahle, 1991). The children have

extremely high active participation rates regardless of gender and in the main are motivated and eager to be part of the lessons. The research confirms the reality that males, generally, are louder and more aggressive than females when competing to perform tasks and that females are more passive during tasks. This is in agreement with the research of Hall (1982, in Brown University, 1996). However the evidence also shows highly motivated females displaying very high levels of aggression during tasks. The gender debate is further notable in non-participation rates. Interestingly it is the low achieving males who score the most non-participation which is in conflict with research indicating that females opt out of science on a more regular basis, Sjøberg and Imsen (1991); Hammrich et al., (2003); Kahle (1991) and Howe (1997).

The research is in opposition to Nuthall's (1996) findings that timing of certain classroom events bear relevance to participation as the results demonstrate active participation throughout the lessons. There is slightly more non-participation at the beginning stages which dissipates during the lesson.

The findings of the research appear to confirm Knain's (2001) conclusion that motivation is connected to ability. The high achievers are also highly motivated whereas the low achievers are less so. We can see much higher levels of non-participation in the lower ability group than in the higher achievers' groups. Also confirmed is the research by Sjøberg and Imsen (1991) who found that self-value is of importance. In one female's case she seems to have learned through experience that she is less capable than her age peers. The high motivation and competitiveness of her peers is too overbearing for her to compete. When the groupings are changed and she is grouped with younger and consequently less able children she takes on her most active role in the group.

On the whole the children were found to perform better when grouped with their age-peers in the group with which they are most familiar. In each group there was one exception noted. One female, a low average achiever, in the 1st/2nd class grouping preferred a group in which she would be the tutor. One female, an average achiever, in the senior infants' class preferred having an older tutor in her group and one male, a well below average achiever, in the junior infants' class also preferred having a tutor in his group.

The implications for the researcher's own classroom in ensuring optimal participation levels from the children are threefold.

1) The participation levels of the children in the research are very high and the children exhibit elevated motivation levels towards the lesson content. They embrace each topic with gusto and expectation. Thus the introduction and implementation of the Revised Primary Science Curriculum guidelines (D.E.S. and N.C.C.A., 1999) appear to have enhanced learning in this respect and the analysis assists in determining this. The insignificant differences in results between the genders seem to confirm the appropriateness, for all children, of the lesson content.

2) It appears futile to try to implement different groupings when the children, in the main, participate predominantly within their own class groupings. The research has underlined that there are always exceptions to the norm and as a teacher it is prudent to accommodate these exceptions if possible. This may mean the establishment of a separate group in which the dynamics allow the children, who find the usual style of participation difficult, to participate more fully and be reaffirmed as having a value within a group. Thus the analysis assists the teacher in organising the class groupings in order to optimise participation levels.

3) The study has shown that there is a considerable difference in participation levels of high achievers and low achievers regardless of gender. High achievers are highly motivated and extremely competitive whereas low achievers display passive tendencies. Important to note is that the above statement is true even in children as young as four years old. The teacher must try to combat the resignation, in low achieving children, which leads to submission to higher achieving children's instructions. The phenomenon, which is usually caused by self-doubt in some children and lack of understanding in others, is perpetuated by the competitiveness of the higher achievers. The low achieving children find themselves in a situation of which they are unsure and consequently hesitant to participate in. This hesitancy forms a pattern which the children are not sufficiently reflective to break; as a result the higher achievers dominate the proceedings. The dominance of the higher achieving children over the lower achieving children could be stopped by the formation of a separate group for the children prone to passive participation and the issuing of specific tasks for each child in order to elevate their low self-value in a group situation.

The wider implications for the study of primary science as a whole, is the positive effect that the Revised Primary Science Curriculum guidelines appear to exert on the children's participation rates at this junior level. It is hoped that these optimistic results set a precedent for science throughout the primary school and into second and third level education. If these positive attitudes towards science are to continue with these children through their education, and are representative of the Revised Primary Science Curriculum throughout the primary sector, there should be an expectation for change in the declining numbers of students pursuing science careers.

The most positive implication of the research is the realisation that the children in the researcher's classroom do not have any preconceived ideas of science as a subject. They approach it with the same enthusiasm as they do for their other subjects. They, without having to be directed, have already identified and understood one of the most important and fundamental facts in regard to science as a subject and that is "science is nothing more than a refinement of everyday thinking" (Albert Einstein, in Harlen, 1996). It is accessible and enjoyable for everyone and essential to every child's education for life.

While this study assessed children's participation levels in the science classroom in relation to gender, groupings and academic abilities it did not take account of the method in which the teacher presented lesson content to the children. If I were to repeat this study an evaluation of the affect that my behaviour as a teacher has on the children's learning of science would be included involving the video-taping of the instructional part of the lesson as well as the children's activity work and so providing further insight into the factors affecting participation in the science classroom. The research conducted raises some interesting questions for further study, particularly if the high motivational levels for science in this group continued throughout their primary education or if outside influences *e.g.,* other people's negative views of science infringe on the children's motivation. It would also be interesting to note if the suitability of class groupings persists or if the dynamics of groupings change as the children age and mature.

Bibliography:

Acadamh Ríoga na hĒireann (2005): *School science infrastructure: Can Ireland deliver?* ,
URL<http://www.ria.ie/committees/pdfs/physicalsciences/science_report.pdf/>, Last accessed: 12th March 2007.

Alberta University (2000): *I liked science but now what do I do? Young women's perspectives following high school*,
URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/16/d0/88.pdf.htm>, Last accessed 5th July 2007.

Ballone, L. and Czerniak, C. (2001): Teachers' beliefs about accommodating students' learning styles in science classes, *Electronic Journal of Science Education, 6, (2), pp.1-24,*
URL<http://www.wolfweb.unr.edu/homepage/crowther/ejse/balloneetal.pdf/>, Last accessed 9th May 2007.

Brimer, A. and Raban, B. (1979): *Infant reading tests (The)*, Educational evaluations, Gloucestershire, England.

British Council (2007): *Press release - Next generation science*,
URL<http://www.britishcouncil.org/netherlands_cf_ngs_london_bc_press_release/>, Last accessed 8th May 2007.

Brown University (1996): *Achieving gender equality in science classrooms*,
URL< http://www.physics.weber.edu/carroll/personal/EQUITYH.HTM/>,
Last accessed 9th September 2008.

Carlton-Parsons, E. and Summer, G. (2004): use of images as reflective discrepant events: Pathways for elementary teachers to reconsider practice in relation to their views of science teaching and learning, *Electronic Journal of Science Education, 9, (1), pp.1-20,*
URL<http://www.wolfweb.unr.edu/homepage/crowther/ejse/parsons.pdf/>,
Last accessed 5th July 2007.

Clarke, J. and Dart, B (1987): *Gender research in classrooms: Scientific or political*,URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/1e/46/4e.pdf.htm>, Last accessed 6th July 2007.

Cohen, L., Manion, L. and Morrison, K. (2000): *Research Methods in Education,* RoutledgeFalmer, London/New York

Collins, A. and Spiegel, S. (1995): *So you want to do Action Research?,* In:Spiegel, S. Perspectives from Teachers' Classrooms. Action research. Science F.E.A.T. (Science for Early Adolescence Teachers), URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/db/03.pdf.>, Last accessed 29th February 2008.

Dalton, B., Rawson, P., Tivnan, T. and Cobb-Morocco, C. (1993): *Equal opportunity learning: Hands – on science for girls and boys,* URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/07/11.pdf.htm>, Last accessed 6th July 2007.

Denscombe, M. (2003): *The good research guide for small-scale social research projects,* Open University Press, Maidenhead/Philadelphia.

D.E.S. (2004): (Please refer to the reference listed as The Department of Education and Science (2004).

D.E.S. and N.C.C.A. (1999): (Please refer to the reference listed as The Department of Education and Science and the National Council for Curriculum and Assessment (1999).

Dixon, P. (1995): *Encouraging participation in a middle school classroom*, In:Spiegel, S. Perspectives from Teachers' Classrooms. Action research. Science F.E.A.T. (Science for Early Adolescence Teachers), URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/db/03.pdf.>, Last accessed 29th February 2008.

DuBois, M. (1995): *Conceptual learning and creative problem solving using cooperative learning groups in middle school science classes*, In:Spiegel, S. Perspectives from Teachers' Classrooms. Action research. Science F.E.A.T. (Science for Early Adolescence Teachers), URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/db/03.pdf.>, Last accessed 29th February 2008.

Educational research centre (1997): *Drumcondra Primary Reading Test*, St. Patrick's College, Dublin.

Eugster, P. (2007): *The perception of scientists- The science creative quarterly,* URLhttp://www.scq.ubc.ca/the_perception_of_scientists/, Last accessed 15th February 2008.

Fassnacht, C. (2002): *Transana 2.1,* URL<http://www.transana.org/>, Last accessed June 2006.

Finson, K., Riggs, I. and Jesunathadas, J. (1999): *The relationship of science teaching self efficacy and outcome expectancy to the draw-a-scientist-teacher-teaching checklist,* URL<http://www.ed.psu.edu/CI/Journals/1999AETS/Finson_Riggs_.rtf>, Last accessed: 6th July 2007.

Folens (2005): *S.E.S.E/S.P.H.E. Earthlink First class*, Folens Publishers, Tallaght, Ireland.

Folens (2005): *S.E.S.E/S.P.H.E. Earthlink Junior Infants*, Folens Publishers, Tallaght, Ireland.

Folens (2005): *S.E.S.E/S.P.H.E. Earthlink Second class*, Folens Publishers, Tallaght, Ireland.

Folens (2005): *S.E.S.E/S.P.H.E. Earthlink Senior Infants*, Folens Publishers, Tallaght, Ireland.

Gais, B. (2005): *Assessing characteristics of teacher and student actions during instructional talks in primary science classrooms by means of video-analysis,* Taylor & Francis Group, London.

Green, P. (1995): *What types of learning Activities are more likely to increase the involvement of non-participating students?*, In:Spiegel, S. Perspectives from Teachers' Classrooms. Action research. Science F.E.A.T. (Science for Early Adolescence Teachers), URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/db/03.pdf.>, Last accessed 29th February 2008.

Gulek, C. (1999): *Using multiple means of inquiry to gain insight into classrooms: A multi-trait multi-method approach,* URL<http://www.eric.ed.gov/ERICDocs/data/ericdocs2/content_storage_01/0000000b/80/11/86/1a.pdf.htm>, Last accessed 4th May 2007.

Hammrich, P., Fadigan, K., Sloan, T., Richardson, G. and Livingston, B. (2003): Sisters in Sport Science: A Sport-Orientated Science and Mathematics Program, *Electronic Journal of Science Education*, 7,(3), pp.1-17.

Hammrich, P., Price, L. and Slesaransky-Poe, G. (2001): Daughters with Disabilities: Breaking Down Barriers, *Electronic Journal of Science Education,* 5,(4), pp.1-11.

Harlen, W. (1996): *The Teaching of Science in primary schools*, David Fulton publishers, London.

Harris, D. (2004): Putting a high-quality teacher in every Florida classroom, URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/1b/9f/5a.pdf.htm>, Last accessed 6th July 2007.

Hollis, J. (1995): *Effect of technology on enthusiasm for learning science*, In:Spiegel, S. Perspectives from Teachers' Classrooms. Action research. Science F.E.A.T. (Science for Early Adolescence Teachers), URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/db/03.pdf.>, Last accessed 29th February 2008.

Hopkins, D. (2002): *A Teacher's Guide to classroom research*, Open University Press, Philadelphia.

Howe, C. (1997): *Gender and Classroom Interaction- A research review*, The Scottish Council for Research in Education, Edinburgh.

Irish Council for Science Technology and Innovation (1998): *Science in Primary schools,* The ICSTI Secretariat, Dublin.

Kahle, J.B. (1991): *Gender and Science Education II.* In: Fensham, P., (Ed.) Development and dilemmas in science education, Falmer Press, London.

Knain, E. (2001): *Gender aspects of self-regulated for low/high performing students in science and mathematics: some results from the Norwegian PISA study.* In:Psillos, D.: Kariotoglou, P.; Tselfes, Bisdikian, G.; Fassoulopoulos, G.: Hatzikraniotis, E. and Kallery, (eds.) Proceedings of the third international conference on science education research in the knowledge based society, Vol. II, pp.474-476, Greece.

Kondrick, L. (2003): *What does the literature say about the persistence of women with career goals in physical science, technology, engineering and mathematics?*, URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/1b/93/91.pdf.htm>, Last accessed 5th July 2007.

Kovac, Dr. K. (2005): Declining Interest in science a concern, URL<http://www.csiro.au/news/ps2uk.html>, Last accessed 10th May 2007.

Lamb, S. and Ball, K. (1999): *Curriculum and careers: The education and labour market consequences of year 12 subject choice. Longitudinal surveys of Australian youth. Research report,* URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/1a/81/74.pdf.htm> Last accessed 5th July 2007.

Lynch, S. (2000): *Equity and Science Education Reform,* URL<http://www.questia.com/PM.qst?a=o&d=96956194.htm>, Last accessed 4th May 2007.

Miller, B. (1991): *A review of the qualitative research on multi-grade instruction*, URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/23/dd//74.pdf.htm> Last accessed 6th July 2007.

Murray, R. (2006): *How to write a thesis*, Open University Press, Maidenhead.

Nuthall, G. (1996): *What role does ability play in classroom learning?*, URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2/content_storage_01/0000000b/80/23/65/a3.pdf.htm>, Last accessed 4th May 2007.

Osborne, J. (2005): *The role of argument in science education*. In:Boersma, K., Goedhart, M., De Jong, O. and Eijkelhof, H. (eds.), Research and the Quality of science education, Springer, The Netherlands.

Pedersen, J. and Thomas, J. (1999): *Draw-a-scientist-teacher-checklist: Children's perceptions of teaching science*, URLhttp://www.courses.ttu.edu/thomas/conference%20paper/narst99/narst99.htm, Last accessed 6th July 2007.

Prim – Ed. Publishing (2004): *1st/2nd class Primary science*, Prim – Ed. Publishing, Ireland.

Prim – Ed. Publishing (2004): *Junior/Senior Infants Primary science*, Prim – Ed. Publishing, Ireland.

Regan, E. and Childs, P. (2003): *An investigation of Irish students' attitudes to chemistry: The promotion of chemistry in schools project ,* URLhttp://www.uoi.gr/cerp/2003_February/pdf/07Childs.pdf, Last accessed 15th February 2008.

Reyer, T. (2005): *Qualitative video-analysis applied to classroom studies-A first steps workshop.* In:Fischer (ed), Developing standards in research on Science Education, pp.39-45, Taylor and Francis Group, London.

Rice, D. and Corboy, M. (1995): *Elementary science instruction: Are teachers prepared to teach what their students must master?,* URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2/content_storage_01/0000019b/80/14/2e/26.pdf.htm>, Last accessed 6th July 2007.

Rubba, P., Barman, C., Ostlund, K., Gatto, C. and Halferty, M. (1997): *Proceedings of the Annual International Conference of the association for the education of teachers in science,* URLhttp://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/16/59/e6.pdf., Last accessed 15th February 2008.

Ryan, L. (2000): *Building and encouraging confidence and creativity in science,* URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2/content_storage_01/0000019b/80/19/3c/cd.pdf.htm>, Last accessed 5th July 2007.

Sanchez, K., Kellow, T. & Ye, R. (2000): *A comparison of Stanford Achievement Test (SAT-9) Performance across grade, gender, ethnicity and educational program placement,* URLhttp://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/16/59/e7/8c.pdf., Last accessed 15th February 2008.

Science and engineering indicators (2002): *Science and technology: Public attitudes and public understanding*, URL<http://www.nsf.gov/statistics/seind02/c7/c7s3.htm>, Last accessed 6th July 2007.

Sharp, G. (1997): *A longitudinal study exploring pupils' views on school science learning experiences from a gender perspective*. In:Science Education Research in the Knowledge based society, pp.627-630, Open University Press, U.K.

Shimizu, K. (1997): *Teachers' emphasis on inquiry science and prevailing instructional method*, URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2/content_storage_01/0000019b/80/16/59/bc.pdf.htm>, Last accessed 6th July 2007.

Sjøberg, S. and Imsen, G. (1991): *Gender and Science Education I*. In: Fensham, P., (Ed.) Development and dilemmas in science education, Falmer Press, London.

Spelman, B. and McHugh, B. (1994): *Belfield Infant Assessment Profile (B.I.A.P.) - Pupil profile booklet,* Folens Publishers, Tallaght, Ireland.

Spelman, B. and McHugh, B. (1994): *Belfield Infant Assessment Profile (B.I.A.P.) – Teacher's manual and resource manual,* Folens Publishers, Tallaght, Ireland.

Swetnam, D. (2004): *Writing your dissertation*, How to books, Oxford.

Theberge, C. (1993): *The boys all scramble through: Some gender issues in sense-making conversations*, URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2/content_storage_01/0000019b/80/13/43/42.pdf.htm>, Last accessed 6th July 2007.

The Department of Education and Science and the National Council for Curriculum and Assessment (1999): *Primary School Curriculum-English Language*, The Stationery Office, Dublin.

The Department of Education and Science and the National Council for Curriculum and Assessment (1999): *Primary School Curriculum-Mathematics*, The Stationery Office, Dublin.

The Department of Education and Science and the National Council for Curriculum and Assessment (1999): *Primary School Curriculum-Science-Social, Environmental and Scientific Education*, The Stationery Office, Dublin.

The Department of Education and Science and the National Council for Curriculum and Assessment (1999): *Primary School Curriculum-English Language Teacher guidelines,* The Stationery Office, Dublin.

The Department of Education and Science and the National Council for Curriculum and Assessment (1999): *Primary School Curriculum-Mathematics Teacher guidelines,* The Stationery Office, Dublin.

The Department of Education and Science and the National Council for Curriculum and Assessment (1999): *Primary School Curriculum-Science-Social, Environmental and Scientific Education Teacher guidelines,* The Stationery Office, Dublin.

The Department of Education and Science (2004): *Education Trends: Key indicators on Education in Ireland and Europe,* URL<http://www.education.ie/admin/servlet/blobservlet/des_educ_trends_chapter10.htm>, Last accessed: 27th March 2007.

Thompson, S. (1995): *Equality in the classroom: An attempt to eliminate bias in my classroom,* In:Spiegel, S. Perspectives from Teachers' Classrooms. Action research. Science F.E.A.T. (Science for Early Adolescence Teachers), URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/db/03.pdf.>, Last accessed 29th February 2008.

Wall, E. and Burke, K. (2007): *Sigma –T Standardised Irish graded mathematics attainment tests*, C.J. Fallon, Dublin 22.

Williams, A. (1995): *Long-distance collaboration: A case study of science teaching and learning,* In:Spiegel, S. Perspectives from Teachers' Classrooms. Action research. Science F.E.A.T. (Science for Early Adolescence Teachers), URL<http://www.eric.ed.gov/ERICDOCS/data/ericdocs2sql/content_storage_01/0000019b/80/14/db/03.pdf.>, Last accessed 29th February 2008.

Women in Technology and science (2007): *SFI tackles Science "Gender imbalance"*, URL<http://www.witsireland.com/>, Last accessed 27th March 2007.

Appendices

Table of contents:

For full Appendices please see the enclosed C.D.

Appendix A- Field notes

N.B. A complete set of field notes is found in Appendix A on the included C.D.

Lesson 1 - Floating and sinking

The start of the lesson had question time with questions such as what makes things float? How do things stay afloat? The following were the children who did not attempt any answers:
Lara and Tim.
Eve.
Harry.

Evidence from video clips:

Teacher gave instructions to $1^{st}/2^{nd}$ class to predict whether their object would float or sink. Five children were present- Pseudonyms- Tara-8, Donal-8, John-7, Harry-7 and Jen-6. Concentrating on issues of participation this is how they reacted:
From the beginning Harry looks directly at Jen for guidance. John stands up to look at Jen's sheet then at Harry's sheet. Donal, Tara and Jen work independently. A few minutes into task and John still has not started. He asks everyone "Do you have to write?" Jen "Yes or draw" Throughout the task John and Harry are constantly looking at Jen. John states" I'm waiting for Mrs. Walker!" and throws his hands up in the air to show defeat. He then puts his head in his hands. Jen goes around to the boys' side of the table and explains what to do. John and Harry begin but are hampered by the spelling. John asks Donal to help but both girls go around and take over the spelling. Donal continues by himself very much on task.

The girls and John are eager to proceed to the next task and inquire when they can test. Donal and Harry although ready are quietly waiting. The children proceed to testing their predictions. Each one is interested and participating. They all observe the others' tests. As time proceeds the 2nd class pupils have taken on the roles of recording and 1st class are doing most of the testing. Jen gets more goes than anyone.

As the video was recording the above the teacher was circulating the Junior and Senior Infants groups and observing. Junior Infants- Six children were present at this group, three girls and three boys. Chris-4, Mags-4, Lara-4, Beth-5, Tony-5 and Tim-4. The following are some relevant observations:
In the beginning everyone was participating and engaged especially if the teacher was asking questions etc. Each child tested the predictions and all

were involved. In the middle of the lesson the teacher asked "Why do you think that the plasticine sank?" At this time only Chris, Mags and Tony were participating. Lara and Beth were playing with the plasticine while Tim was having a day dream. As the lesson was drawing to an end, with the task of trying to make plasticine float, Tim was completely off task. He was ripping up the paper covering the tables and lolling about on his chair totally uninterested. However all the other five children kept on trying new shapes as requested. They did approach the teacher a few times saying that it didn't float but they were willing to keep on trying.

Senior Infants- Five children were present, three girls and two boys. Kevin-6, Tom-6, Ellen-6, Eve-5 and May-5. From the onset Kevin tried to dominate the proceedings with Eve and Ellen becoming quieter and joining in less. In initial questioning the teacher only received answers from Kevin, Tom and May. This became the pattern with the two girls looking to the others for ideas and answers. In fact at one point Eve leaves her group and goes over to look at what is happening at Junior Infants. May and Kevin were easily the inspiration for the others with Kevin trying to tell everyone the *proper* way to do the tasks. May continued the tasks her own way and at one point had to prevent Kevin trying to dominate her in the test. She kept doing her own thing.

Teacher "Why do you think that the plasticine sank?" When this was asked to 1st and 2nd class each child had something to say except for Harry who had his hand up but when asked said he didn't know. When trying to make a boat they all begin enthusiastically. Donal makes a comment about having wood around a boat and Jen attaches a few pencils to make it float. The others follow suit immediately. When the teacher instructs them that there is a way to do it just using plasticine they all try their own thing again. Tara becomes frustrated after a few unsuccessful attempts and asks the teacher "Do you know how to do it?" in a nice way. To which the teacher replied "It's something to do with the shape of the plasticine" Tara immediately returns and tells Jen to stop making a boat. Jen continues with her own ideas and Tara becomes irritated then tries again.

Predictions-Junior Infants

Float	Sink
	spoon
	coin
	crayon
	stone
	pencil
plasticine	
rubber	
matchstick	

Predictions-Senior Infants

Float	Sink
	stone
	plasticine
	rubber
coin	
spoon	
crayon	
pencil	
matchstick	

Predictions-1ˢᵗ & 2ⁿᵈ class

Float	Sink
	coin
	spoon
	crayon
	stone
	plasticine
rubber	
pencil	
matchstick	

Lesson 9 — Look outside

Question time was kept to the end of the lesson today. I simply asked everyone to tell something that they saw or even heard. They are all very responsive. Most notably Tim who interrupts the others with his enthusiasm for telling things. Ellen and May are also animated and recite long lists of things.

Evidence from video clips and teacher observation:
In the $1^{st}/2^{nd}$ group six children were present (Pseudonyms: Donal — 8, Pat — 7, John — 7, Tara — 8, Ann — 7 and Jen — 6. Their task is to work individually and place a hoop anywhere in the grounds and count the number of flowers inside it. There is an accompanying worksheet. We go outside and the teacher tells them to get working. Immediately John throws down his hoop on a nearby flowerbed and says," Miss! Look what I found!" Donal and Pat wander around the wider playground independently, having a good look around. Ann finds a spot away from everyone looks at the flowers in the bed but does not put her hoop anywhere. Tara quickly finds a spot. Jen wanders over to her but does not stay. John asks, "Miss! Do we do this again when we are finished?" Still working. Jen and Donal are still wandering around. Pat finds a place and shouts to Donal. He ignores him and moves beside Tara. Ann then appears in between Tara and Donal (They are very close together.) Tara says to her, "Go down a bit!" Jen and Pat end up beside each other. Tara then calls to me, "Can't you not move again!" complaining about Ann. John keeps questioning about counting. He wants to know if he should count each individual head on the bluebells. Ann is not counting. She has placed her hoop on the ground. Tara tells her what to do. Ann just watches Tara. In the end the teacher goes over to Tara as she has spent too long counting the multitude of daisies. The teacher tells her to count them roughly. Ann has written in some numbers but there has been no evidence of counting.

Analysis of worksheets:
✓   = attempted participation
✓   = correctly answered
X   = no participation

$1^{st}/2^{nd}$	Section 1	Section 2
Donal	✓	✓
Tara	x	✓
Pat	✓	✓
John	✓	✓
Ann	x	✓
Jen	✓	✓

Junior infants: Seven children were present at this group, three girls and four boys. Mags — 4, Lara — 4, Beth — 5, Chris — 4, Bob — 4, Tony — 5 and Tim — 4.

Senior Infants: Five children were present, three girls and two boys. Tom — 6, Jack — 6, Ellen — 6, Eve — 5 and Sue — 5. They are grouped roughly by their ages in the following manner:

Group 1 —	Lara, 4	Group 2 —	Eve, 5
	Chris, 4		Sue, 5
	Tim, 4		Beth, 5
	Bob, 4		Tony, 5

Group 3 —	Jack, 6
	Ellen, 6
	Tom, 6

Their task was to find whichever hoop roughly told them, they were numbered, and draw onto their sheets everything they could see inside the hoop. They had to be careful to draw into the corresponding hoop on their sheets, also numbered.

Group 1 was the youngest group. The teacher tells them which number to find. Bob runs headlong but then stops. He and Lara follow Chris who has taken off running noisily. Tim follows them but way behind. The group chooses a hoop but then Chris runs to another. Bob and Tim run after him while Lara remains staring at the hoop. Chris realises his mistake and brings them all back to Lara. Lara begins her sheet first. Chris and Tim follow suit. Bob watches Lara for a while. He messes about for a while. So does Chris who throws his worksheet in the air. When it is time to move to the next hoop Bob is lost. He has not drawn anything. His team have moved on but he remained trying to draw something. Chris calls for him to come over. He does. Tim and Chris are now off task. Chris is throwing his sheet up again. Lara watches. Bob sticks his pencil repeatedly in the dirt as does Chris. Then Bob lies in the sun.

Group 2 was the five year olds. When asked to find their hoop the three girls immediately take the lead with Tony following behind. Eve comments, "There's a lot of stuff in it!" She is first to sit down and the rest follow suit. May asks Eve a question and Eve gestures towards the hoop with her hand. Beth and Tony begin also. It is not long before Eve and May realise that they have written in the wrong hoop. They come over to the teacher and rectify their mistake; May goes in for her rubber. Meanwhile Tony and Beth are still
concentrating. At the next hoop May sits down first while Tony and Eve take quite a while to settle.

Group 3 was the six year olds. Ellen finds the hoop first. Jack has taken off, at great speed, towards the other hoops but both Ellen and Tom call him back. Tom begins right away. Jack and Ellen sit down and begin. Tom is now standing but still he is on task. Ellen is concentrating and Jack is copying from her drawing. By the second hoop Jack is beginning to lose concentration. He jumps up and down beside the hoop. At the third circle Jack and Tom are messing at the beginning but return to task after a while. Ellen watches them. Tom becomes increasingly noisy. He begins to pull out the grass. He lifts the hoop and sets it down again. The teacher has to tell him to get back on task. He does so for a while.

Analysis of worksheets:

✓ = attempted participation
✓ = correctly answered
X = no participation

Group 1	Area 1	Area 2	Area 3	Comment
Lara	✓	✓	✓	Very accurate
Chris	✓	✓	✓	Area 1 has little detail.
Bob	✓	✓	✓	Area 2 has little detail. Other sections little detail.
Tim	✓	✓	✓	Little accuracy in areas 2& 3
Group 2				
May	✓	✓	✓	Great accuracy in area 1. Little drawn in area 3.
Eve	✓	✓	✓	Excellent effort in area 1. Good in 2. Less detail in 3.
Tony	✓	✓	✓	Excellent effort.
Beth	✓	✓	✓	Not much detail in area 1.
Group 3				
Jack	✓	✓	✓	Only one flower in area 1.
Tom	✓	✓	✓	Less detail in area 3.
Ellen	✓	✓	✓	Very neat. Less detail in area 3.

Appendix B - Lesson plans

N.B. A complete set of lesson plans is found in Appendix B on the included C.D.

Lesson 1 - Floating and sinking

Groupings:
Infants = Junior infants and senior infants
$1^{st}/2^{nd}$ class = Grouped as a class

Objectives:
1. The child should be enabled to investigate how forces act on objects *i.e.*, floating or sinking.
2. The child should be encouraged to classify objects under the headings of floating and sinking.
3. The child should be enabled to take part in an active investigation.

Resources:
Three spoons, Lego, coins, rubbers and various classroom objects
Three basins filled with water   Newspaper (to cover tables)
Plasticine   Prediction recording posters (x 2)
$1^{st}/2^{nd}$ class record sheet

Introduction:
Talk about why things sink or float. Take suggestions. Take some predictions on whether or not an object will float or sink.

Development of lesson:
Each table has a selection of objects on it. The children have to pick an object. The children draw or write their predictions on either the sink or float posters. The children have to test their predictions in rotation to see if they are correct or incorrect. The infants have to report to the teacher later in the lesson. $1^{st}/2^{nd}$ class record their findings on a piece of paper. $1^{st}/2^{nd}$ continue with task while the infants feedback their findings. Next they have to take the objects they tested and place on the correct poster *i.e.* sink or float. $1^{st}/2^{nd}$ feedback their results to the class.

Conclusion:
(Question Time) Where any predictions correct or incorrect? Talk about what made the objects float or sink. Talk about the plasticine. Did it float or sink? Give everyone a piece. Can we make it float? After some attempts give clues such as check the shape *etc.* How did we make the plasticine float?

Lesson 9 - Look outside

Groupings:
Infants = four year olds, five year olds and six year olds
$1^{st}/2^{nd}$ class = individual tasks

Objectives:
1. The child should be enabled to observe, discuss and identify a variety of plants in the immediate environment.
2. The child should be encouraged to use the correct names of parts of plants when describing the plant *e.g.*, stem, leaf, petal *etc*.

Resources:
Nine large hoops   Pencils
A4 sheets numbered 1-3   Infant worksheets
Objects such as a stick, rubbish or stone to place in infants' hoops
$1^{st}/2^{nd}$ class worksheets

Introduction:
Brief discussion on things we might find growing outside. Take examples. What does growing mean? Have a brief discussion. Explain that we are going outside and everyone has got something to find out. Divide into groupings.

Development of lesson:
Discuss the nature of the tasks *i.e.*, Infants will have to locate a numbered hoop (1-3) somewhere in the school grounds and must fill on their sheet in the correct hoop anything which they can see inside the hoop. The children can draw these. They will switch hoops at a given time until they have visited the three hoops. The teacher will direct the groups to find hoops at the correct interval by blowing the whistle each time a group is to search *i.e.* find the initial hoops in rotation to avoid confusion. $1^{st}/2^{nd}$ class each take their own hoop and place it somewhere in the grounds. They then have to follow a worksheet asking them to count how many of four different flowers that they can find in their hoop. Stress it is their choice where they think the hoop should be placed.

Conclusion:
(Question Time) Discuss the findings with the children. Get them to name the parts of the flowers. Did anyone find something that was not growing? Did $1^{st}/2^{nd}$ class have any problems? List what the children found on the blackboard.

<u>Appendix C-Lesson transcripts</u>

N.B. A complete set of lesson transcripts is found in Appendix C on the included C.D.

Lesson 1 – Floating and sinking (Transcript 1.1)

¤<754>PP: Harry looks at Jen immediately when the teacher leaves and the children have been given instructions for the task. AP: Donal, Tara and Jen work independently. ¤<16587>

¤<16669>AP: John looks perplexed and stands up to look at Jen's sheet. Next he looks at Harry's sheet. John asks Jen, "Do we have to draw?" Jen, "Yes or write!" Donal, "Yes!"¤<24127>

¤<27142><24163>PP: John remains unconvinced and declares, "I'm waiting for Mrs. Walker!" AG: He throws his hands up and puts his head in his hands but he grabs the sheet away from Harry.¤<60318>

¤<61824>Jen instructs the boys on what to do.¤<72381>

¤<73134>AG: John thumps his hand on the table when telling Harry which part of the activity he will do.¤<80675>

¤<85952>AP: John asks Donal for spellings. Tara and Jen take over.

AP: Donal works on his own.

Tara and Jen help John and Harry with spellings.

PP: Harry watches quietly while John completes the task. ¤<150793>

¤<152302>Tara, Jen and John want to proceed with task. John, "Will we put things in?"

AP: All participate in testing of objects (floating or sinking). Test in rotation.

AP: Tara and Donal complete recording sheets. ¤<229207>

¤<231469>AG: Jen takes extra turns testing. ¤<244286>

¤<272183>AG: John, "It's my go everybody!" He covers the basin in an attempt to prevent others from accessing it. He takes a drink of water. <349087>"It's my go", grabs object from Harry. Harry complains that John keeps dropping the object but does not attempt to take it from him. Tara to teacher," John keeps dropping it!"

NP: All participating except Donal who is recording but watching. ¤<319683>
¤<321191>Jen initiates flicking water. John and Harry copy. Return to task. ¤<342301>

¤<344563>AG: John, "It's my go" He wrestles object out of Harry's hand. ¤<367936>

¤<399604>AG: Jen flicks water again. John and Harry tell her that she is wetting the table and to stop. Harry wipes the table and John demonstrates to others what Jen was doing. He is annoyed with her. As soon as the teacher appears John shouts, "Look Miss a wet table!"¤<453135>

Lesson 1 – Floating and sinking (Transcript 1.1 cont.)

¤<456150>John makes a face at the camera. ¤<459167>

¤<461429>AP: Teacher, "What happened the plasticine?" All hands up and answering.

NP: Donal continues with his own task while teacher talking.

AP: Mags and Chris engaged.
NP: Tony, Tim, Beth and Lara not interested.

AP: Only Kevin and May give suggestions. NP: Tom, Eve and Ellen unresponsive.

AP: John, Tara, Donal and Jen respond. NP: Harry puts hand up but does not have an answer. ¤<625794>

¤<630318>Teacher, "There is a way to make plasticine float."

Chris, "Huh! Oh yeah!"¤<661985>

¤<686112>AG: Kevin tries to tell the others how to do it.

AG: John, "Make a boat. Make a boat!"

AP: Tara is jumping up and down with her hand up. Jen too but she voices her conclusion. ¤<708731>

Lesson 1 – Floating and sinking (Transcript 1.2)

AP: all infants engaged.
L: Chris shouts what he wants to do in the task. Continues to shout, "It's floating! It's floating!" Highly excited.

¤<0>DT: Tara hops up and down to attract the teacher's attention. When ignored she leaves desk and approaches teacher, "Miss, why it floated with Jen is that the wood is light and it made it float!"¤<30799>

¤<31874>NP: Harry just watching the teacher.¤<34022>

AP: All infants hands-on.

¤<38678>AG: John "Make a boat everyone!" Harry, "I'm not"¤<45125>

¤<45841>DT: Tara, "Miss Do you need to use water to do it? Teacher responds," Well you need to check it out in the water then when you have tried ..." Tara interrupts. But do you need water to put among it? No response. Miss Do you know how to?" Children smile and continue with task. ¤<62315>

L: Mags climbs on table to get closer and tells the others, "I know!"
L: Chris constantly shouting his opinions on task to peers.

AG: Kevin begins to mess with the water.

I: Donal remains on task and independent.

AG: Kevin tries to take things from May. He shoves her and she tries to resist by shoving back.
¤<105292>AP: All on task. ¤<122804>

Lesson 1 – Floating and sinking (Transcript 1.2 cont.)

```
L: Mags, "Miss"

AP: Tony wants to use a boat picture for his boat.

NP: Tim is off task playing with newspaper.

¤<162233>AP, TT, DT & AG: Jen, "Everyone! We have to make a boat.
Tara: Miss Do you have to make a boat? Jen: Yes! Tara," can I have a
roller? I'll be quiet with it!" Teacher no! ¤<187661>

¤<210941>Tara is getting frustrated as task is not being successful
for her. She leaves table to search for boat materials and questions
me about where things are. Returns to task¤<220611>

¤<220969>TT: Tara, "Jen it's not a boat it's a type of shape of a
boat"(Annoyed) Jen argues back and continues with her boat.¤<235836>

¤ AG & <249262>DT: John "Miss I nearly got it that
time .Look!"(Shouting and demonstrating to rest of group)¤<261918>

DT: Tara complains to teacher that she still can't do it.

NP: Eve not trying. Sitting quietly.

¤<323038>AP & AG: All children except Harry are standing to complete
task. He is silent while the others debate about their boats.
¤<331633>
```

Lesson 9 - Look outside (Transcript 9.1)

¤<1805>AP: Ellen finds the 1st hoop. Jack runs on to the other. Tom and Ellen call him back. They begin right away. ¤<7221>

¤<14981>AP: Chris looks for the number.
NP: Bob runs headlong.
L: Tim starts shouting.
PP: Lara follows Chris as does Bob.
AP & PP: Chris runs to the next hoop. Tim and Bob follow.
AP: Lara remains as it is the correct hoop. The boys realise their mistake and go over to Lara.
AP: Lara, Chris and Tim begin. ¤<39714>

¤<44703>AP: All run over together.
DT: Eve, "There's a lot of stuff in it!"
AP: Eve sits down and the rest follow.
PP & DP: Chris, Lara and Tim all work away. Bob looks at Lara's sheet.
TR: Eve gestures with her hand to the hoop. (May asked her something)¤<74615>

¤<88349>AP: All 1st/2nd run off.
DT: John, "Miss look what I found!"
AP: Pat and Donal wander around independently having a good look at different areas.
AP: Ann finds a spot away from everyone and sits down. She looks at it but doesn't use her hoop. Tara finds a spot. Jen wanders over to her but doesn't stay.
DP: Pat shouts at Donal.
DT: John asks if he can do it another time when he is finished. ¤<115533>

¤<122084>PP: Donal and Jen are still wandering.
L & DP: Pat shouts to Donal.
PP: Donal goes over beside Tara.
Ag: Tara tells him to go down a bit which he does.
PP: Ann appears and goes over too. She eventually puts her hoop down in between the both of them. ¤<148628>

¤<166388>PP: Pat and Jen have put their hoops down together and are working away.
DT: Eve and May come to say they have done a "Wee accident". They have copied and both drawn in the wrong hoop.
AP: Beth and Tony are concentrating. ¤<173734>

¤<178113>DT: Chris, "Did you put a stick in?"
DT: Tara, "Miss can't you not move again?" She is annoyed that Ann has come beside her. ¤<193155>
¤<209403>NP: Chris messes.
DT: Jen, "Miss is that okay?"
AP: Jack, Ellen and Tom all focused.
AP: Jen wants another task. ¤<239488>

¤<246708>NP: Donal messes with his hoop.
DT: John questions the teacher about the task.
PP: Ellen complains that Jack is copying. ¤<261152>
¤<271983>PP: Ann looking around instead of counting.
NP: Pat messes with the hoop despite being told not to.
NP: Chris messes with his sheet.

Lesson 9 - Look outside (Transcript 9.1 cont.)

```
Pat waves to the camera.
NP: Bob is lost. His team has moved but he wasn't listening. Tim calls
him over.
L: Chris calls to Bob to come over. T has to tell him to move.
¤<335767>

¤<336368>AP: John and Pat discuss their findings.
AP & PP: Lara and Tim draw. Bob sits watching.
NP: Chris stands and is off task. He throws his paper. ¤<367056>

¤<375481>NP: Jack jumps up and down. ¤<383905>

¤<388373>AP & PP: Each time the teacher looks at Tara and Ann, Tara is
counting and Ann is sitting silently.
DT: Tara is having problems counting. She asks for advice.

¤<442875>AP: Lara is worried because she didn't get to do all her
flowers. ¤<446484>

¤<475046>NP: Chris is not trying any of the task now. ¤<492818>

¤<513952>L: Tom screeches (still filling sheet)
DP: Ellen looks at Tom's sheet.
NP: Tom lifts the hoop. ¤<533135>
I: Children mainly independent in this lesson.
¤<559537>AP: Tara complains that she keeps going off count in the
daisies. In the end the teacher helps her.
PP: Ann stands watching. ¤<563823>
```

Appendix D-Worksheets

N.B. A complete set worksheets is found in Appendix D on the included C.D.

Worksheets Lesson 1 – Floating and sinking:

1st/2nd class

Things which float

Things which sink

plas

pencil

match

Spoon

Crayon

Coin

rubber

coin

(1st/2nd class answers)

plas

Infants

float

S.I. Predictions

Worksheets Lesson 9 Look outside

Infants1st/2nd class

Plants and animals – Activity 1

Look outside!

Area 1

Area 2

Area 3

www.prim-ed.com – PRIMARY SCIENCE – Prim-Ed Publishing   15

Summertime

SUMMER

age 8

Use these clues to name the flowers.

- A buttercup has 5 petals.
- A clover leaf has 3 parts.
- A dandelion leaf has teeth.
- A daisy leaf is like a spoon.

Buttercup

dandelion

daisie

clover

Look at these flowers outside.
How many of each can you find?

Fill in the table.

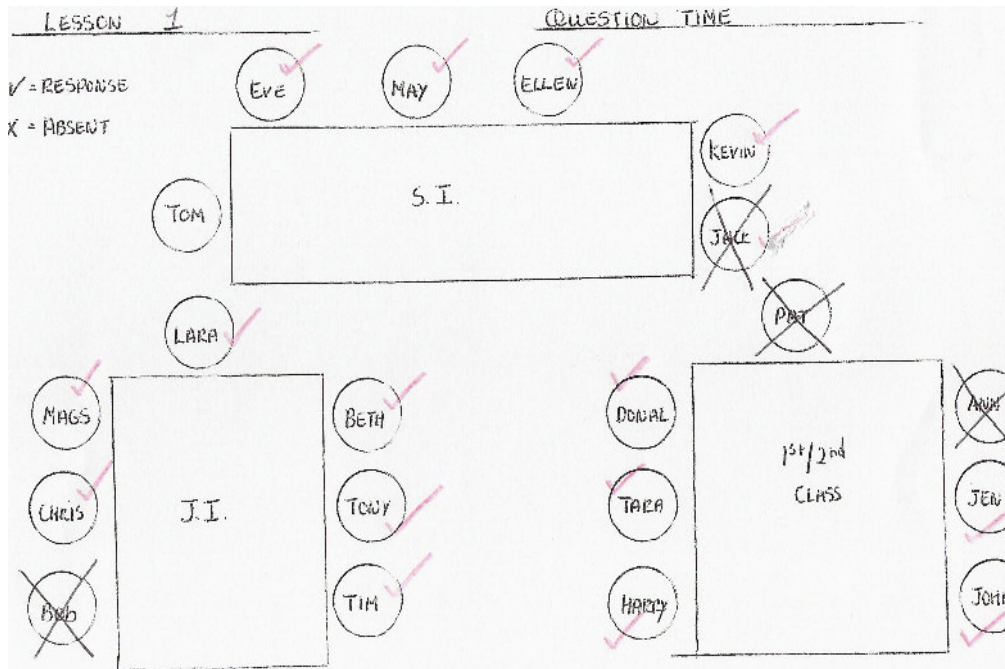| I found	buttercups	clovers	dandelions	daisies
			2	100

Appendix E-Classroom plans

N.B. A complete set of classroom plans is found in Appendix E on the included C.D.

Classroom plan- Lesson 1 Floating and sinking

Classroom plan - Lesson 9 Look outside