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ABSTRACT

An ethnographic study documented and analyzed the idiosyncratic symbols kindergarten children employ to encode their experiences in the domains of mathematics, music, and visual art, in order to identify any patterns in use and meaning. In the area of mathematics, children were given common objects and asked to sort them. Four categories of sorting were found: idiosyncratic, material representation, idea representation, and conventional symbolic. In the area of music, children were given freedom to choose in music making. Five categories of notations were collected: exploration, representation of instrument, representation of instrument with some reference to musical elements, representation of gesture, and symbolic representation. In the area of visual arts, children were given the freedom to choose whether they painted. Structural characteristics found included exploration, topology, pattern, and pictographic representation. In each area, specific patterns emerged. In mathematics and music, children's use of symbols appeared to be linked to the representation of materials within the specific context. In the visual art portion, symbol use appeared to be context-free. The data indicated that as children become more experienced in their responses, their recordings become less context-bound and more concerned with ideas and concepts. (Author/SD)

CHILDREN'S IDIOSYNCRATIC SYMBOL- MAKING

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ABSTRACT

The research reported in this paper aims to map the ways in which young children use idiosyncratic symbols to encode their experiences in the domains of mathematics, music and visual art. These symbols may be viewed as vehicles for conveying meaning and are precursors to the development of the culturally agreed symbol systems of the adult literate world (for example, music notation, mathematics). Specifically, the project aims to document and analyse the idiosyncratic symbols children employ across a range of curricular contexts in order to identify any patterns in use and meaning.

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INTRODUCTION

In this paper some of the ways in which young children use idiosyncratic symbols to encode their experiences in mathematics, music and visual art will be identified. Children's idiosyncratic symbols may be viewed as vehicles for conveying meaning and are precursors to the development of the culturally agreed symbol systems of the adult literate world in these fields. Specifically, the project aims to document and analyse the idiosyncratic symbols children employ across these curricular contexts in order to identify any patterns in use and meaning.

In recent research in children's methods of representation there is a tendency to rely on the analysis of children's symbols generated from their attempts to represent received adult meanings rather than their attempts to encode personal meanings. For example, in music, Davidson and Scripp, 1989; and in the visual arts Winner 1989; and in mathematics, Hughes, 1986. Theoretical discussion of symbol-making should originate from the perspective of children and their developing understanding of a shared peer and adult world. Increasingly it is recognised that children are both shaped by their world and are actively involved in the shaping of that world.

The issue of children's symbol making has been a focus of academic study for many years in particular in the area of visual arts (Lowenfeld 1947; Goodman, 1976; Gardner, 1980; Wilson & Wilson, 1982; Gardner & Perkins, 1988), language (Ferreiro & Teberosky, 1982; Schieffelin & Gilmore, 1986; Schickedanz, 1990), music (Bamberger, 1982; Davidson & Scripp, 1988;) and mathematics (Reeves, 1986; Del Campo & Clements, 1987; Pengelly, 1988). These studies have arisen in response to a desire to more fully understand the developmental progression from childhood to adulthood. Within the national documents The Arts - A Statement for Australian Schools (Curriculum Corporation, 1994), specifically in the areas of Music and the Visual Arts, the issue of children's symbol use, both invented and conventional, has been highlighted as important in children's conceptual development.

Teachers tend to respond more positively to children's attempts to use conventional symbols and reinforce these attempts (Freeman, 1980). As a consequence, little attention is paid to child-derived symbols and the meanings children convey through such symbols.

> Although attention has been drawn to young children's non-representation as a stage of development of considerable importance ... in curriculum construction spontaneous pattern making has been overshadowed by the emphasis on representation by children. Pattern making is of course included in art curricula; however it is either taught by drawing the child's attention to patterns in the environment, which are then copied in some way, or taught by the use of visual devices. In general, spontaneous pattern making is not incorporated (Booth, 1982, 1).

A greater understanding of the culture of childhood and the diverse nature of the ways in which children express themselves should inform educational practice. Current approaches to curriculum, teaching and learning tend to promote a hegemonic tradition which favours the reproduction of adult conventional symbols (Gentle, 1984; Hurwitz & Day, 1991). Through such an emphasis teacher's attention is drawn away from the creative pathways

available to children. In this project the researcher's have attempted to document patterns of children's idiosyncratic symbol use generated in response to open-ended challenges as a means to highlighting the importance of encoding experience.

RESEARCH DESIGN

The research was naturalistic in design and focussed on the collection of data within a kindergarten classroom setting. The decision to use a naturalistic design was based upon the need to observe children working in their normal classroom situation.

ETHNOGRAPHIC CONTEXT

The study was conducted in a kindergarten with all children enrolled in a program consisting of two full days per week. The kindergarten is situated at a district school (K-10 campus), situated in a small rural town approximately twenty-two kilometres from the nearest city centre. The children come from a heterogeneous socio-economic background. The backgrounds of the children's parents range from professionals to blue-collar workers, and people involved in primary industries. Parental/guardian consent to participate in the study was sought and obtained for all children enrolled in the kindergarten.

Twenty children are enrolled in the kindergarten. The age of the youngest child at the commencement of the study was four years and ten months. The oldest child was five years and nine months. There are nine boys and eleven girls in the kindergarten. The kindergarten is staffed by a full-time teacher and one teacher's aid. The kindergarten operates on a model where children are encouraged to make decisions independently concerning their participation in classroom activities. At times the teacher directs individual children to participate in activities. However, this was not a strategy employed by the researchers.

THE METHOD

The researcher's visited the research site once a week over a period of eight weeks. Visits always occurred at the commencement of the kindergarten session on Monday mornings. Each of the researchers worked with either individuals or small groups of children within the classroom setting. Children were invited or freely chose to work with one or more of the researchers in each session. The decision to work in this way was based on a desire for the children to perceive these experiences as a component of their usual school experience.

Children were offered opportunities to manipulate materials in mathematics, music and visual art with a common focus on the production and representation of pattern in these fields. For the purposes of this study pattern is defined as: an event in which two or more elements are presented in relation to each other and repeated at least once.

Three researchers were involved in the study and children's symbol-making in mathematics, music and visual arts were the focus of the study. In the following section of the paper each of these areas are addressed in turn.

MATHEMATICS

Materials
Children were provided with a range of "natural" materials (non specific focus) including pine cones, shells, ice cream sticks, corks, leaves etc. These materials were chosen in preference to "commercial" materials (specific focus) because the natural materials have more open-ended uses than more structured materials. Paper, texta pens and crayons were available for children's use at each session.

Procedures
The researcher was present in the classroom to work with children on Monday mornings between 9 and 11am. Materials for patterning activities were left on a learning centre for children to use at other times during the week, as mathematical experiences focussing on pattern were made available to the children as part of their daily activities. Children were free to choose to interact with the patterning materials and researcher.

Most of the patterning work with researcher occurred on a large carpet mat outside the classroom on a covered patio. This area was chosen because it enabled children to continue patterns across the space without interfering with other children's activities.

Instructions
Children were initially asked to explore the materials and to find a way of sorting the materials into groups. It was important to establish children's willingness to participate in the experiences and to appraise their understanding of the individual characteristics of the materials. The researcher believed that if children were unable to complete a simple categorisation task they would be unlikely to successfully select and use materials to represent pattern. It was also important to have the cooperation of the children because any form of complicity may have effected the quality of the work in terms of the commitment children may make to the patterning experiences.

On subsequent visits, individual children worked with the researcher exploring linear patterns. The researcher engaged children in conversations about patterns to ascertain their understanding of the concept. The researcher then made a simple two element pattern with three or four repeats. The researcher vocalised the pattern as it was being constructed (eg. shell, stick, shell, stick). Children were asked to continue the pattern and then describe the pattern by vocalising each element from the beginning to the end of the pattern. Children were also encouraged to touch each element as it was described. This process helps children to see and hear the pattern using their whole body. Children were generally provided with three or four opportunities to construct and share their patterns during each visit.

As this project had symbolic representation as its focus, children were requested to record their constructed patterns on paper each session. Most children understood the term record because the three researchers had been using the term consistently to describe any form of visual representation of the ideas being manipulated.

Further challenges were offered to children on subsequent visits depending on the understanding which had been previously displayed or communicated to the researcher.

Those children who demonstrated an understanding of the nature of the elements of the pattern were subsequently prompted to make a three (four or five etc) element pattern. The same procedure was used as described above, with the researcher beginning the pattern and requesting that children continue the pattern. Children were encouraged to construct their patterns using many repeats. The researcher modelled this process and verbally suggested that children may like to make their patterns go from one end of the mat to the other, or from one focal point in the environment to another.

Children who displayed confusion about their patterning were simply asked to repeat the types of procedure used in the initial visits, with the researcher constructing a 2 element pattern for children to continue.

Data Analysis

A number of categories have emerged from the work undertaken in mathematics with the children. These categories are detailed below.

1. Exploratory (Idiosyncratic)
Children's responses may be categorised as Exploratory or Idiosyncratic when their representations appeared to be meaningless to the context in which they were working. These recordings are characterised by a seemingly meaningless arrangement of marks on the paper.

2. Pictorial (Material representation)
This second category was characterised by children's use of symbols which represented the materials being manipulated. Children produced these recordings in two main ways. Children either arranged their materials on the paper and traced around them, or drew freehand representations of the material showing one-to--one correspondence of materials and recording symbols. Some of the Pictographic recordings were done in mono colour, others in several colours and others showing a relationship between colour, symbol and the pattern constructed.

3. Pictorial (Idea representation)
The recordings in this category are those in which children have used symbols to represent the material, without the reference to a direct representation. For example, recordings which used symbols such as strokes and circles to represent a two element pattern would be classified as Iconic because the symbols do not relate to any perceived quality of the material, the symbol represents the relationship between the elements.

4. Conventional Symbolic
Recordings classified as Symbolic are those where children used a symbol such as a numeral or word to describe the pattern in terms of its identifiable features, rather than describing the relationships and organisation of the elements.

MUSIC

Procedure
The basic procedures consisted of:

1. giving each child freedom to choose to participate in music-making and the notation of sound patterns.

2. collecting all the notations produced by each child during the research period.

3. allowing each child to select instrumentation and recording materials.

4. requesting each child to 'make up' or 'compose' a pattern.

5. requesting each child to find a way of recording or 'writing down' their pattern.

Materials

1. Instruments: A selection of tuned and un-tuned percussion instruments were made available to the children. This consisted of: agogo bells; 2 triangles; 2 sets of claves; small cabasa; tambour; sleigh bells; wooden tone-block; castanets; and small maracas.
2. Paper: Cartridge paper was available at each session.

3. Oil Pastels: Oil pastels were available at each session.

Setting and Presentation of materials
Music experiences were available to the children every Monday morning from 9am until 11am. The instruments were placed in a large basket and placed in a comfortable corner of the room with ready access to paper and oil pastels.

Children initiated the music experiences through moving to the music area and selecting an instrument to play. Within the music area there were sufficient instruments and room for four to five children to work simultaneously. Generally the maximum number of children working on the music task at any one time was two to three. A number of children in each session requested to make a number of patterns, choosing to work with a range of different instruments. Those children who wished to continue working in music during the session were encouraged to do so.
Instructions
At the commencement of each music interaction each child was invited to explore the instruments. During this experimentation time children were encouraged to extend their exploration beyond the conventional ways of producing sound on the instruments. As none of the children in the class had previous experience with musical instruments, the researcher considered it essential that a significant amount of time be devoted to exploration and familiarisation experiences. Children were then encouraged to engage in a short 'question and answer' exchange using the instruments. Through this exchange the researcher modelled different ways of producing sound on the instruments, and addressed the musical elements of dynamics (quiet, loud, crescendo, diminuendo), duration (long and short sounds

and silences), pitch, where relevant (high and low pitch on the agogo bells), and tone colour (ringing and damped sound). These exchanges were not rhythmically organised into specific metres or phrase lengths, rather, it was intended that children be introduced to the palette of sounds available to them on the instruments.

After these exploration and familiarisation experiences, children were then asked to 'compose, or make up' a pattern of sounds from those they had discovered on their chosen instrument. Children were then asked to perform the pattern several times. When the children were satisfied that they had established the pattern in sound, they were then asked to 'write down the pattern'. On completing this task children were then asked to perform the pattern again. On occasion the researcher would then ask the child if she could play the pattern. On being given the child's consent, the researcher would take the child's instrument and perform the pattern from the notation. At times, the child would correct the performance, and discuss the notation, demonstrating which sections of the notation represented specific sounds.

As each child completed a notation these were collected and annotated.

Data Analysis

A number of categories emerged from the notations collected. These are detailed below.

1. Exploration

A number of notations consisted of random explorations upon the paper in which there was little discernible relationship between the sound event, and the recording of that event.

2. Representation of Instrument

A number of notations consisted of simple representations or sketches of the instrument. In one case, the child's strategy for recording was to place the instrument on the paper and trace around it. This strategy was employed by that child on three separate occasions. Children who chose to record through representation of the instrument were able to relate the sound event to the process of recording that event. However, there is little evidence that these children were able to record the musical elements of that sound event.

3. Representation of instrument with some reference to musical elements

A development from simply depicting the instrument was to sketch the instrument a number of times, varying the size of the representation. For example, one child notated a pattern of loud and quiet strikes of the triangle by drawing a large triangle and a small triangle. A similar strategy was employed by another child to represent the difference in pitch of the agogo bells (that is, a large sketch of the instrument for the 'bigger' or lower pitched bell, a small sketch of the instrument for the 'smaller' or higher pitched bell). For these children, their method of recording the sound event displays some awareness of differences in sound (be it a difference in duration, dynamics, pitch or tone colour), and a desire to record that difference in some way.

4. Representation of gesture

A number of notations were produced as a result of imitating on paper the gestures involved in performing the pattern. For example, a pattern of alternating tremolos and single strikes on the maracas was depicted as a jagged line, followed by a series of dots. There is some correspondence between this strategy and notational strategies used by contemporary adult composers. For example, the notation of artificial harmonics is derived from a depiction of the action needed to produce the sound, rather than a depiction of the sound itself., This is achieved by referring to the placement of fingers on the instrument, rather than the identification of specific pitches. Whilst children who have recorded in this way seem to display an understanding of differences in sound quality, it is not clear if their intention was to record the quality of the sounds or the action by which the sounds were produced.

5. Symbolic representation

A number of notations consisted of patterns of symbols such as vertical lines, circles, dots, triangular shapes, with each shape representing a different sound. At times varying sizes of symbol were used to represent changes in the musical qualities of dynamics and pitch. For example, the majority of children represented changes in duration of sound through drawing lines of varying lengths. At times these were depicted horizontally, at other times, vertically. For these children the musical qualities of the sound event were a focus of the notation, as they attempted to record patterns of sound in which variation in these qualities were demonstrated.

Another version of this strategy was to create a distinct rhythmic pattern of three or four beats that was represented by a single symbol. This symbol was subsequently varied to represent a pattern of performance on different parts of the instrument.

In addition to the above categories, one child drew a pattern of alphabetic letter names in which the letter 'W' always represented the rhythmic pattern of paired quavers and a crotchet. All other letter names represented single crotchets. This particular child appeared to be using the letter names as a nemonic device for recording the duration of sounds.

Generally, when children were asked to play their sound event from the notation, there was a significant correspondence between the original event and the post-notation performance. This may be attributed largely to the children's capacity to remember the sound event. However, in one case a child selected her notation from a previous session (two weeks before), selected the instrument originally used (cabasa), and performed the rhythmic pattern she had produced and notated as it had been originally performed. On completion of this performance, she commented 'But I can play it on this as well', and performed the rhythmic pattern as written and performed on a different instrument. This child seems to have acquired the notion that representation of sound patterns may exist independently of the context in which they were originally produced.

Whilst children were asked to 'compose' or 'make up' a pattern of sounds, the resulting sound event and notation did not always constitute a pattern as defined earlier in this paper. However, many children used the element of repetition in the composition of their 'pattern' of sounds and subsequently demonstrated repetition of symbols in the recording of the sound event.

VISUAL ARTS

Procedure

The basic procedures consisted of:

1. giving each child the freedom to choose as to whether they painted.

2. collecting all the paintings produced by each child during the research period.

3. allowing each child to mix personal colours using the materials as presented.

4. requesting each participating child to paint a pattern.

Materials

1. Paint: Student quality liquid acrylic paint in the following range of colours was supplied at each painting session: Warm and cool red, warm and cool blue, warm and cool yellow, black and white. The paint was dispensed in small, clear plastic bottles so that the actual colours of the paints were clearly visible.

2. Brushes: No. 8 bristle brushes with the handles shortened to a length similar to the handle of a water colour brush. The strategy of modifying the length of the handles enabled the subjects to more easily manipulate the brushes.

3. Paper: Cartridge paper was available at all painting sessions. Cartridge paper is substantial and will withstand a number of reworkings with wet paint.

4. Palettes: White plastic plates and large lids from ice cream containers were used as palettes.

5. Water: Water was dispensed in 2 litre plastic ice cream containers. This strategy reduced the need for the children to be obtaining clean water during the time that they were actually involved with a painting. The containers are also more stable than the usual water pots available for young children.

6. Paper towelling: This was provided to enable the children to easily remove any excess water from their paint brushes in-between mixing the colours.

Setting and Presentation of materials

Painting for this study was available to the children each Monday morning from 9.00 until 11.00 during the implementation of the research program.

A single painting table was set up with work stations for four children to paint at any one time. Each child was supplied with:

1. a sheet of cartridge paper,
2. a palette ,
3. a container of water

4. a sheet of paper towelling.

The plastic jars of paint and the bristle brushes were placed in the centre of the painting table so that free access to them was possible by each of the participants.

The paper was placed on the table in front of each child as they indicated that they wished to make a painting.

Instructions

The children were :

1. shown how to apply an appropriate quantity of paint from their selected colours onto their individual palettes.

2. shown how to place their favoured colours around the outer edge of the palette and retain the maximum area for actually mixing colours.

3. encouraged to experiment with the mixing of colours and to create their own secondary and tertiary colours.

4. instructed how to thoroughly wash their brush before using a subsequent colour and also how to squeeze the excess water from the brush using the paper towelling. This strategy prevented the colours from becoming over diluted and allowed the children to have more control over the placement of the colours.

5. instructed to paint a pattern.

The completed paintings were left on the painting table for the researcher to move to a place to dry. The researcher checked that each painting was clearly named and dated.

As each child completed a painting other children were able to take their place at the painting table. If they desired, a child was permitted to undertake multiple paintings if no other child was waiting for a turn.

Data analysis

Criteria for painting categories

The categories used to make the initial classifications of the art works were those referred to by Booth in a study of early painting development. (Booth, 1982)

Each painting was classified according to structural characteristics as follows:

1. Exploration

Paintings which showed lack of form and where one or more colours were randomly painted in areas adjacent to each other or where they were overpainted.

2. Topology

Paintings where colours were clearly separated in masses or spots without a clearly defined order.

3. Pattern

Paintings which displayed an orderly arrangement of straight lines, curved lines, spots, blobs or a combination of these. Paintings which used rhythmical patterns.

4. Pictographic Representation

Paintings which contained any pictographs such as a human figure, architectural structure, flower, tree, machine or animal regardless of the painting being predominantly non-representational.

At this stage of the research it is clear that children presented with paint on a palette which enables them to freely manipulate the colours in the manner of an adult artist initially focus on the quality of the paint and a concern to actually investigate the possibilities of colour mixing. Several of the subjects spent some considerable time manipulating their paint on a palette without actually transferring it onto the paper with a brush. During the exploratory phase there was a concentration by the subjects on managing the paint, holding the brush handle in a comfortable position, mixing the colours, loading paint onto the brush, placing the paint on the paper, washing the brush free of one colour before mixing a subsequent colour and loading it onto a brush.

When some subjects produced paintings which have been identified as examples of the topology category, they concentrated on spreading the paint evenly over some areas of the paper, refining their technique of mixing secondary and sometimes tertiary colours and manipulating the brush to produce dots, lines and other controlled marks.

The examples which the researcher has classified as pattern paintings generally made use of the basic elements of the line and the dot. In some examples the subjects used repeated elements to produce patterns. The development through the phases was not linear. Pictographic representations appeared and disappeared and sometimes were integrated with patterns. As well regressions to earlier phases occurred usually during the transition from one phase to another.

CONCLUSION

Although at this stage of the project it is premature to draw any significant conclusions about children's idiosyncratic symbol use across the areas of mathematics, music and visual

arts, it is clear that patterns of use emerge within these domains. Within the areas of mathematics and music in particular, in the context of this study and the tasks given to the children involved in the study, children's use of symbol appears to be closely linked to the representation of materials and procedures within a specific context. However, in the visual art component of this project such an approach to symbol use appears to be context-free.

Initial analysis of the data collected in this project indicates that as children become more experienced in encoding their responses, their recordings become less context-bound and more concerned with ideas and concepts.

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