Continuity and progression in graphicacy

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Continuity and progression in graphicacy

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Abstract

Graphicacy is defined, and both its importance and relative neglect as a research area in relation to literacy and numeracy are discussed. The outcomes of a literature review are presented and the developmental stages of mark-making described, based primarily on research by Gaitskell, Lowenfeld and Kellogg. Supporting and contradictory opinions from a range of authors are brought together and differences noted. Strategies for addressing the emerging research agenda are then discussed, and particularly for the development of descriptors of continuity and progression in graphicacy. A taxonomy for the analysis of graphicacy within curricula is presented, and potential research methodologies for exploring graphicacy within different areas of the taxonomy are then reviewed. Three of these areas: analysis of tasks, co-research and the validation of research outcomes through a Delphi study are discussed in detail.

Introduction

Visual communication is the development and conveyance of ideas and information in forms that can be read or looked upon. The skill required for dealing with visual communication is 'Graphicacy', which is defined as the ability to communicate using still visual images, such as graphs, maps, drawings etc. The power of images has great possibilities and potentials. It can break through the barriers of language and academic status. It can change one's perceptions and decisions. It can be used as a tool for learning and for recording thinking. In our schools' curricula, we find literacy, numeracy and articulacy being the main focus areas across the subjects, placing no substantial efforts towards graphicacy. However, in all subjects, lessons are primarily taught with the use of verbal and visual communication. Despite this, the teaching of understanding and working with different types of images takes up little space in the curriculum.

Graphicacy was first explored in the 1960s by Balchin (1966) and subsequent research was completed in a number of countries. In the 1970s Fry developed a taxonomy of graphs, which was effective at that time but had not been up-dated. The need for such an update is illustrated in

Past research has highlighted the importance of visual communication in a variety of subjects, including the sciences, mathematics, geography and art and design. It also revealed research conducted on gender differences, map reading, cartography, graph reading and other areas relating to graphicacy.

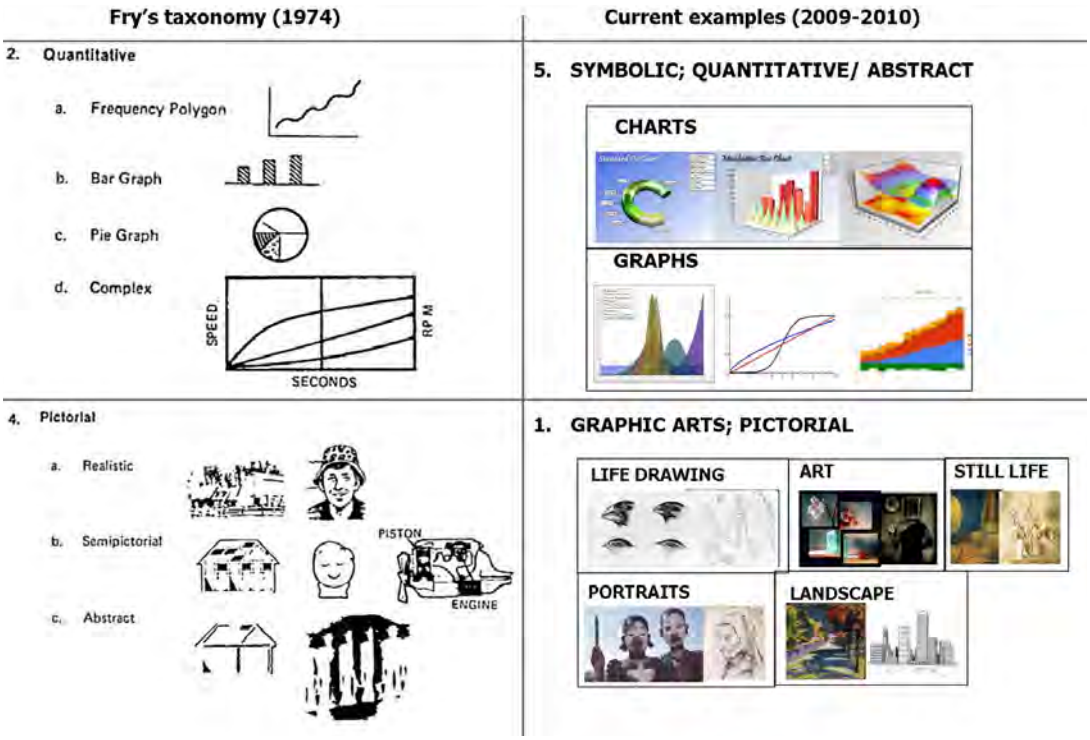


Figure 1 Images from Fry's taxonomy (1974) Vs recent examples

A detailed literature review was conducted and its outcomes are summarised in the first section of this paper. However, it was evident that there had been little advance on the position described below by Kellogg in 1970.

> Teachers are confused by art educators who advise them to approve all child work in order to avoid discouraging further effort, but not to praise work unless it is up to the standard for the age level. Yet nowhere are age level standards defined in a way that is both objective and usable in an ordinary classroom. Thus each teacher's personal taste actually becomes the final measure of age-level achievement
>
> (Kellogg 1970: 152)

Consequently the key focus of this paper is towards making progress on this major research agenda. In order to support practice in this area, it is necessary to work towards answering research questions, such as the following.

- Can a taxonomy of graphicacy be developed that can act as a framework for research in this area?
- How can continuity and progression be defined in any area of such a taxonomy for graphicacy?
- Which research methods can give usable results?
- Can a Delphi study help to validate the outcomes?
- Can co-research support the data gathering?

The later sections of the paper describe progress that has been made towards addressing these research questions.

Literature review

This literature review was conducted to get a general understanding of previous work concerning the development of children's art, drawing and mark-making (outgoing graphicacy skills) and to identify the main stages/levels of visual-spatial ability that children go through.

Development of mark-making and drawing capability

The review revealed the limited amount of information which exists regarding human development and progression in drawing; more specifically, children's abilities to create images. Detailed work was conducted by Kellogg in the 1970s, which describes the stages children go through in drawing, from ages 1 ½ to 8 years old. For older children, other researchers have looked at development and progression in a more generic way, identifying stages covering longer periods of development (2 years and more).

The first stage is often referred to as 'scribblings' or 'random scribblings' and it is considered universally to be a child's first mark. Opinions on the skills required to create these scribbles vary. Gaitskell believes that when children first go though the manipulation stage, their mark making is done in an 'exploratory and random fashion and then to a controlled movement that leads to making art on purpose such as recognizable or nameable objects' (Gaitskell, 1958). Others believe that scribbles 'demonstrate awareness of pattern and increasing eye-hand coordination' instead of just being 'aimless or uncoordinated movements' (Lowenfeld & Brittain, 1987; Kellogg, 1970).

From around 2 years old, children might label or name the scribble before they draw it, and they might change the name later if it reminds them of something different. Kellogg believes that naming the scribbles is the result of adult influence, whereas Lowenfeld believes it to be 'one of the important stages in human development (covering ages from 1 to 4 years old) as it indicates a change of thinking from a mere kinaesthetic to an imaginative' stage.

After the age of 3, children go into the 'Design' stage where they start producing 'Combines' (2 diagrams joined together in one drawing) and 'Aggregates' (3 or more diagrams joined together). These can appear simpler in construction than certain basic scribbles made at a younger age, but they are considered to be more advanced developmentally. They show the child's desire to draw lines in meaningful relationships. Gaitskell (1951) details 10 elements of design: balance, line, mass and space, light and shade, texture, colour, rhythms, movement, unity and centre of interest. At this stage children can include all but light and shade and texture in their drawings. According to Gaitskell, children stay at this stage for about a year, before they start producing drawings with pictorial qualities, which is a position supported by Kellogg. The first pictorial drawing children produce is of a sexless, ageless human figure, followed by flowers, animals, boats, houses and vehicles. Opinions on the 'armless human' vary amongst academics, ranging from it being due to aesthetic values to demonstrating a relationship to mental and psychological factors.

Gaitskell calls all the above stages the 'manipulation stage' which he believes covers ages 1 to 5 years old. Stage two, as defined by Gaitskell, is the 'symbolic stage', recognised by the use of symbols, starting at 3 and lasting until 7, or there

might never be clear progression beyond it. This stage is characterised by the type of drawings Kellogg names as 'pictorial work', where children use fixed symbolic representations for objects, i.e. the circle with short lines around the perimeter for a sun, stick men figures etc. (Gaitskell, 1951).

Gaitskell continues to describe children's developmental stages until the 'mature productive artist' stage. He believes that from as early as 9 years old, students enter the 'realism stage' where they begin to become more critical of their work or express a deep desire to get new knowledge to help them improve. Similarly, Hope (2008) believes that children start feeling dissatisfied with their drawing output as early as 7 years old. Gaitskell believes this is the right time for children to begin learning the basics of art such as direct observation from real life.

The final stage as defined by Gaitskell reflects the 'process used by mature productive artists' (Gaitskell, 1951). Inventiveness and deeper thought are applied in an effort to make specific statements either defined by themselves or others for creative art, advertising or design.

Figure 2 shows Kellogg's and Gaitskell's perspectives alongside that of Lowenfeld. Lowenfeld, Kellogg and Gaitskell all supported the belief that there is an observable order for the development of children's drawing abilities, which relate to age groups, where they adopt recognisable modes of artistic expressions. Kellogg has drawn her conclusions from work conducted over a period of 20 years, with a very large number of drawings having been analysed. Kellogg's studies have been primarily focused around children's drawing development between the ages of 1-8. Kellogg's work has produced detailed phases with clear progression stages; perhaps the most detailed analysis of children's development in drawings between those ages. Gaitskell studied children's art for many years while working closely with school teachers and sought to give some guidelines to help in the teaching and evaluation of students' art. Four main stages were indentified which were based on the type of images created by the child as described above.

Lowenfeld (1947) connected intellectual growth, psychosocial stages and children's drawings to generate six stages for the development of children's drawings. His appreciation of individual's work is largely characterised by interpretations of a psychological nature. He viewed children's art as documents that reveal child personality, instead of as just lines and forms, as was the case in Kellogg's work. He claimed that children's work is either 'visual' or 'haptic', reflecting the child's sense of touch and their muscular and kinaesthetic awareness. His terms describe characteristics that have more to do with matters of character.

Other perspectives on drawing and mark making

The common thread of all of the above positions is that the graphicacy capability of children develops with age, although the viewpoints differ on the period of occurrence of each stage. Luquet (1927) supported the idea that children have an internal model from which they extract knowledge when drawing, which in many children appears to be very similar at similar ages. He also supported that artistic development never develops in one direction or in a constant order due to cultural and educational aspects. Another common view is that children experience some kind of regression phenomena in

regards to their artistic development, which is dependent on their cultural, social, mental and physical growth (Luquet 1927, Lowenfeld 1947).

Harris' (1971) research on children's basic scribble patterns supports the above idea. The 20 scribbles identified by Kellogg, which are described as a universal propensity in scribble patterns with the growth of children's motor skills, were used for this research. Harris found that tendencies differ depending on culture and society, and not incidentally, drawing experience. According to Harris, some native people (the South American Andes Indian, Bedouins from the Sinai Peninsula, and Kenyan children) tend to skip to drawing figures without the process of diverse scribble patterns. Balchin (1966) also believed that it is possible for children to 'skip' some of the initial stages (random scribbling, scribbling, simple diagrams etc.), if the child did not have the opportunity to create marks at the appropriate age and yet be able to create drawings fitting in the 'correct' stage for their age. However, Kellogg states that 'the opportunity to scribble freely has meaning for two critical operations of intelligence: reading and writing' (1970:262).

When finding similar aged children across different cultures creating different types of drawings, Golomb (1992) hypothesised that differences of representation in children's drawings may come from the difference of aesthetic to which children are accustomed.

Another controversial view exists around children's abilities concerning the use of style when drawing. Winner (1982) supported that children between the ages of 6 to 10 do not have the ability to express mood with colour or lines. He felt children at that age were oblivious to different ways and styles of drawing and felt their drawings were accidently created. Arnheim (1974) agreed with Winner's view and claimed that there was no certain evidence showing children using or having advanced intellectual concepts which are needed for abstract thinking of symmetry, proportion or rectangularity. Many authors such as Kellogg (1970), Schweizer (1999), Edwards (1993), Harris (1971), Gardner (1980), Silk & Thomas (1990) and Lowenfeld & Brittain (1987) disagree over this issue of style and emotional expression.

Freeman (1980) found that young children (below 8 years old) produced drawings that emphasised known facts about the object, whereas older children could draw objects as they were set in front of them correctly illustrating their viewpoint. Hope (2008:100) believed 'that children start from their own viewpoint and only later create powerful generalisations about the world since under the schema'. Piaget believed that young children are self-centric as they understand things from their point of view and do not have the ability to sympathise with an adult's perspective.

It is fair to say that there has been significant research with younger children, but that there is little agreement regarding the influences of 'nature' and 'nurture'. There are corresponding uncertainties about the reasons children often appear to lose interest in spontaneous art activities by the age of 7 to 9 years old and the effects on children of premature instruction. There has been little research with older children.

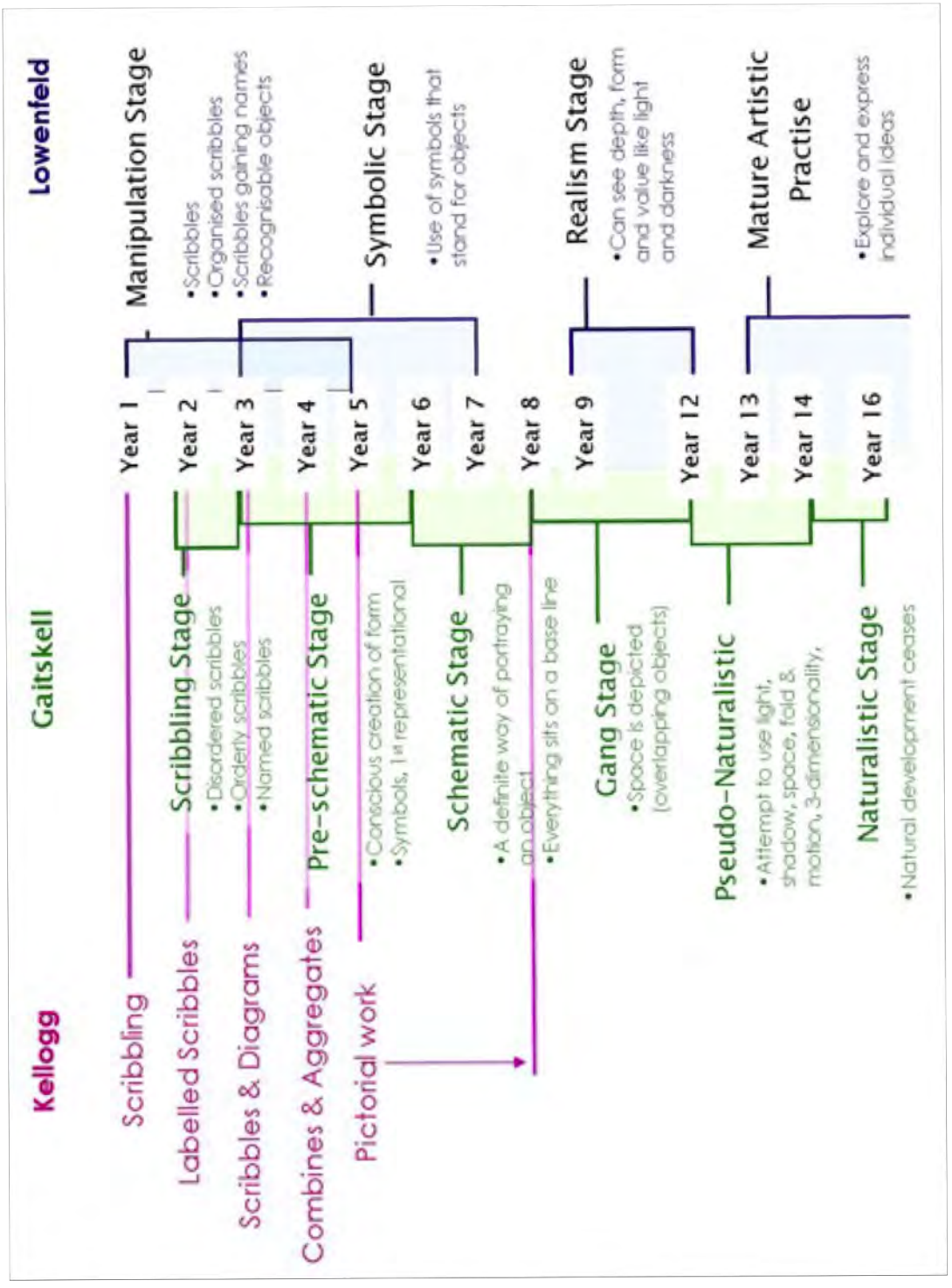


Figure 2. Kellogg, Gaitksell and Lowenfeld's developmental stages

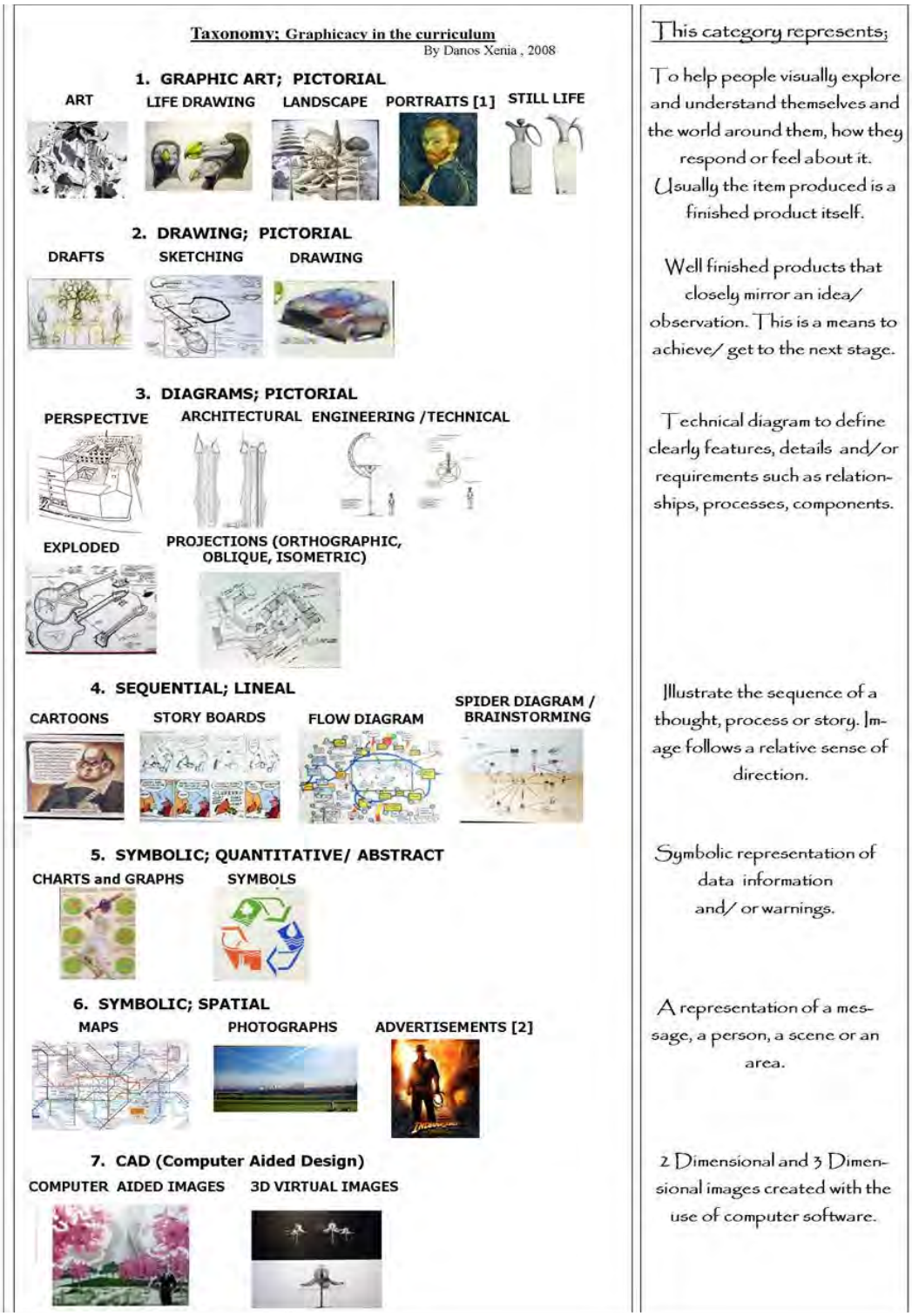


Figure 3. A taxonomy for graphicacy

Research strategy for exploring continuity and progression in graphicacy

Making significant progress in such a large research area depends crucially on taking a systematic approach. Consequently a taxonomy of graphicacy for use as an analytical tool within research in secondary education has been developed from both literature reviews and analyses of image use in school curricula (Danos & Norman, 2009; Danos & Norman, 2010).

Three case studies based on the analysis of textbooks have been conducted in secondary schools in Cyprus, the UK and the USA. The main purposes of the studies were to identify graphicacy across the curriculum and to test the taxonomy from an inbound perspective as used within secondary education. Furthermore, the study identified the subject areas related to particular aspects of graphicacy (Danos & Norman, 2010) and has indicated that graphicacy is very widely used in all the subject areas analysed. Curriculum links were also identified (Table 1), as well as common teaching and learning purposes across the curriculum (Table 2).

Research methodology

The taxonomy of graphicacy is composed of 24 areas which need investigating to define continuity and progression. This study will be focused on Key Stage 3 (KS3). A range of different methods could be adopted to establish the descriptors for each area:

- Analysing tasks
- Analysing books
- Observing teachers
- Interviewing teachers
- Focus groups
- Co-research
- Delphi study

It would be expected that teachers have significant tacit knowledge and expertise in relation to graphicacy and that this could be embodied in the tasks they set and the textbooks they influence. It would be expected that aspects of such knowledge could be captured by direct analysis, and could be confirmed through observations, interviews, focus groups or a Delphi study. These possibilities are explored here by discussing the analysis of tasks and a Delphi study. The further possibility of co-research to accelerate the process is then presented.

From the pictorial, sequential, symbolic and CAD categories	From the additional category entitled 'Other'
Gain familiarity and place new knowledge into context Support embedding new knowledge Provoke interest Spark conversation Illustrate students' ideas, knowledge and understanding Image used for visual stimulation Visual representation of information/data Test students' knowledge Test students' understanding Exploration, research, understanding	Organise information Learn through play

Table 2. Common learning and teaching purposes relating to all areas of the taxonomy

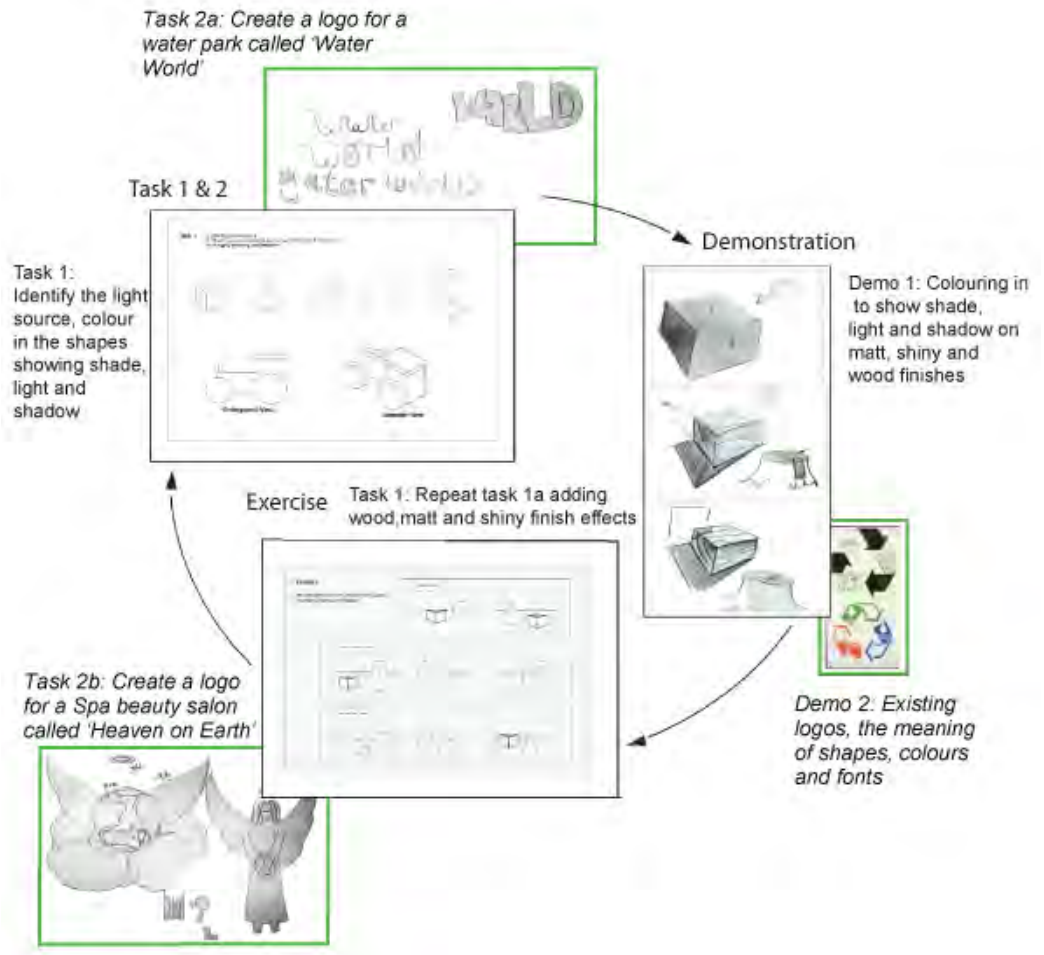


Figure 4. The sequence of the lessons for rendering (task 1; typed in normal font) and symbolic representations/ logos (task 2; types in italics)

Analysing tasks

This methodology has been developed and trialled during a case study completed at Loughborough University (Danos et al., 2010). A group of 24 Year 10 students (around 14 years old) took part in a workshop designed around the students' academic needs. The students were in their first year of GCSE, studying product design, resistant materials or graphic products. Three areas of the taxonomy were looked at during this study, to develop and finalise the methodology. These were:

- Pictorial (category): Drawings (subcategory): *Perspective*[2]
- Symbolic (category): Abstract (subcategory): Symbols - *logo design* (Figure 2)
- Pictorial (category): Art (subcategory): Life drawing – *rendering* (Figure 2)

The methodology followed for each session (for each area of the taxonomy) was designed in a similar manner (Figure 4).

[2] The focus of the tasks set in the particular area of the taxonomy are shown in italics

1. In order to create an individual record of progression for each student, students were asked to complete a task before the theory was delivered on any technique. They were told what to do but no explanation was given on how to do it.

2. Theory along with demonstrations and exercises were delivered, and students practised implementing the new knowledge. The exercises increased in difficulty and complexity as the session went on, to ensure gifted and talented students were equally challenged. This also provided some indications towards the limitations of skills and abilities of that group of students.

3. A final task was given in a similar way as the initial task, to complete the individual records of progression. Analysing data: Completed tasks were scanned and the originals returned to the students with relevant feedback on future progression goals. The virtual copies were saved by replacing each student's name by a code identifying the relevant session, task number, year group, date of completion, gender and number of participant. Once the comparative analysis between students' work was completed, a list of descriptors for continuity and progression was drawn (Table 3). The number of students achieving each descriptor was then counted in order to explore the possibility of sequences in the data.

Rendering list descriptors			
	Students' work		
	Student 1		
Tasks	1a	1b	1c
Identify a light source	/	/	
Rendering			
All visible surfaces coloured in		/	
All visible surfaces coloured in using the correct tone	/	/	
All visible surfaces coloured in using the correct gradient		/	
Gradient of colour applied in a smooth form where appropriate		/	
Shading to suggest the correct form/ shape of the object			/
Shading drawn to suggest a specific finish i.e. wood, matt, shiny	n/a	/	n/a
Shadow			
Shadow added		/	
Shadow added at the correct direction		/	
Shadow coloured in using a gradient			
Shadow coloured in using the correct gradient			
Shadow added to suggest the correct form of the shape		/	
Shadow added correctly according to the distance of the light source			

Table 3 Rendering: analysis of students' work

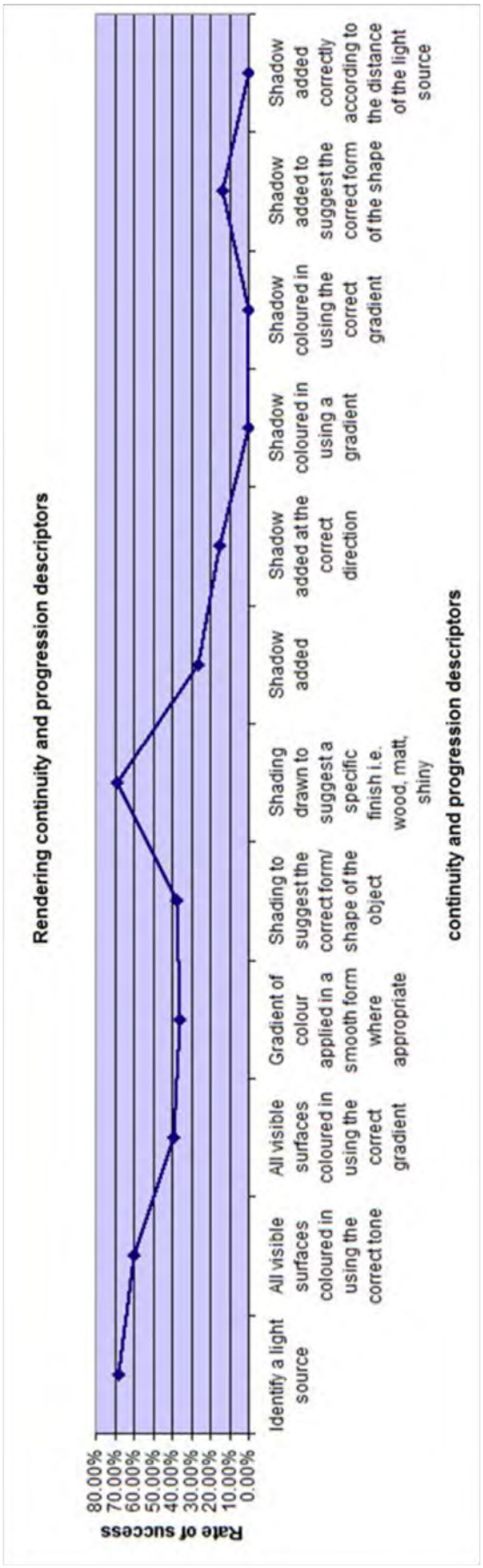


Figure 5. Rendering: rate of successfully completed level descriptors

Figure 5 illustrates the progression descriptors of the students according to the descriptors for a rendering task, indicated during a pilot study (Danos et al., 2010).

The case studies have established this as a successful methodology for the research.

Delphi technique

The Delphi method is considered to be a systematic interactive forecasting method formed by a group of experts, 'effective in allowing a group of individuals to solve complex problems' (Linstone & Turoff, 1975:3). It is based on the assumption that group judgments are more valid than individual judgments. Experts are asked to give their opinion (otherwise known as 'forecasts') on the issue at hand, which is clearly explained in an appropriate form, varying from questionnaires to open questions. Answers are collated; processes and any irrelevant comments are filtered out. Common and conflicting

A collaboration with a secondary school has been developed to enable other areas of the taxonomy to be studied. Current schemes of work have been analysed, covering the subject areas of graphic products, resistant materials, systems and control, textiles, food technology, art and ceramics and appropriate tasks developed. viewpoints are identified. The outcome is then sent back to the experts who comment on their own forecasts, the responses of others and on the progress of the panel as a whole. Results are processed again by the panel director and sent out for further review (Figure 6). This avoids the negative effect of face-to-face panel discussions and solves any group dynamic issues. Usually all participants maintain anonymity which allows them to freely express their opinions and encourages them to openly critique and admit errors by revising earlier judgments. Participants were mainly from UK, Cyprus and the USA.

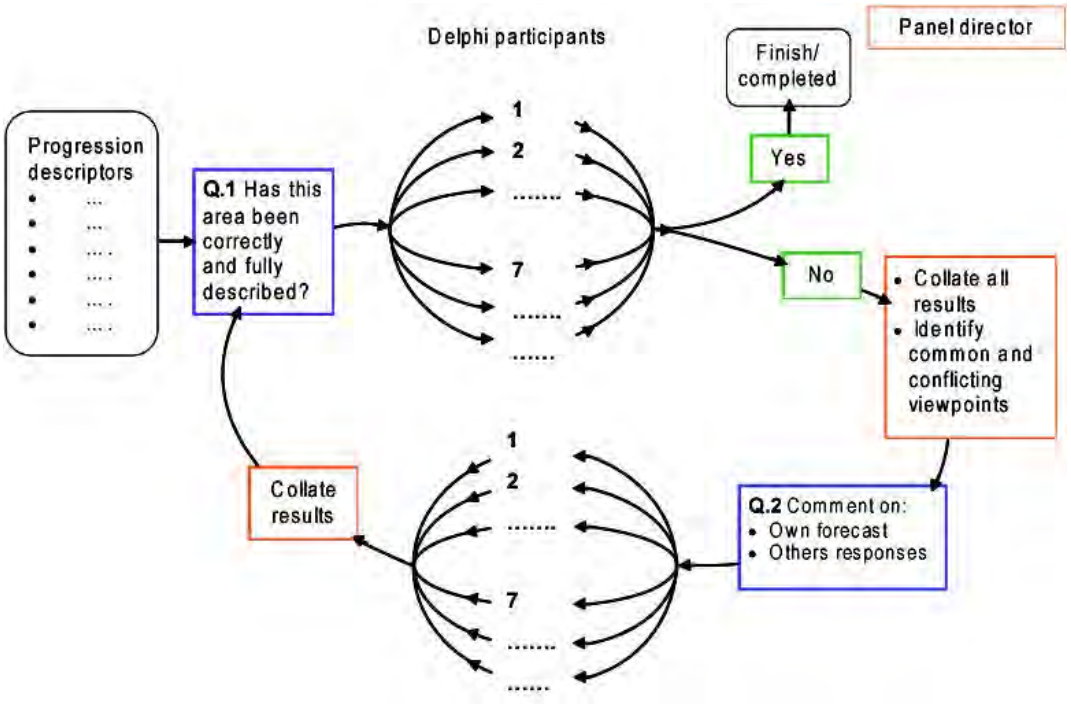


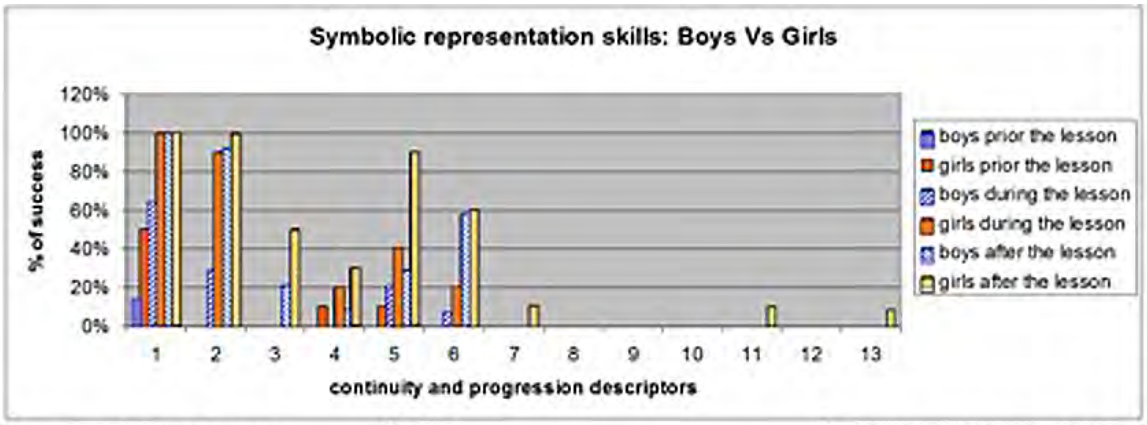
Figure 6. Visual representation of the Delphi technique

Co-research

The initial pilot studies on defining level descriptors brought to the surface the time requirements and dedication needed to achieve accurate and detailed results of continuity and progression level descriptors of graphicacy. For this reason, the possibility of working with other researchers in order to investigate some of the areas has been considered and deemed appropriate. The areas to be studied using this method were chosen according to the possibilities available at the time a co-research partnership developed.

Working with other researchers while the author was still focused on this study had the advantage of helping and guiding the interested researchers in pursuing this area. This allowed co-researchers to produce reliable results in a form that could be used and collated with this project. PGCE[3] students were targeted for co-research since they were required to undertake action research as part of their teacher training programme (Danos et al. 2010). This was used as a pilot study to test this methodology. In some instances, results from this co-research failed to capture the necessary depth of detail required; in others, the data were incompatible. However, new ideas were generated for tasks as well as identification of possible issues that could be looked into in the future (Figure 7). For example gender differences, age, punctuality etc.

Co-research could be organised to gather data on graphicacy within school curricula as well as to facilitate graphicacy audits as indicated in Figure 8. Through such a scheme, sufficient sample sizes for statistically determined levels of student performance could be established. These could be based on either teachers' experience or expectations, or from actual results taken form student's work.



Continuity and progression descriptors
YEAR 7
1. Understand what logos are and why they are used
2. Understand that colour conveys meaning
3. Addresses the intended message using words
4. Can say if they like/ dislike the logo and why
5. Can identify the type of logo
6. Addresses the intended message using colour

YEAR 8
7. Will only use bright colours to make logo 'fun' or 'eye catchy'
8. Has good composition
9. Can use colour to suit mood , age range etc
10. Uses imagery in correct way to address intended meaning
11. Can identify the purpose of the logo
12. Will change word layout to make logo different

13. Will change/ add images to make logo different
YEAR 9
14. Shows that fonts can address the intended meaning as well as/ instead of colour
15. Can fully justify the type used
YEAR 10
16. Takes into consideration negative space
17. Has hidden or witty meaning

Figure 7.
Symbolic representation skills; Gender differences (adapted from work by Sam Lyne)

[3] Postgraduate Certificate of Education

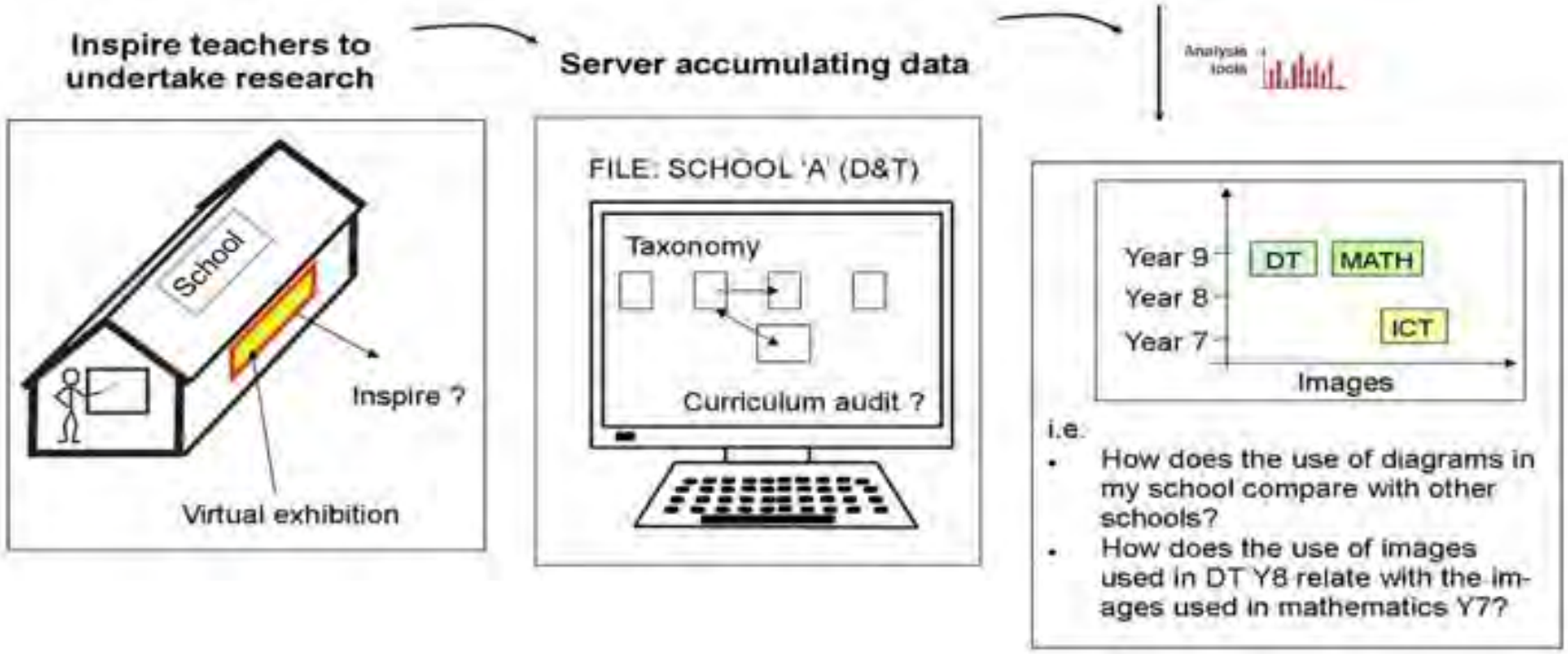


Figure 8. Co-research: gathering collectively information

Concluding discussion

Detailed work has been found in regards to early childhood mark-making and drawing development, with well-defined and described stages drawn from research. Academics, scientists and other authors have described stages children go through during the years from 11 -14 covering different aspects of development, but the information found has been rather vague. Detailed work focused on that age range could be very beneficial to both educators and the research community.

The literature review suggests a lack of understanding and clarity as to where nature stops and nurture takes over. Strong indications are provided however, as many authors agree that around the age of 8 years old children have to 'make an effort to learn how to draw', or else they 'give up drawing'. This might be a primary reason as to the reason developmental stages and progression becomes very vague around and after that age. However, no empirical evidence has been found to support the above view.

Some of the key areas of agreement within the work reviewed were:

- the progressive direction and artistic ability of children develops with age
- children have an internal model from which they extract knowledge when drawing, which in many children appears to be very similar at similar ages.
- artistic development never develops in one direction or in a constant order due to cultural and educational aspects (Luquet (1927), Lowenfeld (1947), Harris (1971))
- it is possible for children to 'skip' some of the initial stages such as the random scribbling and simple diagrams. (Harris (1971), Balchin (1966), Golomb (1992).
- children (below 8 years old) produced drawings that emphasised known facts about the object, whereas older children can draw objects as they are set in front of them correctly illustrating their viewpoint
- Piaget believed that young children are self-centric
- children lose interest in spontaneous art activities by the age of 7 to 9 years

Some significant contradictions found within the work reviewed were:

- children between the ages of 6 to 10 do not have the ability to express mood with colour or lines. There is no evidence to suggest that children can use or have the advanced intellectual concepts which are needed for abstract thinking about symmetry, prop-ortion or rectangularity (Winner (1982), Arnheim (1974), Kellogg (1970), Schweizer (1999), Edwards (1993), Harris (1971))
- the hypothesis that differences of representation in children's drawings may come from the difference of aesthetic to which children are accustomed (Golomb (1992).

The literature review has revealed this to be a research area in need of major efforts and systematic approaches. A taxonomy for the analysis of graphicacy has been presented and the outcomes of its use in 3 case studies in schools in Cyprus, USA and UK have been noted. Cross-curricular links as they emerged from the case studies were described, along with common teaching and learning purposes for which the images were used. The most pressing need seemed to be for identifying continuity and progression (CaP) descriptors for graphicacy and a number of research methods suggested.

Task analysis has been piloted and demonstrated to be an effective approach for developing CaP descriptors. Co-research has also been piloted and, although it did not result in further CaP descriptors, its potential for providing greater reliability for the findings was evident. Data could be collected through these and other methods, such as observations, interviews and focus groups, and its validity significantly increased through a Delphi study. As there is a great deal to be done to make inroads into the research agenda, research methods that allow researchers to collaborate and share their findings need to be established.

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