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CROSS-CURRICULAR LINKS: PSYCHOLOGY AND APPLICATION

A Dissertation submitted to the Faculty of Education

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by

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Dissertation Abstract

This dissertation examines the pluralistic nature of Intelligence, and the position of Art within that theory. I examined how current knowledge was applied in second-level schools. I propose the utilization of cross-curricular links as one way of making the school curriculum more relevant to students' lives. I looked at the value of cross-curricular links as seen both, within the official syllabus and by practising teachers. Chapter Three proposes some Art Historical References which could provide starting points for schemes with links to mathematics. Chapter Four describes the application of one of these schemes, showing student artwork produced. It also discusses students' views on subject linkage. The dissertation concludes with a summary of the conclusions discussed in each chapter and recommended action.

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INTRODUCTION

> Allow me to transport all of us to the Paris of 1900- La Belle Epoque- when the city fathers of Paris approached a psychologist named Alfred Binet with an unusual request: Could he devise some kind of a measure that would predict which youngsters would succeed and which would fail in the primary grades of Paris schools? [1]

Binet did devise a test, which has been the basis of many IQ tests since 1900. Little changed, I believe these tests should be made redundant as they only predict academic success. More and more they are used to predict suitability for a career or job vacancy. Psychologists and even schools, are coming to realise that personal success does not depend wholly on academic prowess. They realise that many factors other then the traditionally valued ones, such as a logical mind and ability to cope with languages, are no use on their own but require back-up from a wide variety of areas if a person is to succeed in the workplace. It is my belief that the traditional, general, 'intelligent' person is a thing of the past. I believe that intelligence is more complex then the single dimension it is currently portrayed as. In my opinion, all aspects of intelligence should be valued for what they are; essential and valuable in their own right. From my research in Chapter One, I discovered that intelligence was in fact, made from component parts. Students' abilities in each one of these areas differ. I felt that the best way to help students with a low ability in a particular area was to link it to an area in which the student was successful. In this way, I came to link the study of intelligence with that of cross-curricular links. Chapter Four describes the methodology I used in my research. Chapter Five describes my conclusions and recommendations.

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[1] Howard Gardner, Multiple Intelligences : The Theory in Pactice, (New York : Basic Books,1993) p. 5

CHAPTER 1

INTELLIGENCE: A REVIEW OF THE LITERATURE

Intelligence: A Definition

Intelligence.....(of a person or an animal) quickness of understanding, Wisdom[1]

Is this definition correct? Does the word intelligence only mean speed of comprehension and knowledge acquired by a person or animal? On a closer look, intelligence or more correctly the nature of intelligence, seems to be infinitely more complex. Within speech and in books, people use the word intelligence without defining exactly what they mean. Often they skip immediately into talking about the I. Q or intelligence quotient-a phase that exists along one dimension, instantly measurable and internationally understood, or is it?.

Is it possible that intelligence can be measured as easily as measuring someone's height? Psychologists have tried to measure intelligence by measuring the size of the brain, the size of the skull, the strength of a man's grip, and the accuracy of children's drawings. This has led to some interesting results. Sir Francis Galton was one of the first to attempt to measure intelligence. He tested over 9,000 people in 1884, measuring head size, reaction time, visual understanding, auditory thresholds, and memory for visual forms in each person.

[1] Concise Oxford Dictionary, 8th (1990-1992), s.v. "Intelligence"

To his disappointment, he discovered that eminent British scientists could not be distinguished from ordinary citizens on the basis of their head size, and that measurement such as speed of reaction, were not particularly related to other measures of intelligence.[2]

Contemporary psychology claims to be a more exact science, able to place everyone, after a series of tests, at some point on a scale ranging from low intelligence to high intelligence. This claim is an extraordinary one as current tests tend to examine just one facet or a few aspects of intelligence. According to Biehler and Snowman, "....Intelligence is multifaceted and can be expressed in many ways."[3] A true assessment of intelligence would take into account a person's intelligent behaviour in all aspects of their life. For example at work, at home or during leisure time, etc., Biehler and Snowman felt that, "future intelligence tests may be broader in scope than those in use today." [4]

Various psychologists have offered a variety of definitions and views of intelligence. David Fontana defines intelligence as "the ability to see relationships and use this ability to solve problems."[5] This seems to be as concise as the dictionary definition, but the statement raises a number questions. Does one person's intelligence change with different activities? Fontana's narrow definition does not allow an answer to this question.

The earliest IQ tests were designed to test whether a student would benefit most from normal classroom education or special education; for this reason they were closely linked to academic success. When Lewis Terman of Stanford University revised Alfred Binets 1911 test, he

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[2] Rita L. Atkinson, Richard C. Atkinson et al. Introduction To Psychology (Fort Worth : Harcourt Brace Jovanovich, 1990) p. 458.

[3] Robert F. Biehler, Jack Snowman, Psychology Applied to Teaching (London : Houghton Miffin Company, 1993) p. 163.

[4] Ibid.

[5] David Fontana, Psychology for Teachers (London : British Society Books, 1993) p. 79.

named the child's level of performance an intelligence quotient (or IQ). Since then though, many have revised the definition of the intelligence quotient. Charles Spearman a British psychologist, noted that some children tended to do consistently well (or poorly) on all tests, this he called "a general factor", abbreviated to "g". There were some exceptions where children performed well on some tests but poorly on others.

He called this a set of specific factors, (abbreviated as "s") as they only affected performance on specific tests. Spearman's test takes into account two aspects of intelligence - this approach is called the two-factor theory of intelligence. Recently however, tests have tended more and more to diversify in the range of processes they test. The Wechsler Intelligence Scale for Children-Revised or WISC-R for short, is composed of twelve different subjects, shown in Table 1.1.

TABLE 1.1

Components of Wechsler Intelligence Scale for Children-Revised

Verbal Information	Performance Picture Completion
Similarities	Picture Arrangement
Arithmetic	Block Design
Vocabulary	Object Assembly
Comprehension	Coding
Digit Span	Mazes

Source: Robert F. Biehler, Jack Snowman, Psychology Applied to Teaching p.163

Although this test measures a wide range of skills it tends to ignore anything that is not related to academic success such as sport, creativity, etc. Lowenfeld and Britain support this view, stating that, "Intelligence as we now test it does not encompass the wide range of thinking

abilities that are necessary for the survival of mankind."[6] If intelligence is only related to academic success this is adequate but more and more "intelligence" is related to personal success, such as achieving a personal ambition and exhibiting exceptional social skills

One psychologist who realises this need for a new definition of intelligence is an American called Howard Gardner. Through his research he seeks to explore the mind and it's working. To him, intelligence is more than just a word to be used arbitrarily in psychology journals and "Test your own IQ" magazine articles. Gardner develops upon the historically accepted definition of intelligence. At a recent lecture in U.C.D. Gardner described intelligence as "the ability to solve a problem or fashion a product that is valued in at least one culture or community."[7]

Gardner takes a pluralistic view of intelligence he believes we should look at "more naturalistic sources of information about how peoples around the world develop skills important to their way of life."[8] One example of this, is when musical ability is essential for an opera singer to succeed. Musical ability is not necessary to be a good lawyer and is not valued within a lawyer's workplace. This is also true for various cultures. Some skills are valued more than others. When devising an intelligence test one must take this into and other similar factors into account.

Gardner put forward a theory of Multiple Intelligences. He proposes that intelligence consists of component parts which are related to the different kinds of skills one has. There is a close connection between intelligence and skills, as skills are a concrete example of intelligence.

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[6] Biehler, Snowman, Psychology Applied to Teaching, p. 166.

[7] W. Lambert Brittain, Victor Lowenfeld, Creative and Mental Growth (New York : Macmillan Publishing, 1975, p. 4.

[8] Professor Howard Gardner, The Implication of the Theory of Multiple Intelligences for Curriculum Planning and Assessment Lecture in U.C.D. Belfield, Dublin on 11th January 1995.

Gardner backs his opinion by varies case studies, such as a situation where a person suffers a stroke and specific abilities or skills, such as talking or movement are destroyed in isolation without affecting other abilities.

Gardner attempts to classify the intelligences. Gardner emphasizes that this is a preliminary attempt and not a final, comprehensive one. The seven intelligences he identifies as having equal importance, in random order are Logical-Mathematical, Spatial, Interpersonal, Intrapersonal, Musical, Linguistic, and Bodily-Kinesthetic intelligences. Gardner gives an example of each intelligence;

Linguistic Intelligence: "is exhibited in its fullest form by poets".[9]

Logical-Mathematical intelligence: is closely related to "powers of deduction and observation."[10] Scientists would display high levels of logical mathematical ability.

Spatial Intelligence: according to Gardner "is the ability to form a mental model of a spatial world and to be able to maneuver and operate using that model." [11] Sailors, surgeons and sculptors all have highly developed levels of Spatial ability. They all think in a three-dimensional way.

Musical Intelligence: is an ability to perceive and produce music. Gardner gives the names of Bernstein and Mozart as examples of those with a high level of Musical intelligence.

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[9] Howard Gardner, Multiple Intelligences : The Theory in Practice (New York : basic books, 1993) p. 7.

[10] Ibid., p. 8.

[11] Ibid., p.19.

Bodily-Kinesthetic intelligence: is "the ability to solve problems or to fashion products using ones whole body, or parts of the body." [12] Seen best in dancers, surgeons or sculptors.

Interpersonal intelligence: is according to Gardner "the ability to understand other people; ...how to work cooperatively with them." [13] Politicians, teachers and successful leaders are likely to have good interpersonal abilities.

Intrapersonal Intelligence: is more to do with the individual. Gardner describes it as "a capacity to form an accurate, veridical,[14] model of oneself and to be able to use that model effectively in life." [15]

How do Howard Gardner's seven intelligences relate to Irish Education? All subjects on the school curriculum are influenced in some way by each of the intelligences, but some more so than others. From my personal knowledge of the Irish second-level educational systems, I have grouped each of the seven intelligences with those subjects they effect the most.

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[12] Ibid., p.9.

[13] Ibid.

[14] Ibid.

[15] Veridical : expressing the truth; accurate, Readers Digest University Dictionary, 1st ed. (1978), s.v. "Veridical".

TABLE 1.2

The Relationships Between the Seven Intelligences and School Subjects

Type of Intelligence	School Subject
Linguistic	Languages: English, French, German, Irish, Latin and Spanish, Geography and History
Logical-Mathematical	Mathematics, Science, Technical Graphics and Art, Craft, Design
Spatial	Mathematics, Science, Technical Graphics and Art, Craft, Design
Musical	Music and Art, Craft, Design
Bodily-Kinesthetic	Physical Education, Music, Woodwork, Metalwork and Art, Craft, Design
Interpersonal	Business Studies, Religion, Civics and Art, Craft, Design
Intrapersonal	Religion, Civics and Art, Craft, Design

Looking at Table 1.2 one can see that some school subjects are strongly influenced by a particular intelligence, others by a variety. Can this affect the way subjects are taught? Gardner says that;

> An intelligence can serve both as the content of instruction and the means or medium for communicating that content. [16]

This implies that you can teach a logical-mathematical principle in a logical-mathematical way, but imagine if the student learning the new principle has a low level of logical-mathematical intelligence - it would be difficult for them to learn the principle. The successful teacher must find an alternative route, perhaps by teaching in a linguistic, a spatial or even a bodily-kinesthetic way. The teacher translates the principle into a different form. It is important to note however, that the secondary route is, at best, a translation. The student must be able, not only to follow instructions but to understand why, otherwise the student does not "know" the new principle. Gardner says;

> Without this translation, what is learned tends to remain at a relatively superficial level.[17]

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[16] Gardner, Multiple Intelligences, p.9.

[17] Ibid. p.32.

How does Art stand within Intelligences Theories?

Some psychologists think that intelligence can be measured by analysis of children's drawings. Claparede proposed a study of a number of children's drawings in an attempt to find any lasting correlation between aptitude in drawing and general intellectual ability.

He worked out a method of scoring the drawings to a six point scale that took into consideration,

- Sense of proportion
- Imaginative conception
- Technical and artistic value.[18]

Equal weight was given to each of the categories he then compared the results of this test with teachers' evaluation of students general intelligence?. "He found a positive correlation in nearly all instances." [19]

So is it possible that Art has a strong relationship with intelligence. Conversely, the reverse can also be true, occasionally to a startling degree. One notable case is that of Nadia Chomyn, Nadia has produced drawings that are amazingly sensitive for her age, her line drawings show an understanding of proportion and perspective far beyond her years. Figure 1.1. shows her

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[18] Ibid., p. 33

[19] Florence L. Goodenough, Measurement of Intelligence by Drawings, (New York : World Book Company, 1954.) p.2.

drawing of a rooster done while she was six years old. The fact that makes her drawings unbelievable is that Nadia is severely mentally handicapped.

> Tests showed that Nadia had profound difficulties not only with verbal expression but also with comprehension. She appeared to lack many of the prerequisites of language development. She could not imitate... Nadia was also very clumsy and poorly coordinated. She could not hop, nor walk upstairs, one tread at a time. Her fine motor control was also surprisingly poor in view of her drawing ability. For example she could not do up her buckles or use a knife and fork together. [20]

ILLUSTRATION 1.1

ROOSTER

Nadia Chomyn

SOURCE: Sheila Paine, ed. Six Children Draw. (London Academic Press, 1981) p.58

For Nadia, general intelligence is completely removed from artistic intelligence. Is there such a thing as an artistic intelligence?

When questioned about the existence of an artistic intelligence, Gardner says that it would be more likely that the phrase "artistic intelligence" would serve as shorthand

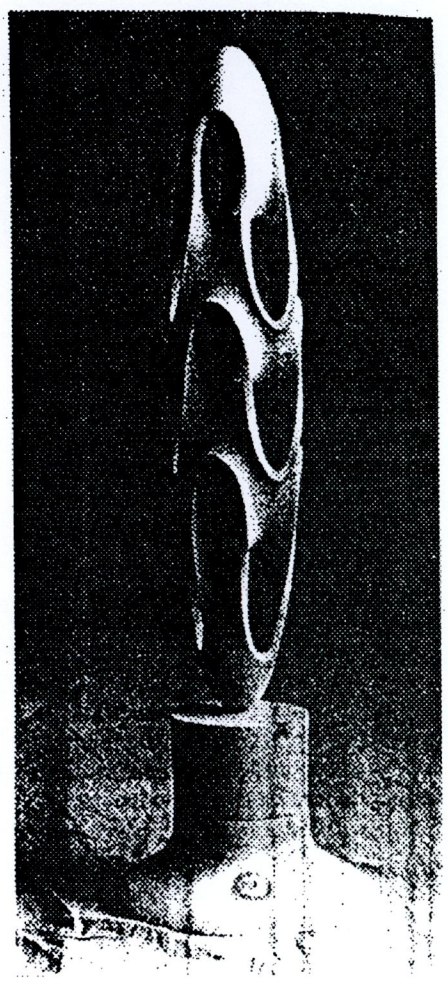
[20] Ibid.

for musical intelligence or for aspects of spatial or linguistic intelligence. He says, "Technically however, no intelligence is inherently artistic or non artistic."[21] He gives as an example the fact that many patterns derived for mathematical purposes have ended up on display in Art galleries. See illustration 1.2.

FIGURE 1.2

TWO SIDED, TRYSYMMETRIC SURFACE WITH THREE SPANNING LEVELS

Brent Collins



SOURCE: Michele Emmer, The Visual Mind: Art and Mathematics

(USA: Leonardo Books,1993)

[21] Sheila Paine, ed., Six Children Draw, (London : Academic Press, 1981.) p.49.

If Art is influenced by a variety of intelligences, then the performance of a student in Art depends largely on their special blend of intelligences and the area of Art on which they work. A student who displays high levels of Bodily-Kinesthetic and Spatial intelligences would be likely to excel at three-dimensional work while a student showing developed linguistic and intrapersonal intelligences would be likely to find that painting in a personalized style came with ease. Different sections of Art could require different intelligences.

CHAPTER 2

CROSS CURRICULAR LINKS IN SECOND LEVEL IRISH EDUCATION

Possible reasons for cross curricular links.

Each September brings many changes in Irish school society. Perhaps the most startling change experienced is that by 11/12 year olds. For them, September means a transition from primary level to second level. This is not just a change in location but a change in the way they are taught.

> "They move from the primary level of education to the post-primary level where they encounter a programme significantly different in organisation and structure". [1]

In primary school they have been taught all subjects by one teacher; during the day there is a smooth and natural transition from topic to topic. On reaching second level this approach is drastically changed. Students are bundled from class to class. Each subject is taught by a different teacher - none of them knowing what the others are teaching, from where the students come or go. Subjects and class periods are compartmentalised. The introduction of the Junior Certificate aimed to encourage a less abrupt transition.

> Education should be seen as a continuum, with close alignment between the primary level and the junior cycle post-primary level in curriculum, learning processes and teaching methods. [2]

How, under the radically different organisation of a second level school, can an individual teacher contribute and how can the Junior Certificate programme assist?

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[1] National Council for Curriculum and Assessment, Curriculum and Assessment Policy towards the New Century. (Dublin: Government Publications, March 1993) P.25.

[2] Ibid., P.26.

> A conscious attempt is made in the Junior Certificate programme to identify areas of linkage between different subjects. Common themes and issues are often treated in different but complementary ways.[3]

Unfortunately, teachers are given no help to find these themes and issues. Teachers themselves must take the initiative to find the areas where their subject crosses over to another. Teachers are told that "there should be an organic relationship between courses in the same subject area" [4], because "while students may perform poorly in certain areas, they can achieve high standards in other areas". [5]

The school is told to seek out those areas. They are however given a little help by the Curriculum and Examinations Board. They have identified areas of the curriculum where there is a natural crossover. Firstly, elements of learning; for example, where the principle of simple interest is taught both in Mathematics and Accountancy; Secondly, areas of experience, of which they have identified eight:

1. Arts education (creative and aesthetic studies).
2. Guidance and Counseling.
3. Language and Literature (a) Irish and English (b) other languages
4. Mathematical studies.
5. Physical education.
6. Religious Education
7. Science and technology
8. Social, political and environmental studies [6]

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[3] Ibid., P.27.

[4] Curriculum and Examinations Board, In Our Schools: a Framework for Curriculum and Assessment. (Dublin: Government Publications, March 1986) P.14.

[5] Ibid.

[6] Ibid., P.21.

While it is accepted that different teachers will have different perspectives on the relationship between their own subject and the various areas of experience, the CEB offer a matrix of possible relationships. See Table 2.1. On completion of the Junior Certificate Programme students are entitled to have experience in each of the eight areas.

TABLE 2.1

Matrix of possible relationships between subjects and areas of experience

AREAS OF EXPERIENCE / SUBJECT	ARTS EDUC.	GUID. & COUNS	LANG-UAGE & LIT.	MATH. STUDIES	PE	RE	SCI. & TECH	SOC/POL/ ENV STUDIES
ART	X							
MUSIC	X							
GAEILGE			X					
ENGLISH			X					
LATIN			X					
GREEK			X					
CLASSICAL STUDIES			X					X
HEBREW			X					
FRENCH			X					
GERMAN			X					
SPANISH			X					
ITALIAN			X					
MATHS				X				
COMMERCIAL ARITHMETIC				X				
PE					X			
RE						X		
SCIENCE							X	
RURAL SCIENCE							X	
HOME ECONOMICS							X	
TYPEWRITING								X
SHORTHAND			X					
WOODWORK							X	
METALWORK							X	
MECHANICAL DRAWING							X	
HISTORY								X
GEOGRAPHY								X
CIVICS								X
COMMERCE								X

Source: Curriculum and Examinations Board, In Our Schools: a Framework for Curriculum and Assessment. (Dublin: Government Publications, March 1986) Appendix 5

Another area where there is a major link between subjects is in their relation to the general aims of the Junior Certificate. Each subject contributes to all the individual aims and principles. There is great potential here to organise a team-teaching approach, fulfilling the general aims and principles through each subject area.

Do teachers know the importance of cross curricular links within the aims of the Junior Certificate Curriculum?

Leaving aside the ideals of the Junior Certificate Curriculum, I aim to find out how and if the theory is put into practice. To do this I have composed a questionnaire.(See Appendix A) I randomly distributed the questionnaire throughout the staffroom. The teachers seemed to find the first few questions easy, which I had planned, but on arrival at question four most had to spend some time to sort out exactly what they taught. This time spent I feel will be beneficial to their teaching as some of them obviously had not thought much about this angle of their teaching. General conversations sparked off by the introduction of the questionnaire seemed to concur that cross curricular links were an important part of any subject. Practically, the present system did not seem to allow sufficient room to allow linkage to fully develop. The one exception was on the fourth year programme run by most schools. The "mini-company" afforded a good vehicle for cross-curricular linkage.

In answer to question 3, 100%, that is all the teachers, said yes, their subject or subjects had links or potential links with other subjects. The majority of teachers (70%) thought these links were very important, 15% thought they were important and 15% thought they were useful. No teacher felt they were unnecessary.

When asked about the meaning of the term "cross-curricular links", each teacher seemed to have a correct definition. Frequently mentioned terms included; decompartmentalization, cross over, common ground and practical integration. Approximately half of the questionnaires mentioned teacher involvement in their definitions of cross-curricular links. Looking at the wording of the question "What does the term 'cross curricular links' mean to you?" I thought many more would refer to their own role in cross-curricular linkage. This suggests that many have either read or heard about cross-curricular links but not actually thought about their role within a school environment. Answering about their own conscious effort to create links, 15% said they always did, 85% said they sometimes do. Unfortunately, I tend to think these answers were given mostly because they were the "right" ones. They should ideally create links, therefore they did! (At least for the questionnaire.)

Ways in which the teachers created links were fairly diverse, ranging from utilising their own experience of particular subjects for examples, to staffroom discussion on the section of the syllabus certain classes were being taught. Teachers also sought advice from others on particular areas of expertise. Fourth year was seen as the ideal time for promoting team teaching or joint projects. 85% of teachers felt that success in one subject may influence another subject. I found no relationship between the length of time a teacher was teaching and answers given. The most important data I found was the frequency each subject was mentioned as having links with another. I thought this would follow the traditionally academic valued subjects, perhaps with mathematics and languages more frequently mentioned and Art and music somewhere near the bottom. I was wrong.

FIGURE 2.1

Frequency of subject links mentioned

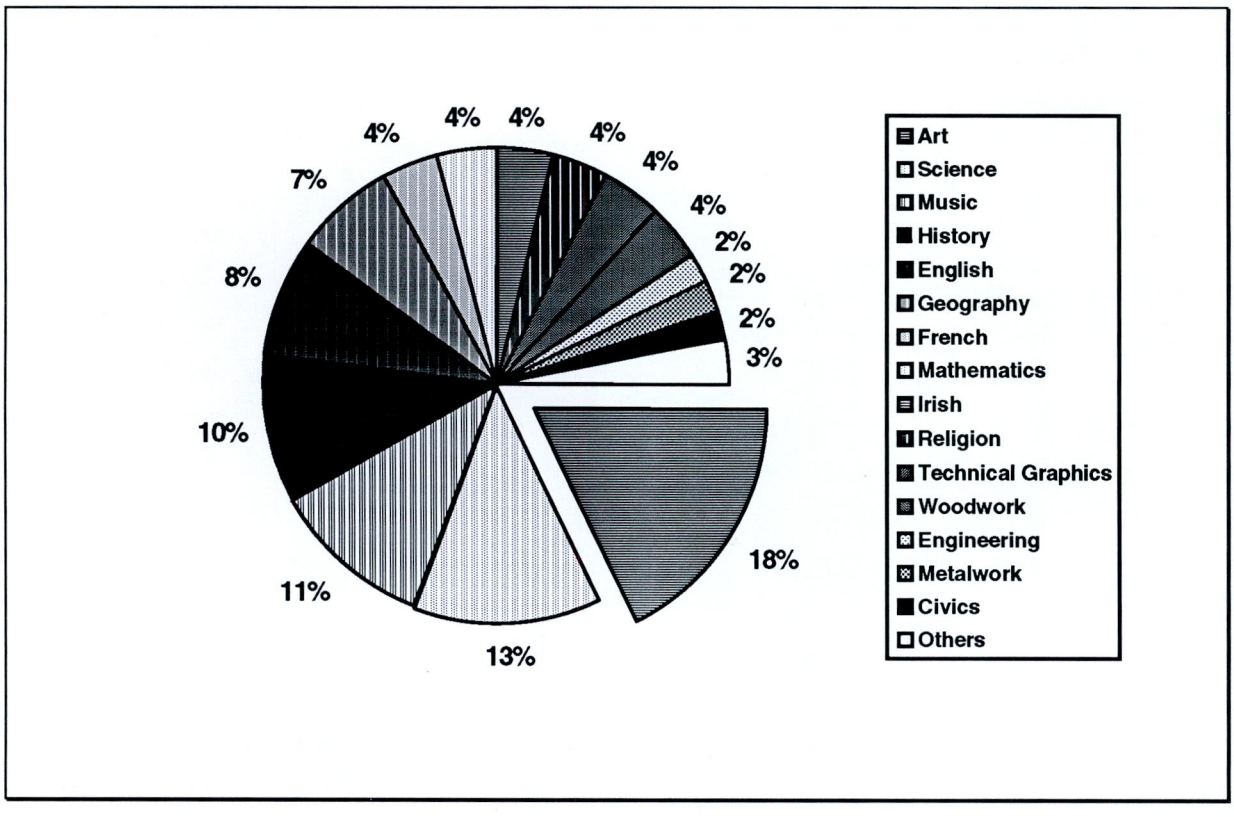
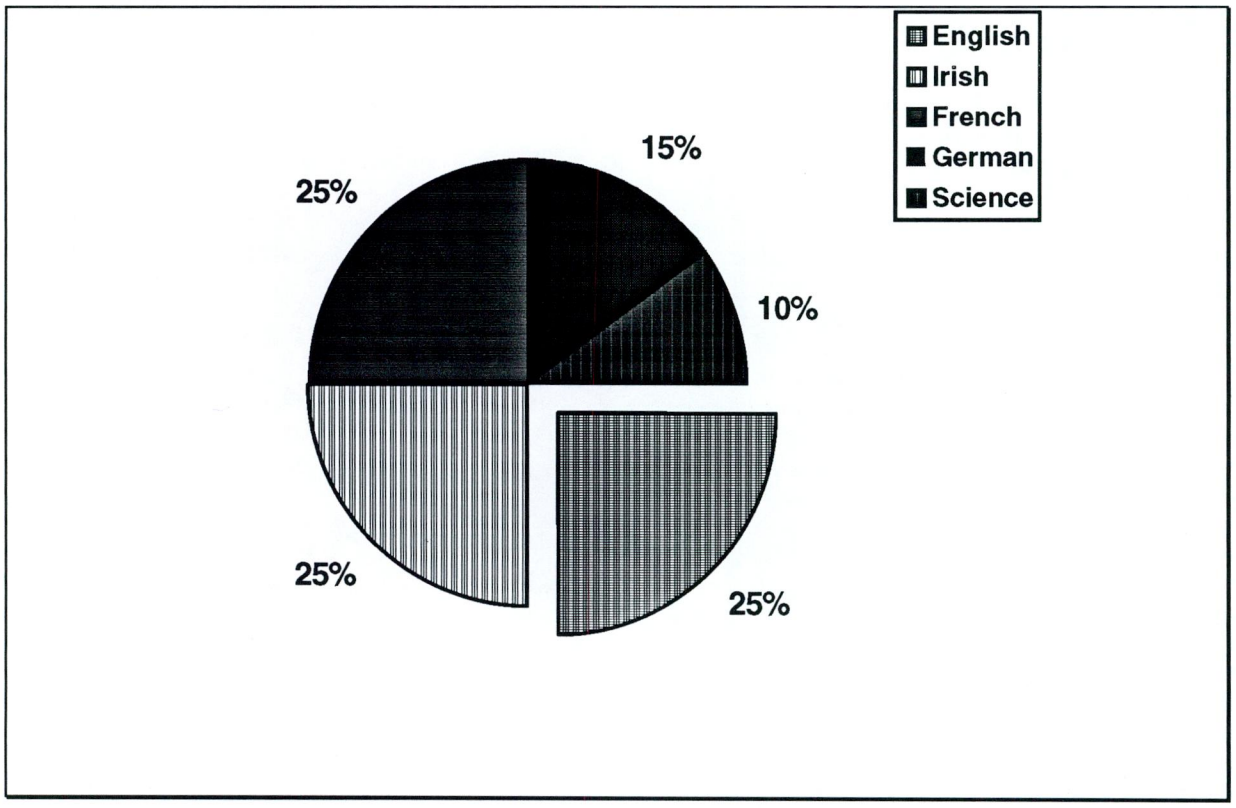


FIGURE 2.1 shows a pie chart illustrating the frequency of subjectscts mentioned by all teachers as relating to their subject. After Art, Science was most mentioned as having links, then Music, History, English, Geography, French, Mathematics, Irish, Religion, Technical Graphics, Woodwork, Engineering, Metalwork, Civics and others, in descending order. Even more surprising and worrying are those subjects mentioned as having no links to specific subjects. See FIGURE 2.2. for these results.

Figure 2.2

Instances where subjects mentioned- no links



English, Irish, French, German and Science had no links to particular subjects. This is worrying as this shows teachers do not see languages as having an influence on their subject. This will have to be addressed by language teachers. The fact that Art was mentioned as asserting an influence over ALL other subjects gives the Art teacher an important role. The Art teacher is often approached by teachers who wish for advice, for assistance or technical knowledge. This also means the Art teacher can easily get resources and help if needed from any area of the school, on a barter basis; I will help you if you help me. This can be beneficial to all parties.

CHAPTER 3

CROSS-CURRICULAR LINKS

WITHIN THE ART SYLLABUS

Looking at the Art, Craft and Design objectives in the syllabus, there are so many references to skills which are used in other subjects, that even if we did not make a conscious effort to make cross-curricular links they would happen naturally. Looking in detail at a selection of the objectives one can see the many places where references need to be made to other subjects.

Course Objectives

The Art Craft and Design course develops the students' ability to:

- use the three-dimensional process of additive, subtractive and constructional form-making in expressive and functional modes.
- use a variety of materials, media, tools and equipment.
- understand relevant scientific, mathematical and technological aspects of Art, craft, and design.
- develop an awareness of the historical, social and economic role and value of Art, craft and design and aspects of contemporary culture and mass-media.[1].

The first two points clearly link with any of the three-dimensional form-making subjects such as metalwork, woodwork and constructional studies in the techniques, the tools and media used. The third point links with science, mathematics and computers, etc. The fourth point shows links with history.

These links are the strongest ones, but ALL subjects have the potential to link with Art, especially within a theme-based project. The link I am going to explore here is the one I have explored through my teaching. I believe that through these links the interest of the student can

[1] An Roinn Oideachas, Art, Craft, Design. (Dublin: Government Publications) P.3

be aroused - the topic is made more relevant to them if it applies to more than one subject in their daily school life.

From their very first days in primary school students are taught mathematics through Art - they are shown a drawing of one apple, two balls, three cats and told to copy them. Zero is similar to an orange. One is similar to a pencil. They use shapes to make pictures. Many elements of Art are treated in mathematics textbooks, for example, proportion in Art is taught as ratio in mathematics; pattern as sequences, series and more recently tessellations; symmetry taught in Art is taught in mathematics also, under the guise of axial symmetry or central symmetry. For centuries mathematics has influenced Art in some way. Strangely artists seem to have either a love-hate or love-love relationship with mathematics. I have heard many artistic friends saying that they really hate mathematics, that they had problems with mathematics in school. Some artists feel mathematics is central to their work, while others feel it is completely irrelevant.

> There has always existed an interesting dichotomy both within the ranks of mathematicians and, independently, in the world of Art as to the respective relevance and importance of either field to members of the other one. [2]

There are many successful modern artists whose personal philosophies include a love of mathematics for example Vasarely, M.C. Escher, Sonia and Robert Delauney. One artist, Mark Spalatin wrote;

> Influences in my work can be more directly attributed to my continuous fascination with the geometric aspects of origami, mosaics, tribal Art, floor tiles, patterns, ancient as well as modern architecture, and so forth.[3]

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[2] Michele Emmer, The Visual Mind: Art and Mathematics (USA: Leonardo Books, 1993) P.xiiv

[3] Ibid.

Short Historical Account of the Merging of Mathematics with Art.

Starting in the fifteenth century, Piero Della Francesca has been described as one of that centuries greatest mathematicians.

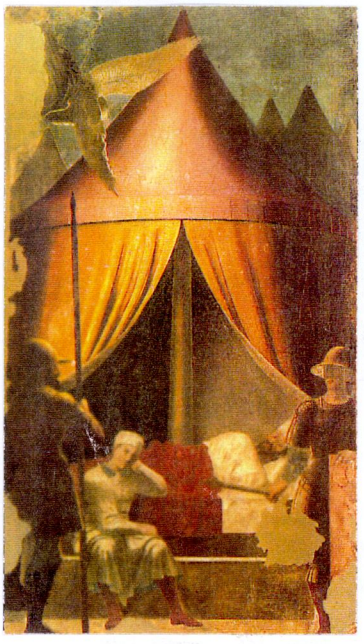
> This highly intellectual painter had a passion for geometry and planned all his works mathematically to the last detail. The placement of each figure was calculated so as to be correct in relation to other figures and to the organisation of the painting as a whole. [4]

Like many other Renaissance artists, Piero Della Francesco was greatly excited by the pictorial possibilities opened up by the formation of perspective. His drawings illustrate his constantfascination with architecture and geometry, (see illustration 3.1).

ILLUSTRATION 3.1

CONSTANTINE'S DREAM

Piero Della Francesco



During the final twenty years of Piero's life he turned away from painting to mathematics. Another versatile artist was Leonardo Da Vinci. His interests included anatomy, geology,

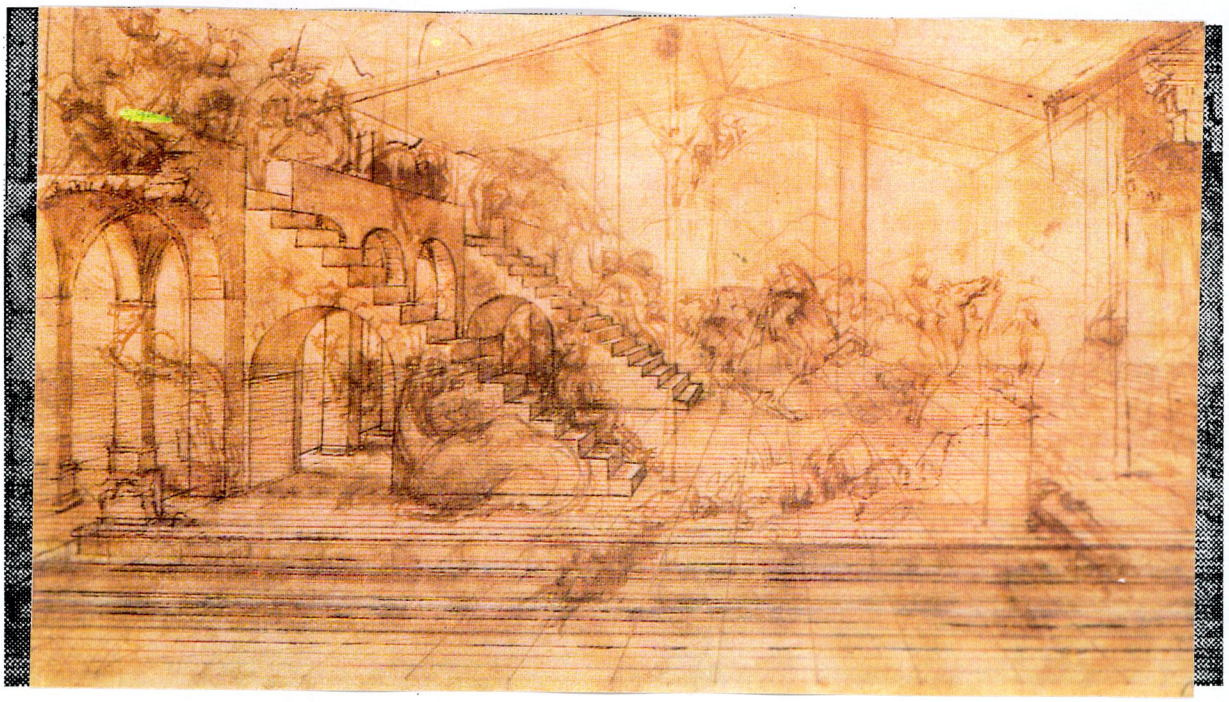
[4] Ibid., P.2.

man-powered flight, composition in painting, architecture and military devices (see illustration 3.2). This reflects the Renaissance tradition of training artists and mathematicians in close proximity.

ILLUSTRATION 3.2

STUDY FOR 'THE ADORATION OF THE MAGI'

Leonardo Da Vinci



Skipping to the twentieth century, mathematics takes on an even more important role in the work of some artists.

> During the first three decades of the twentieth century, the fourth dimension was a concern common to artists in nearly every major modern movement: Analytical & Synthetic Cubists (as well as Duchamp, Picabia and Kupka), Italian Futurists, Russian Futurists, Suprematists and Constructivists, American Modernist in the Stieglitz and Arensberg circles, Dadaists and members of De Stijl. [5]

[5] Ibid., P.229.

For them the fourth dimension is time. They tried to represent time in various ways. (See Illustration 3.3)

ILLUSTRATION 3.3

NUDE DESCENDING A STAIRCASE

Marcel Duchamp

Although time is not directly related to mathematics, the artist taught the mathematicians to expand their horizons, not to think in a linear way. As the mathematician Ervin Rodin says:

> The genius of the artist now serves as an inspiration for us to understand and explore our non-linear world better. And our own discoveries and developments allow our artist friends to express today, in more and more ways and in their inimitable intuitive fashion, some of the truths we will stumble upon tomorrow.[6]

According to Rodin, artists often intuitively discover mathematical theories before mathematicians. One artist who has explored a mathematical theory almost to exhaustion is

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[6] Ibid., P. xvi.

Mauritis Cornelius Escher. For as long as he can remember he has had a fascination with geometrical division of planes. Emphasising the intuitive exploration of mathematical themas as described by Rodin:

> He relates that in the beginning he puzzled quite instinctively, apparently without any well define purpose, driven by an irresistible urge to repeat one or a few forms to fill a page without gaps. [7]

Through his investigation of shapes used in repeat patterns he discovered an underlying geometric structure, or framework, which is present in every regular division of the plane.

> Every interlocking jigsaw puzzle pattern of congruent pieces which repeats in such a way that every piece is surrounded in the same way can be associated with one of the six geometric regular divisions shown in his illustration: of parallelograms, of rectangles, of squares, of triangles, of 60 degree rhombuses, or of regular hexagons. [8]

Illustration 3.4 shows this.

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[7] Don's Schattschneider, Visions of Symmetry: Notebooks, Periodic Drawings, and Related work of M.C. Escher. (New York: W.H. Freeman, 1990), P.2.

[8] Ibid., P.31.

ILLUSTRATION 3.4

EXAMPLE OF TESSELLATION

SOURCE: Don Schattschneider, Visions of symmetry: Notebooks, Periodic Drawings, and Related work of M.C. Escher

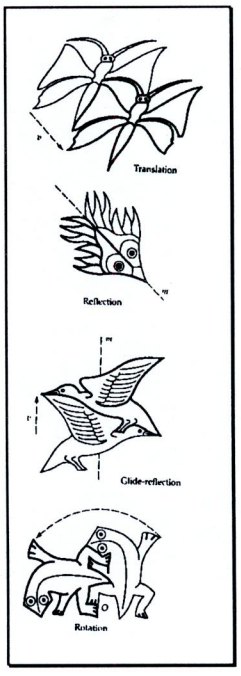
Escher also went on to explore geometric transformations. Four particular transformations held his attention; translation, reflection, glide reflection and rotation. Illustration 3.5 shows these four in actions that preserve the exact shape and size of the motif.

> A translation slides all figures the same way; a vector-v shows the direction and distance of the slide. A reflection transforms figures to their mirror images across a line m (the reflection axis) which acts as a mirror. Here, the left and right sides of a fish are mirror images of each other. A glide reflection is a two step transformation: a translation with vector v followed by a reflection across an axis m which is parallel to v. A rotation turns figures about a fixed point O (the rotation center) through a specified angle. Here one lizard rotates 90 degrees onto the other. [9]

[9] Ibid., P. 34

ILLUSTRATION 3.5

TRANSLATION, REFLECTION, GLIDE-REFLECTION, AND ROTATION



SOURCE: Don Schattschneider, Visions of Symmetry: Notebooks, Periodic Drawings, and Related work of M.C. Escher

Through this exhaustive study of tessellations, Escher developed a unique style of Art, incorporating a "magic" element within his work. Children especially are attracted by the way his animals interlock so perfectly. Art teachers who understand his findings can introduce students to the basic shape and the many ways of adapting it, by helping the students to expand upon the basic principles. Once students can practically see the use of translations, symmetry, etc. they will find it easier to grasp the more abstract concept presented to them in mathematics class. Sculptors especially will be happy to note that Escher's work was not completely two dimensional. He also worked with the concept of solids made from tessellating planes, samples of which I have included (illustrations 3.6).

ILLUSTRATION 3.6

SOLIDS

M.C. Escher

"Heaven and Hell" carved sphere, 1942. Maple, stained in two colors, diameter 235 mm.

Carved sphere with eight grotesques, 1943. Beechwood, stained in two colors, diameter 130 mm.

SOURCE: Don Schnattschneider, Visions of Symmetrey

Influenced by Ester's woodcut "Day and Night"-1960 (Illustration 3.7) was a professor of architectural design at the State University of New York of Buffalo. From his students William Huff elicited a variation on the tessellations (shapes that mesh together to fill a plane) which he has named parquet deformations.

> Traditionally a parquet is a regular mosaic made out of inlaid wood, on the floor of an elegant room; and a deformation - well, it's somewhere between a distortion and a transformation.[10]

In order to qualify as a parquet deformation two requirements must be satisfied, the first that there should only be change in one direction.

[10] Douglas R. Hofstadter, Metamagical Themas: Questing for the Essence of Mind and Pattern. (London: Penguin Books, 1986) P.192.

ILLUSRATION 3.7

DAY AND NIGHT

M.C. Escher

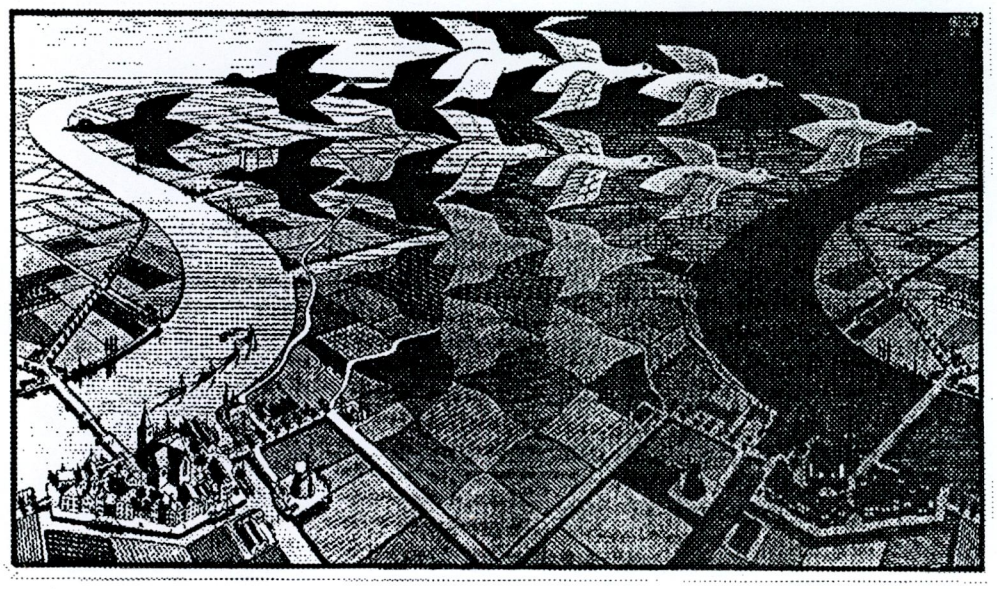
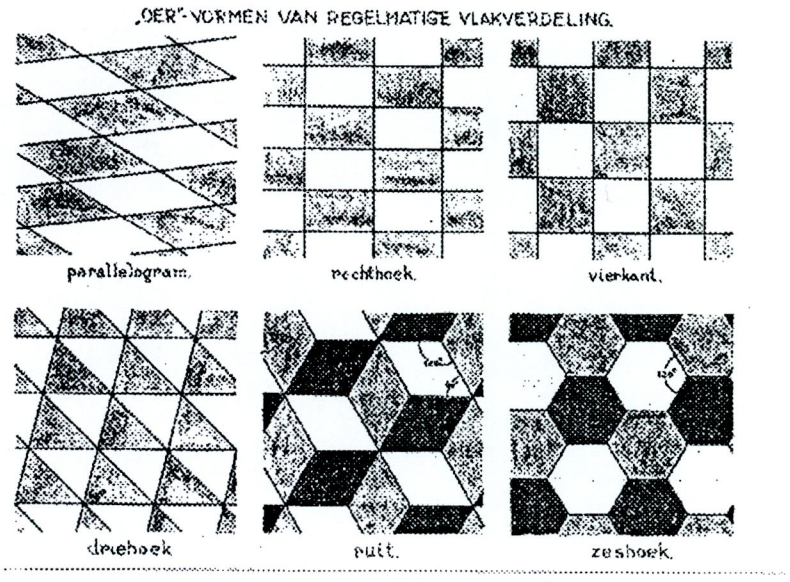


ILLUSTRATION 3.8

TESSELLATING SHAPES

M.C. Escher



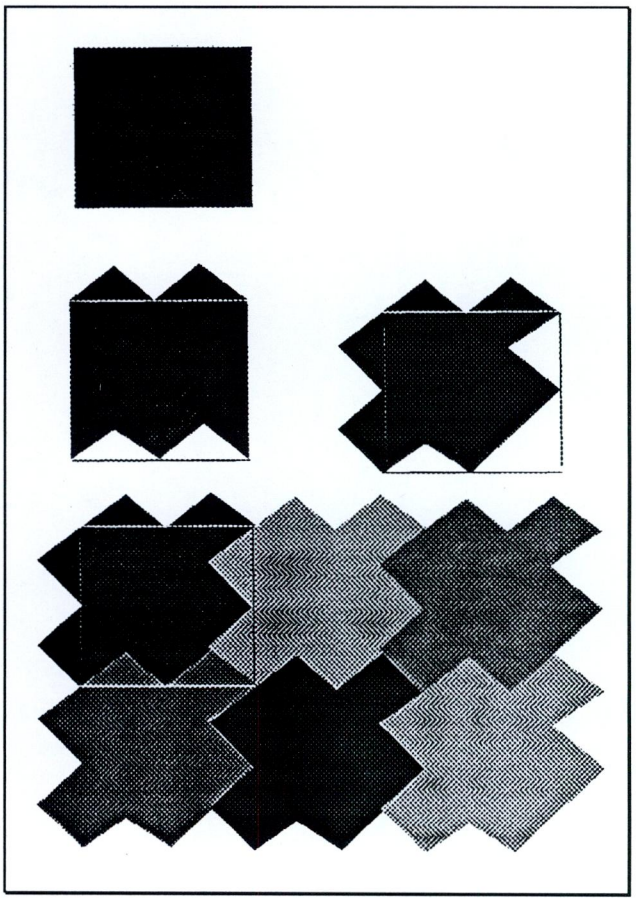
SOURCE: Don Schattschneider, Visions of Symmetry

The second requirement is that at each stage the unit cell must be able to combine with itself so as to cover an infinite plane exactly (illustration 3.8). Some simple examples of tessellations are squares, rectangles, diamonds and L-shapes. There can also be irregular tessellations as seen in the work of Escher.

Tessellations by Escher are nearly all animals, how did he devise them? I have encountered two ways of making shapes that tessellate. The simplest way is to take a shape you know tessellates and adjust it. This works best with abstract shapes. The adjustments must be carefully done to keep the tessellation. Parts can be taken, that is subtracted, from any side of the basic shape. It is then placed or added back to the shape exactly opposite. The section subtracted can be any shape at all. Illustration 3.9 illustrates this process.

ILLUSTRATION 3.9

DESIGNING A SHAPE WHICH TESSELLATES-SUBTRACTION METHOD

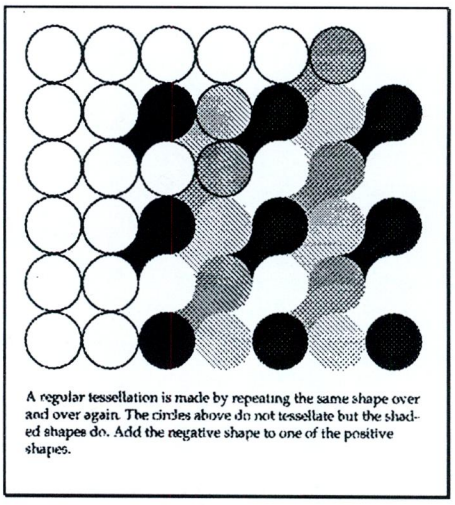


Another method of making a tessellation is to develop or design any motif. Take four of these motifs and place each pair side by side. The motifs must touch each other to create a negative space. The space must then be joined to one of the motifs. This method is illustrated in illustration 3.10.

These methods of making tessellations are easily picked up by students and lead to excellent results. Included are some examples of my students work on tessellations. These have great potential for further exploration.

ILLUSTRATION 3.10

MAKING A SHAPE WHICH TESSELLATES- ADDITIVE METHOD



A regular tessellation is made by repeating the same shape over and over again. The circles above do not tessellate but the shaded shapes do. Add the negative shape to one of the positive shapes.

Parquet deformations involve the changing of the tile in a linear way. This means that while tiles move horizontally and vertically, the changes only happen horizontally. Each tile is an exact copy of that immediately above or below it. Each tile differs slightly from that to the right and to the left. Different devices are used to change the tiles. These include:

- lengthening or shortening a line
- rotating a line
- introducing a "hinge" somewhere inside a line segment so that it can "flex"
- introducing a "bump" or "pimple" or tooth (a small intrusion or extrusion having a simple shape) in the middle of a line or at a vertex
- Shifting, rotating, expanding, or contracting a group of lines that form a natural sub-unit[11]

[11] Ibid., P. 195.

What links parquet deformations to Art and Mathematics? To answer this question I will borrow a quotation from Louis Kalm (architect):

> what he teaches is the introduction to discipline underlying shapes and rhythms, which touches the arts of sight, the arts of sound, and the arts of structure. It teaches students of drawing to search for the abstract and not the representational.....It is the introduction to exactitudes of the kind that instill the religion of the ordered path. [12]

[12] Ibid., P.210.

CHAPTER 4

THE RESEARCH PROJECT

Background to the School

Portmarnock Community School is situated in a residential, coastal area. Most students live within walking distance from the school. Surrounding the school are 15 acres of private grounds containing football and hockey pitches and space for many other sports. The school is well equipped with many specialist rooms; that is special rooms for Home Economics, History, Geography, Technical Graphics, Computers, Technology and Materials Technology. Catering for the non-examinable disciplines, the school has a fully equipped gymnasium, library, canteen and prayer room. To help with study there are supervised evening study sessions. Students personal problems are handled by a team consisting of the guidance counsellor, remedial teachers, and a full time chaplain.

The school offers sixteen subjects at Junior Certificate level;

Irish, English, Mathematics, Art/Craft/Design, Business Studies, French, Geography, German, History, Home Economics, Materials Technology, Metalwork, Music, Science, Technical Graphics and Technology.

It offers twenty subjects to Leaving Certificate level. In addition to those on offer at Junior Certificate level are,

Accounting, Applied Mathematics, Biology, Chemistry,
Construction Studies, Economics and Engineering.

A variety of non-examination subjects are also on offer;

Civics, Religious Education, Japanese, Physical Education,
and Computer Studies.

In Portmarnock Community School, the school day does not end at four o'clock. Every evening teachers give voluntary time to help with extra-curricular activities and societies. These include;

athletics, badminton, basketball, camogie, chess, choral work,
choreography, cycling, debating, gaelic football, golf,
gymnastics, hill-climbing, hurling, music tuition, orienteering,
photography, public speaking, rugby, soccer, speech and drama,
and swimming.

As can be seen, sport and competition are strongly encouraged, with nearly all teachers taking part.

There are about one thousand students in the school. The staff of sixty is made up of permanent and part-timers and consists of very friendly and supportive people, whose wide age range provide a variety of views and opinions on varying teaching topics, a mixture of experience and enthusiasm which results in a strong staff support team for both colleagues and students.

The Art Department

The school has three Art teachers, each with their own Art room, varying widely in facilities and environment. Each of the Art teachers come from very different areas, providing a balanced approach to Art in the school. Art has a high profile within the school and is not restricted to the Art room. Student work adorns school corridors and ornamental gardens. There are also many examples of painting around the school. The choice of paintings shows imagination and breadth of vision.

Previous Experience of Fourth Year Students in Cross-Curricular Links

This year I taught second years, fourth years and fifth years. I chose my fourth years as my research group. They had all completed Junior Certificate and had established their ability in various subject areas. I also taught them practical Art and would be able to link this in with other subjects. I devised a questionnaire to gain information from them. It included two types of questions - closed, looking for facts and open exploring ideas.

The sample consists of eighteen students, eight of who are female, the remainder male. The age group ranges from fourteen to sixteen. Before receiving the questionnaires, they were asked to give clear, honest answers; to work on their own and to think carefully before they answered all the questions. The students were then given as much time as they needed to fill in their answers. I collected the questionnaires from them when they were completed, as they returned to their work.

The questionnaire contains nine questions (see Appendix B). Question one asked students for their Junior Certificate results. It is to be hoped that when I categorised these results I would be able to find out if there are similarities between students' abilities in certain subject areas. When analysing the data I decided to group together all the subjects that I felt were mostly influenced by particular intelligences. For example:

Linguistic: English, Irish, French, German, Geography and History.

Logical-Mathematical: Maths, Science, Art, Technical Graphics and Technology.

Spatial: Maths, Science, Art, Technical Graphics, Metalwork and Technology.

Musical: Music and Art.

Intrapersonal: English and Art

Interpersonal: Business Studies, Home Economics and Art.

Bodily-Kinesthetic: Music, Materials Technology, Metalwork and Art.

For the last category, Bodily-Kinesthetic, I could not include the most obvious subject, Physical Education as this is still not an examinable subject and therefore I could get no concrete grade for each student. In the musical category I also came across a problem as no student had taken both Art and Music. I conclude from this that there must have been a clash on the time table. Art was probably on at the same time as Music.

Analysing the data proved complicated but eventually I invented a system. What I wanted to find out was, if students' abilities were similar across each individual subject area. For example in the Logical-Mathematical area, were students' grades similar? I assigned each student a number that I called the grade variation. Basically, this is the difference between the lowest grade and the highest grade a student achieves in each area. A practical example of this is the grade variation I assigned to Student A in the Logical-Mathematical area. This student received a grade variation one, as the lowest grade achieved here was a C at Honours level and the highest was a B at Honours level; a one step difference. (See Appendix ?) The highest possible number is nine, the lowest zero. My hypothesis is that the highest number will not be reached. If it was, it would mean that students' abilities are not linked over subject areas. The lower this number stays the more it will mean subject abilities are linked. An ideal but improbable figure would be zero. Improbable, mostly because of differences in the marking system of various subjects. For example, traditionally it is harder to achieve an A on a German paper. According to the Department of Education, in 1994, only 1.4% of students entered for the Honours English Leaving Certificate paper, received an A1, while almost twice that number, 2.6% received an A1 in the Honours German paper.[1]

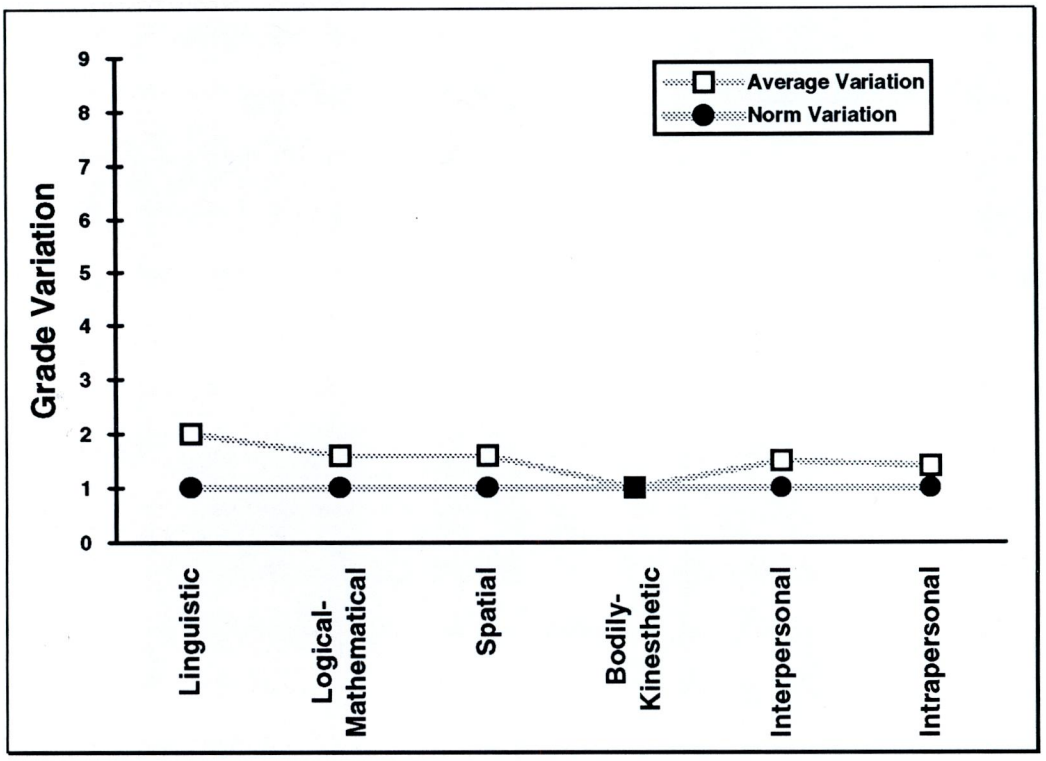
Having found the average variation for each area, I designed a graph to illustrate the result. I also found the norm or the grade variation experienced by most people, (this eliminates any exceptional cases). Both these results are shown on Figure 4.1. This information, i.e. that the range of average grade variation only covers from one to two,

[1] Central Statistics Office, Department of Education Annual Statistics Report 1993-1994,(unpublished data)

and that the range of the norm variation only covers from zero to one (only a small percentage of the graph), proves that there must be some correlation between a persons ability in a particular intelligence area and their performance in various subjects with a strong relationship to that intelligence.

TABLE 4.1

Grade Variation in Various Intelligence areas



This information must be compared to the general subject grade variation. The average figure I found to be 3.5, a marked difference from the 1 to 2 range experienced when subjects are broken down into particular areas. The norm was 2, a significant change from the grade variation of 1 that occurred when subjects were grouped by intelligence area.

How can this information help teachers and students?

If students' strengths are identified before subject choices are made, it might be possible to predict their success or failure. There is a danger though, of students experience being restricted to a narrow range of subject experiences. Educators must ask themselves whether the education system is to prepare students for university

entrance or for life. Unfortunately universities and third level institutes seek high points and good grades only, not the wide breadth of experience which in my opinion would be favourable.

The answers to question two and three back up the results obtained from question one. 83% of student identified their best and worst subjects as coming from different subject areas.

In answer to question four I found that favourite subjects tended to be in the same subject area as their best subject; although their favourite subject tended not to be the same as their best subject.

Question five was an open ended question in order to find the subjects students thought linked with Art. The answers to this were quite varied, the majority being related to practical subjects such as; technical graphics, engineering, construction studies, technology and science, where Art was mainly used to "put ideas on paper", and "to explain things better". Art was also seen as having links with History, "as you study some Artists", and with English because "instead of drawing what you feel or see, you can describe it in words".

The results of question six were disappointing. Students were asked if they saw any links between the logo design project I completed with them and other subjects. The project brief (see Appendix?) was to design a logo for a night-club, to attract science students from a local university. Only one student identified the brief as having links with science, whereas many students suggested that the project was linked with

technical graphics and construction studies! (Which it was not) This suggests that students have problems perceiving real links between subjects even when, in this example, all sources for the project came from science. 18% of students identified Business Studies as being related through marketing. This result I was pleased with as marketing is an important aspect of Graphic and Design.

Question seven also produced some surprising results. Only 61% of students said their teachers used Art when teaching them. Compare this to the result obtained when teachers were asked a similar question. Each one of them thought Art could be linked with their subject in some way. Students said that, or more particularly drawing, was only used "to explain things better".

Question eight was concerned with students' opinions on teachers working together. 50% thought that teachers should work together, students commenting;

- they could give each other ideas and make school more interesting
- teachers should work together so then we would have less projects to do and we could spend more time on one
- it would help us to see how different subjects can interlink
- they can show you different ways of doing things and give different ideas
- there would be different influences and ideas making up the project

50% thought teachers should not work together saying;

- with only one project a student could get bored and lose interest
- you would be repeating the same thing all the time.
- it is good to do different projects

The main fears were ones of boredom and repetition.

The final question asked students for their ideas as to projects they would like to do which would incorporate another subject. Some suggestions were:

- a wooden relief linking Art with Materials Technology (woodwork)
- archaeological art work linking Art with History
- calligraphy written in a different language linking Art and French, German or Irish

Bringing the Theory into the Art Room

Description of the Project

I developed a scheme incorporating various topics from other subjects. The students were to paint a diptych showing "Sorrow and Joy". I encouraged students to think of occasions when they had felt those emotions; perhaps when a pet had died, or they had won a basketball final. After a few preliminary classes looking at the structure of the human figure, we developed a frame. We compared childrens' stick figures to the human skeleton. As part of home activity, students had to draw out a skeleton - thus

creating a link with Biology. We also spent time working out the proportion or measurements with regard to the human figure. We then explored form through figure drawing. Students interest was enhanced by models role-playing various situations of sorrow and joy - creating a link with religion.

Panel One: was to show emotion using images only. Colour was restricted to black and white. History was brought in by students use of historical paintings as a source for a background. English was linked through the use of unusual words, such as 'frottage` and 'chiaroscuro`.

ILLUSTRATION 4.1

Student Artwork: Sorrow and Joy- through black and white

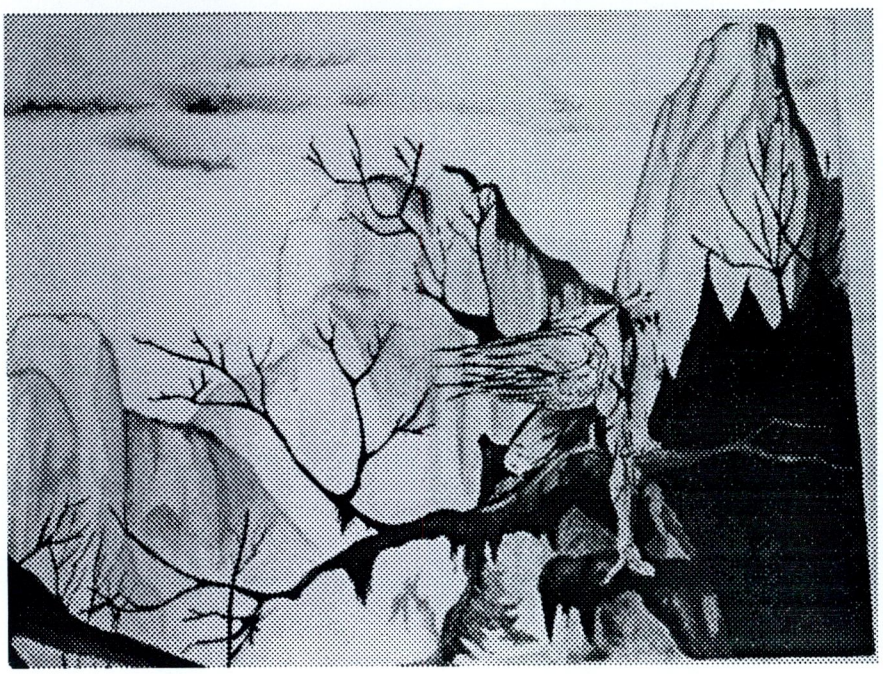
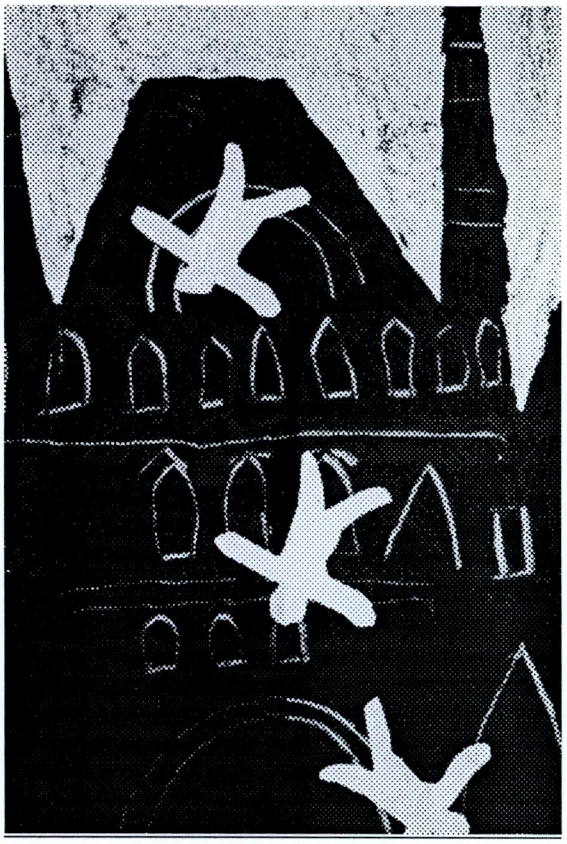


ILLUSTRATION 4.2

Student Artwork: Sorrow and Joy- through black and white



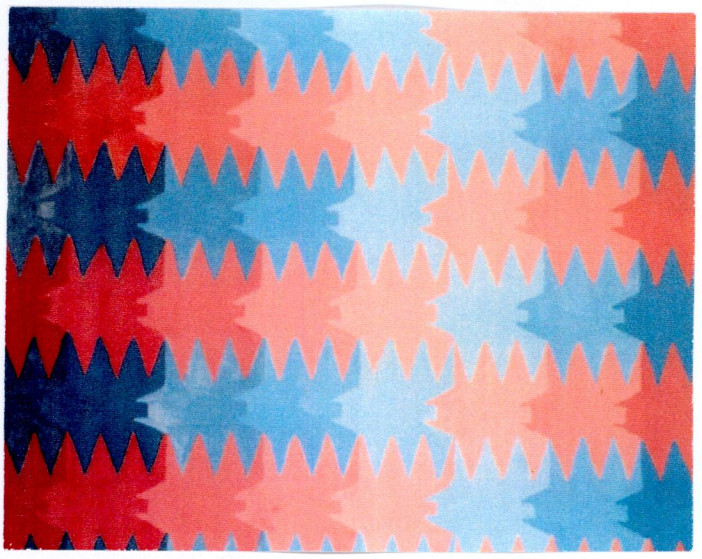
Panel Two: was to portray the same emotion, this time using only colour. They were assisted in their choice of colours by a work sheet where they had to develop a personal theory of colour. Through this, individual involvement in the project was emphasised. Students could say any colour represented any emotion, as long as they could say why. For example; red could represent sorrow because of blood; or joy because of a clown's nose. (See Appendix E) To emphasise colour as important for this particular exercise, I introduced the students to tessellations, which they also study in Mathematics. This enabled students to concentrate on colour and painting techniques. We explored different tones of a single colour.

ILLUSTRATION 4.3

Student Artwork: Sorrow and Joy- through colour

ILLUSTRATION 4.3

Student Artwork: Sorrow and Joy- through colour



Because I looked carefully at the possibility of cross-curricular links throughout the project I managed to cover some aspect relating to each of the intelligences. This should give each student some chance at success in the Art class, they can bring what they know to the Art room and utilise that experience.

Table 4.1

Links between "Sorrow and Joy" scheme and Gardner's Intelligences

Intelligence	Artistic Experience
Linguistic	Symbolism, History of Art, New Vocabulary
Logical-Mathematical	Measuring the figure, tessellations
Spatial	Structure, using a view finder, composition
Bodily-Kinesthetic	Painting techniques, paint mixing, exploration of various media
Musical	Pattern, tones of colour
Interpersonal	Group idea generation, figure drawing, critical appraisal
Intrapersonal	Personal theory of colour, expressing mood and emotion, encouraging self-esteem, critical appraisal

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Through my research I have arrived at a number of conclusions. These can be broken down into two categories; general and artistic.

General

Intelligence is more complex then the single, rather narrow, dimension referred to as the intelligence quotient. Intelligence is, and should be, pluralistic in its definition, taking into account all the aspects needed for the survival and advancement of human society. The education system should value and cater for each and every component needed for this survival, valuing every person's special blend of intelligences. Education should be able to assist the realisation of individual's strengths and be able to minimise weaknesses. In order to achieve this it is essential that all students at junior level have access to the widest range of experiences. In this way students' strengths and weaknesses could be readily identified. At senior level students should be allowed to specialise in certain areas, while at the same time following a general course. The Irish education system caters for these needs well, at least in theory. It recognises the need for specialisation in senior level. I feel it does not adequately value those students whose areas of expertise are not academic. Physical Education, although compulsory can not be taken as a Leaving Certificate subject. Drama or dance, although viable careers, again can not be taken as a Leaving Certificate subject. When asked to name somebody famous or successful, how many of us would straight

away name a linguist, or a scientist? The majority of people would name an actor or a sports-star. Personal success no longer is reliant on the archaic education system. It is changing, but slowly. With the introduction of the new Applied Leaving Certificate I hope will come a wider range of subjects. Why can students not take a driving course at school? This skill is becoming more and more a necessity yet driving licences are increasingly becoming harder to obtain. This subject would cater for those students who have good spatial intelligence and are weak in other areas. It would also improve their self esteem - they are good at an important skill. Success in this area may improve their confidence generally which in turn may affect performance in other areas. The same would go for other intelligence areas. Traditionally logical-mathematical intelligence and linguistic intelligence have been valued more highly then other areas. Howard Gardner would say this is the fault of society, but I feel that the other areas are increasingly valued by society. The problem is that this trend has not yet influenced the education system. How long will the education system take to catch up with the changing needs of society?

I do think students should be given the opportunity to improve on their weaknesses. Teachers can help with the use of cross-curricular links. Students learn better when they are interested in the topic discussed. There are numerous ways, as I have discussed earlier in which cross-curricular links can be created. If a student has a difficulty grasping a particular concept the teacher has to be aware that the concept can be taught in many ways. When teaching map reading, a three-dimensional model could be made where the student could move various objects around. This is related to teaching in a bodily-kinesthetic way or a spatial way. The concept could be described using words; a linguistic way or it could be drawn; in a visual way. In day-to-day

teaching it would be ideal to incorporate as many different possible ways into teaching methodology so teachers can be sure all students are being reached. Of course if one went overboard there is a danger of confusing students.

When choosing subjects students' history of success and failure should play a role. As shown in my research there is a direct correlation between abilities over particular subject areas. Students, mostly do equally well or badly over similar subject areas. I have shown that there is a difference between the general grade variation and the variation experienced over particular areas. To back up this conclusion it would be essential to carry out the same research over a much wider sample.

Artistic

When researching the general literature I discovered that there is no general artistic intelligence but that it is thought that art is actually an amalgamation of various intelligences. I would tend to agree with this as all the artists I know usually excel at a particular aspect of art. One would not talk about someone having a talent for German grammar, for example, they would say that someone was good with languages. In art it is a different story. One would talk about a talented painter, designer or sculptor. The various aspects of Art seem to be more segregated then would be found in other subjects. This is not taken into account in the Art, Craft and Design Syllabus. I agree that at junior level there should be a general course but surely at senior level there should be an opportunity to specialise in some area.

All too often art is cut off from other subjects through a lack of skills on the art teachers part. For example the suggestion by one of my students that a wooden relief be attempted. My knowledge of woodwork is rudimentary at best. My student on the other hand has had four years of woodwork. To help students like these there should be a formal arrangement in schools where teachers can swap skills, advice and equipment. At present it is important that teachers themselves make the effort to improve their knowledge in all disciplines that are ideally supposed to be available to the students. Teachers should also remain open to learning from their students. To encourage this it is important to show appreciation to students when knowledge is shared. Students do not only accumulate knowledge from school, but from their homes also. Nearly every student will be coming from a different background and will have knowledge taken from parents occupations or workplaces that would be of benefit to both other students and teachers. The art room should be a place where it is easy to share knowledge.

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APPENDIX A

Teachers Questionnaire

I would be delighted if you could spare a few minutes to fill in this questionnaire. As part of my dissertation I'm looking at teachers' opinions on subject links. The questionnaire will be totally confidential. No need to put your name. Think carefully when answering each question and when it's completed, please return it to me or leave it in the box marked 'completed questionnaires'.

Thank you for your participation

Natalie Doyle

1. What subject/s do you teach? .....
2. How long are you teaching? 1-4 years ___ 5-9 years ___
   10+ years ____
3. Do you feel your subject/s have links or potential links with other subjects? Yes __ No __ Maybe __
4. If yes, please fill in the table below, to show the subjects with which they link.

Subject/s	Linked with	Slight links with	Not linked at all with

5. In what way do you feel those subjects link? Use the reverse of the page if you need more room.

.....

.....

.....

6. What does the term 'cross-curricular' links mean to you?

.....

.....

.....

7. How important do you think cross curricular links are?

Very Important Important Useful Not Necessary

8. Why do you think so?.....

.....

.....

9. Do you make a conscious effort to create cross-curricular links?

Always Sometimes Never

10. If so, in what way ? .....

.....

.....

11. What different methods could you use to create cross-curricular links between subjects? .....

.....

.....

12. Do you believe that success in one subject may influence another subject? Yes Maybe No

Thank you for taking the time to fill in this questionnaire.

APPENDIX B

Student Questionnaire

1. What results did you get in the Junior Certificate Exam?

Subject	Didn't do	Higher Level Grade	Ordinary Level Grade
English			
Irish			
Mathematics			
Geography			
History			
German			
French			
Spanish			
Home Economics			
Science			
Art			
Business Studies			
Technical Graphics			
Technology			
Other			

2. Which is your best subject? _____

3. Which is your worst subject? _____

4. Which is your favourite subject? _____

5. What subjects do you think link with art, and why?

_____

_____

_____

6. Which, if any, subjects do you think link with the last two projects I completed with you, (a) Painting based on Sorrow and Joy and (b) Logo for Night Club? Why? (a)_____

_____

(b) _____

_____

7. Do any of your teachers use art when teaching you? Yes No

If yes, in what way? _____

_____

8. Do you think it would be a good idea if different teachers worked together on a single project? Give a reason for your answer.

I think different teachers should / should not work together because

_____

_____

9. If you were the teacher in our next project, and you wanted to use a cross-curricular link (where some subjects relate to each other) what would you want to do?

Musical Intelligence

Student	Higher Level		Lower Level		Grade Variation
	Music	Art	Music	Art	
A		B			N/A
B		B			N/A
C		C			N/A
D		A			N/A
E				D	N/A
F				C	N/A
G				C	N/A
H	B	–			N/A
I		A			N/A
J	B				N/A
K		C			N/A
L		C			N/A
M		C			N/A
N		A			N/A
O		C			N/A
P		C			N/A
Q				D	N/A
R				C	N/A

Average Variation N/A

Norm N/A

LINGUISTIC INTELLIGENCE

Student	Higher Level						Lower Level						GRADE VARIATION
	English	Irish	French	German	Geography	History	English	Irish	French	German	Geography	History	
A	D		D		B	C		D					5
B	C	C	B		B	B							1
C	C	B		B	B	B							1
D	A	A	B		A	B							1
E	C	C	C		B	C							1
F	B	B		A	B	B							1
G	C		C		B	E		C					4
H	B	A		B	A	C							1
I	B	A	A	A	A	B							1
J	C	B	A	A	A	A							2
K	C	B	B		A	C							2
L	D	D	D	B	B	D							2
M	C	D	C	B	C	E							3
N	C	C	B	A	A	C							2
O	C		C	B	C	B		B					3
P	D	C	C		C	C							1
Q	D			D				C			B	D	3
R	C	D	C		B	C							2

Average Variation 2

Norm 1

Bodily-Kinesthetic Intelligence

Student	Higher Level				Lower Level				GRADE VARIATION
	Music	Materials Tech	Metalwork	Art	Music	Materials Tech	Metalwork	Art	
A				B					N/A
B				B					N/A
C				C					N/A
D				A					N/A
E								D	N/A
F								C	N/A
G								C	N/A
H	B								N/A
I				A					N/A
J	B								N/A
K				C					N/A
L				C					N/A
M				C					N/A
N				A					N/A
O		D		C					1
P				C					N/A
Q								D	N/A
R								C	N/A

Average Variation 1

Norm 1

Spatial Intelligence

Student	Higher Level							Lower Level							GRADE VARIATION
	Maths	Science	Art	Tech/Graphic	Materials Tech	Metalwork	Technology	Maths	Science	Art	Tech/Graphic	Materials Tech	Metalwork	Technology	
A	C	C	B				B								1
B	A	B	B				B								1
C	B	B	C				A								2
D	A		A				A								0
E	B	C								D				B	5
F	A	B								C					5
G		D					D	B		C					2
H	A	B													1
I	A	A	A												0
J	A	A													0
K	C	B	C				C								1
L	C	C	C				C								0
M		D	C					C							3
N	C	B	A												2
O	D		C		D										1
P	B	C	C												1
Q								D	C	D					1
R		C					C	9		C					3

Average Variation 1·6

Norm 1

Intrapersonal Intelligence

Student	Higher Level		Lower Level		Grade Variation
	Art	English	Art	English	
A	B	D			2
B	B	C			1
C	C	C			0
D	A	A	D		4
E		C	D		4
F		B	C		3
G		C	C		N/A
H		B			1
I	A	B			N/A
J		C			0
K	C	C			1
L	C	D			0
M	C	C			2
N	A	C			0
O	C	C			1
P	C	D			3
Q		D	D		3
R		C	C		

Average Variation 1·4

Norm 0

Interpersonal Intelligence

Student	Higher Level					Lower Level					GRADE VARIATION
	Business Studies		Art		Home Economics	Business Studies		Art		Home Economics	
A			B		C						1
B	C		B								1
C	A		C								2
D	A		A		A						0
E	B							D			5
F	B							C			4
G					C			C			3
H	B				A						1
I			A								N/A
J					B						N/A
K	B		C								1
L			C								N/A
M	C		C								1
N			A								N/A
O			C		C						1
P	C		C								1
Q	D							A		D	3
R	C							C			3

Average Variation 1.5

Norm 1

Logical-Mathematical Intelligence

Student	Higher Level					Lower Level					GRADE VARIATION
	Mathematics	Science	Art	Tech Graphis	Technology	Mathematics	Science	Art	Tech Graphis	Technology	
A	C	C	B		B						1
B	A	B	B		B						1
C	B	B	C		A						2
D	A		A		A						0
E	B	C						D		B	5
F	A	B						C			5
G		D			D	B		C			2
H	A	B									1
I	A	A	A								0
J	A	A									0
K	C	B	C		C						1
L	C	C	C		C						0
M		D	C			C					3
N	C	B	A								2
O	D		C								1
P	B	C	C								1
Q						D	C	D			1
R		C			C	A		C			3

Average Variation 1.6

Norm 1

APPENDIX D

ART- Home Activity

Imagine you are a professional Graphic Designer.
A client, (who will pay you pots of money) wants a new name and logo for his nightclub which opens in 5 weeks.The nightclub is situated near a science university and he wants to attract their custom. So how can you help?

The First Stage

What suggestions can you give for a name?	What images could you use as a starting point for a logo?
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

All your research, mockups, experiments etc. will be presented to the client throughout the project in a portfolio (ie. a very well presented scrapbook)

For the next stage, you will need to bring in images to work from.

APPENDIX E

Development of Colour Theory

Personal Development of a Symbolic Theory of Colour in Art

Many artists / critics / periods developed theories relating to the symbolism of colour in Art. They used colour as a language to help convey their message. Sometimes the public could interpret this language and sometimes it had to be explained.

Some sample theories :

Colour	Van Eyck	Johannes Itten
Red	Light + heat	Square - solid, attacking
Yellow	---------	Triangle - flamelike
Blue	Loyalty, friendship	Circle - inward looking
Purple	Wealth, nobility	Ellipse
Green	Youthful, nature	Spherical Triangle
Orange	---------	Trapezoid
Black	Dignity	----------
White	Purity	----------

Develop your own Theory of Colour
giving *reasons* for your choices.
In particular relate the colours to a *mood or occasion*.

Colour	Meaning	Reason
Red	love + Christmas + warmth	Because red is such a strong colour for love and is cheerful for Christmas.
Orange	heat + warmth	orange is the colour of a blazing fire
Yellow	Easter + new life	Yellow is the colour of the sun as it rises in the morning - new beginning.
Green	fresh Jealousy + nature	alot of nature is green Green eyes are a sign of jealousy
Blue	cold + loneliness	Blue is right and is not a warm colour like red
Purple	Power + importance	Purple is a rich colour
White	clean + marriage	White is right and pure
Black	+ unhappiness Death + funeral	Black is dark and lifeless.

And so says ....Anne Doyle 4Or.....