

1 Introduction

The field of developmental psychology has traditionally focused on a rather narrow view of cognition as the end state toward which children are developing. This perspective is due significantly to the work of the pioneering giant in developmental psychology, Jean Piaget. Piaget named the end state of cognitive development as “formal operations,” which describes how scientists are meant to think when they are being wholly rational. The formal operational thinker weighs the evidence for a hypothesis formed in terms of a verbal proposition, teasing apart confounded variables and testing them one at a time. For Piaget, all of cognitive development is moving toward this final and valued end state of hypothetico-deductive reasoning. Many other researchers in the Piagetian tradition, such as Jerome Bruner, Robbie Case, John Flavell, Deanna Kuhn, and Heinz Werner, considered scientific thinking as representative of all thought.

While developmental psychologists rarely use the term “formal operations” today, the idea of the child as a little scientist learning to think logically remains central to the field of developmental psychology (Gopnik et al., 1999). The assumption of logical scientific thinking as the end state of development was challenged by Gardner in the early 1970s (Gardner, 1971). He asked developmental psychologists to consider artistic thinking as another viable end state. Indeed, the arts emerged prior to science in human history, and there is no culture lacking one or more forms of art. While most adults are not practicing artists, neither are most adults practicing scientists. Nonetheless, all adults participate in some manner in the arts: if they are not makers, they are perceivers of the arts. They read novels and poetry; watch plays, films, and dance performances; and go to art museums and try to make sense of works of visual art. In this Element, we have taken seriously the idea of “participant in the visual arts” as one of many endpoints toward which children are developing.

We begin our focus on the child as a developing visual artist by pointing out what may not be obvious: The ability to produce a pictorial representation is a considerable cognitive achievement, one that appears to be uniquely human and that is seen in our earliest ancestors. In 2021, researchers reported the discovery of drawings of wild pigs in a cave in Indonesia. These drawings may be the most ancient pieces of representational art discovered thus far, and are dated to be at least 45,500 years old (Brumm et al., 2021). Figure 1 shows a realistic drawing of a wild pig drawn in profile. The two protrusions on the front part of the head seem to be facial warts growing in front of the eyes. It is not known whether the artists were *Homo sapiens* or another human species now extinct. Upper Paleolithic cave drawings by *Homo sapiens* from between 30,000 and 32,000 years ago found in the Lascaux caves in France show



Figure 1 Drawing excavated from Indonesian island of Sulawesi, dated from at least 45,500 years ago. From Brumm et al. (2021). Photo credit: A. A. Oktaviana, ARKENAS/Griffith University.

animals depicted with as much skill and realism as displayed by any painter across the centuries (Chauvet et al., 1996).

As far as can be determined, cultures have either had some form of representational art, or, as in some Islamic cultures, they have actively prohibited representational picture making. The near universality of representation in art strongly suggests that the drive to make pictures is inborn rather than a product of culture.

Representational drawing requires first the capacity to use and understand symbols, because a representational drawing stands for something in the three-dimensional world. Representational drawing also requires the ability to see the similarity between picture and referent even though the representational information in pictures is impoverished compared to information available in the world. Pictured objects are readily recognized even though they are usually smaller than the actual objects depicted. Black and white pictures are easily read even though they lack color. And outline drawings are effortlessly interpreted even though actual objects do not have outlines around them. In addition, pictorial information is contradictory: Certain depth cues suggest the third dimension, whereas other information (e.g., from binocular and motion parallax) shows the surface of the picture to be flat. Art critic Schjeldahl (2021, p. 73) describes the act of drawing as “rehearsing the timeless purpose – and the impossibility – of pictorial art: to reduce three dimensions to two.”

There is no clear evidence of representational drawings in nonhuman animals, though when given paint brushes and paints, captive apes, monkeys,

and elephants have learned to make marks on paper. The lack of representational images in nonhumans cannot be ascribed to motor difficulties. This was shown in a study comparing Japanese children to juvenile and adult chimpanzees (Saito et al., 2014). Children (11–31 months of age) and chimpanzees (four adults, two juveniles) were tested every 2–3 months over a period of almost four years. During each session, after being allowed to draw freely with colored markers on paper, children and chimpanzees were given a piece of paper on which the experimenter drew a form and then looked to see whether the children and chimpanzees copied the form. Children were explicitly asked, “Can you draw like this?” Chimpanzees were simply motivated with fruit to attend to the task. Two to five different forms were drawn per session, one at a time, by the experimenter: horizontal lines, vertical lines, a circle, a cross, and a square.

The children were able to make marks on the forms, trace them, and eventually reproduce the forms, with horizontal lines the easiest (copied at two years, four months), a square the most difficult (copied at four years). The chimpanzees made marks on the forms, and three of the four adult chimpanzees drew similar lines or traced the lines, but none of the chimpanzees tried to copy the figures. The fact that the chimpanzees traced the lines shows that they had the motor capacity to control the kinds of lines they made. Hence, they had the motor skills required to draw a simple representation.

Next, the researchers showed the children and chimpanzees pictures of chimpanzee faces with a missing feature, such as an eye. By two-and-a-half years of age, children spontaneously added the missing part. Chimps traced the faces some of the time, showing more motor control than the children, but they never added any missing features. These findings lead to the conclusion that we are capable of graphic representation not because of an evolutionary advance in motor skills but because of a cognitive advance specific to humans allowing us to imagine forms that are not present, and then draw them.

Early humans had the capacity to make representational drawings, but we do not know what motivated them to do so, nor why some exhibited expertise and had works displayed and preserved in special settings such as the Lascaux caves. We do know that this same urge to represent three-dimensional reality on a surface – whether by using markers on paper or sticks in dirt – is seen in all children, even those with cognitive disabilities (Burt, 1921; Cox & Bragal, 1985; Jolley, 2010, chapter 3; Golomb, 2004, chapter 8; Golomb & Barr-Grossman, 1977; Goodenough, 1926; Kerschensteiner, 1905; Rouma, 1913). Given the universality of drawing in human life reaching back thousands of years, it seems unfortunate that the study of this form of artistic behavior has been relegated to a minor area of psychology, just as the teaching of the visual

arts has been relegated to a minor area in school (Winner, 2022). We are pleased that the Elements series has chosen to include the visual arts in its offerings.

In Section 2 we examine what is known about the development of representational drawing as well as the perception of graphic representations, considering what has been learned from children's spontaneous drawings as well as from experimental investigations carried out to test hypotheses about why children draw the way they do. In Section 3, we raise the question of the universality of features of children's drawing development by investigating external influences on drawing as a function of schooling, peers, and cultural exposure to images.

Developmental scientists studying drawing have focused almost exclusively on representational development, and far less has been written about a number of other important questions concerning child art. We focus on these understudied issues in the remainder of this Element. In Section 4 we discuss evidence for the child as an inventive artist, an issue that emerged in the twentieth century when artists (not psychologists) recognized a connection between child art and modernist art. In Section 5 we examine the function of drawing for children's emotional development. Section 6 examines what we know about child prodigies in art and what such children can tell us about relations among drawing ability, IQ, and visual-spatial abilities. In Section 7 we discuss various and conflicting views on how educators can best nurture children's artistic development. We conclude this Element with some further thoughts about participation in the arts as one of several possible end states of cognitive development.

2 Emergence and Development of Representational Drawing

Toward the latter part of the nineteenth century, there emerged a strong interest in the child and in human development. Charles Darwin published *On the Origin of Species* in 1859 and a study of his son's development in 1877. G. Stanley Hall launched the child study movement in the United States in the 1880s and published *The Contents of Children's Minds on Entering School* in 1893. With the growing interest in child development, scholarly writings on children's drawings from a developmental perspective emerged (e.g., Hall, 1893; Ricci, 1887). Scholars began to make voluminous collections of children's spontaneous drawings – drawings that children create on their own, with no special instructions or constraints (Barnes, 1894; Hall, 1892; Kerschensteiner, 1905; Lukens, 1896; Luquet, 1913, 1927/2001; Maitland, 1895; Ricci, 1887; Rouma, 1913; Sully, 1895), and public exhibitions of children's drawings began to appear (Fineberg, 1997).

Following the descriptive studies of children's drawings begun in the late nineteenth century, a long period ensued in which little research on this

topic was conducted (Freeman, 1977). However, by the mid-1970s, experimental work on children's representational drawings began to flourish. Instead of just describing and speculating about children's drawings, researchers began to ask children to draw specific objects that they would not ordinarily draw on their own (e.g., cubes, incomplete human figures) to test specific hypotheses, such as whether children's drawings of humans showed all that they knew about the body, or the kinds of strategies children invent to show one object behind another (e.g., Freeman, 1980; Golomb, 1981; Willats, 1985).

We note here that the vast majority of the research on children's drawings has been conducted by Western scholars studying Western children. We simply do not know what anthropologists studying non-Western cultures (such as Claude Levi-Strauss, Franz Boas, Margaret Mead, W. H. R. Rivers, or E. E. Evans-Pritchard) would have discovered had they focused on the development of children's drawings in the cultures they studied.

2.1 Understanding Representational Pictures

A representation is a symbol (or signifier), something that stands for something else: The word "apple" is a signifier that stands for the actual fruit, the signified; a picture of an apple is also a signifier that stands for the signified fruit. Graphic representations bear a visual resemblance of some sort to what they stand for; words bear an arbitrary relation to what they represent (except in the case of onomatopoeia where the sound of the word is similar to the sound of the referent – as in *buzz* or *squish*).

Of course, children cannot begin to *make* representational drawings without the ability to *understand* representation. This is a competence–performance distinction: the competence to understand a graphic representation must be present for the child to create, intentionally, a representational drawing. Understanding the representational nature of pictures requires that the child recognize (1) the similarity between a picture and what it represents, (2) the dual reality of a picture as both a two-dimensional surface and a representation of the three-dimensional world, and (3) the fact that pictures are made with intentionality and are to be interpreted.

Children apparently need no instruction to grasp the similarity between a picture and its referent. Evidence for this comes from an experiment by a husband-and-wife research team who withheld representational pictures from their son from birth and avoided naming any pictures that he glimpsed despite their efforts (Hochberg & Brooks, 1962). At nineteen months of age, the child was shown drawings of objects whose names he knew. He had no trouble

naming the drawings correctly, even when the representations were black and white line drawings.

Naming a picture of a shoe “shoe” does not indicate that the child realizes that the picture represents a real shoe. The child may simply think that a picture of a shoe and a real shoe both have the same name – a form of overgeneralization common in child language, as, for example, when a child calls all round shapes “ball,” or anything furry “doggie” (Clark, 1978). And in fact there is evidence that two-year-olds do not recognize a picture as a signifier. For example, children were introduced to a game involving dropping various objects down a tunnel (Callaghan, 2000). They were shown a line drawing by the experimenter depicting one of the objects, and their task was to select that object to put down the tunnel. Two-year-olds (but not three- and four-year-olds) failed to use the pictures as symbolic objects, selecting objects randomly rather than the one that matched the picture. Occasionally the two-year-olds treated the pictures as objects, putting the picture down the tunnel (similar behavior was also shown by DeLoache & Burns, 1994). A sharp change occurred by two-and-a-half years of age, when children revealed their understanding of the representational nature of pictures. At this age, children could use a color photograph of a room to determine where a toy was hidden in the actual room (DeLoache, 1987).

Children must also come to realize that pictures are made intentionally by someone with a mind (Allen et al., 2016). Glimmers of understanding the intentional basis of pictures can be seen in three- and four-year-olds. Bloom and Markson (1998) asked three- and four-year-olds to draw a lollipop as well as a balloon (and the two drawings looked similar). When children were later asked to describe their drawings, they named them according to their prior intention (a drawing intended as a balloon was a balloon, one intended as a lollipop was a lollipop). This finding shows that children recognize their own intentionality in drawing. A related study by Browne and Woolley (2001) showed children a puppet making a drawing with the intention of drawing a bear. The resultant drawing looked somewhat like a bear and somewhat like a rabbit. When asked to name the drawing, four-year-olds said it was a bear, thereby showing that they recognized the puppet’s intentions in drawing.

2.2 Producing Representational Pictures

Infants may recognize the similarity between a picture and its referent, but it is not until the age of three that children typically create their first pictorial representations. Early representational drawings by children are replete with odd nonrealistic elements that cry out for explanation – from curious parents, teachers, older siblings, and, of course, developmental scientists. Some of these

oddities are shown in Figure 2. These drawings make us wonder. Why do children's drawings of people (Figures 2a and b) look like tadpoles? Do they think arms are attached to people's heads? Why does the boat in Figure 2c appear transparent, allowing us to see the legs of the people sitting inside the boat? Why are the trees in Figure 2d folded out perpendicularly from both sides of the road? Figure 2d is an example of a drawing from mixed viewpoints: the trees on one side of the road are drawn from the viewpoint of standing on the road facing those trees; the trees on the other side are drawn from the opposite viewpoint.

These oddities have often been seen as deficiencies to be outgrown. British psychologist James Sully (1895) considered the lack of realism in children's drawings as a defect, as did Swiss scholars Jean Piaget and Bärbel Inhelder

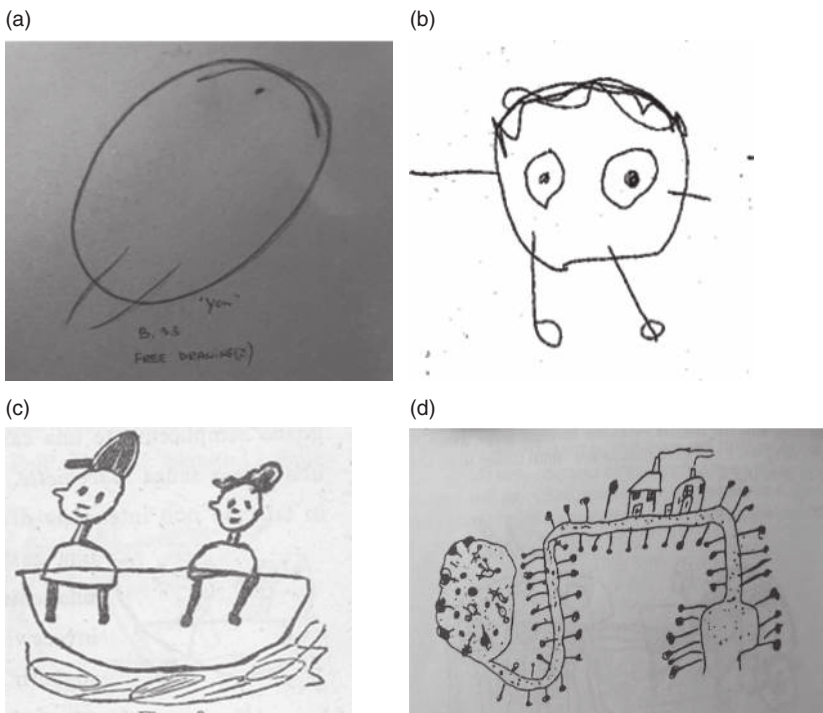


Figure 2 Odd features of children's drawings. (a) Armless tadpole, age three years and three months. From Golomb (2004, Fig. 16a), reprinted with permission of Claire Golomb. (b) Tadpole with arms protruding from circular form, age three years and six months. From Golomb (2004, Fig. 16b), reprinted with permission of Claire Golomb; (c) Transparent boat. From Ricci (1887). (d) Trees "folded out" from street drawn from mixed viewpoints. From Kerschensteiner (1905).

(1956). But other thinkers from various eras, such as French scholar Georges-Henri Luquet, Austrian founder of the Child Art Movement Franz Cizek, and German Gestalt psychologist Rudolf Arnheim, rejected this negative interpretation and insisted that visual realism is no more right and natural than the ways in which children draw. Instead, children's drawings have their own logic and intelligence. Indeed, artists have often included these same kinds of oddities in their works, as have engineers in their diagrams, showing that realism is just one of several conventions that artists can choose to use. Cizek and Arnheim celebrated early nonrealistic drawings as particularly charming, aesthetic, and appealing.

The most important early analysis of these kinds of features in children's drawings appeared in 1927, when French philosophy professor George-Henri Luquet published a book entitled *Le Dessin Enfantin*, translated as *Children's Drawings* in 2001 by British psychologist Alan Costall. Luquet maintained that children enjoyed the act of drawing, and he opposed any kind of intervention or correction by adults, which he felt might destroy children's love of drawing. He noted how children used color decoratively rather than realistically: making one eye of a person violet, the other green, making sheep blue and hens greenish yellow. Luquet took children's drawings seriously, never dismissing them in terms of what they lacked. His insightful interpretations have, for the most part, stood the test of time and have been confirmed by later observational and experimental studies (e.g., Cox, 1978, 1992, 2005; Gardner, 1980; Golomb, 2004; Freeman & Janikoun, 1972; Thomas & Silk, 1990; Winner, 1982).

Luquet described the wide variety of subjects that children represent – for example: people, animals, landscapes, objects (still lifes), scenes based on stories and legends. Children represent whatever is in their experience, whatever is important to them and catches their interest. Sometimes they may draw the same object over and over before moving on to another object and drawing that one repeatedly. Sometimes their interpretations of what they have drawn do not match their stated intentions, and this leads them to expand their repertoire. For instance, Luquet described a four-year-old who, after intending to draw a fish, interpreted it as a mouse. These kinds of analogies based on shape provoke children to begin to draw the new object (in this case, a mouse). In Luquet's words, “the enrichment of the child's graphic repertoire is primarily due to productive mistakes” (1927/2001, p. 30).

Researchers studying children's drawings have been preoccupied with the development of graphic representation (rather than nonrepresentational aspects of art such as expression), and Luquet falls squarely in this tradition. He described four phases (or stages) of graphic representation: fortuitous realism, failed realism, intellectual realism, and visual realism. He stressed that these

stages “emerge out of the preceding one through an almost indiscernible progression” and that “the former stages extend for a rather long time into the following ones, and only gradually diminish” (1927/2001, p. 91). Thus, stages are not sharply demarcated, and drawings by a child at the same point in time may appear to be characteristic of different stages. In what follows we describe each of the stages identified by Luquet along with evidence in support of – or contrary to – what Luquet observed.

2.2.1 Fortuitous Realism

Children make their first deliberate marks on paper between one and two years of age. Luquet (1927/2001) subscribed to the view that children’s first markings are not intended to represent anything, and other scholars have agreed (Kellogg, 1969; Lowenfeld & Brittain, 1970; Piaget & Inhelder, 1956). The scribbling child was seen as making marks for the sheer enjoyment of mark-making, with no intention to make the lines stand for something in the world. We know that children enjoy the motor activity of drawing, but we also know that they pay close attention to the marks they make (Tarr, 1990): when given a pencil without graphite (and thus with no mark-making capacity), they lose interest in scribbling (Gibson & Yonas, 1967).

Children’s mark-making is stimulated by provision of markers by adults and is likely inspired by watching adults write or draw. As mentioned, by one to two years of age, children can recognize what is represented in their picture books. And by two years of age, they discover that the marks they have made remind them of some object, and so they name their pictures – a mouse, a fish, a bird, an airplane, etc. They may even add more marks to their drawing to amplify the resemblance – for instance, adding legs to what they had called a bird. Because the initial resemblance was accidental, children cannot always make drawings resembling something in the world and often continue to make marks with no clear representation.

However, sometimes after noting a fortuitous resemblance, children deliberately try to create what they have made by accident. Thus, a child who accidentally made something that looked like a bird may then try to draw a bird. By the age of three, children possess the three components needed to make a drawing: the intention to make a particular representation, the ability to execute that intention, and the ability to interpret the drawing consistent with their original intention.

We should not underestimate the cognitive advance of fortuitous realism. The discovery that a line or shape drawn on paper, or a form made of clay, can stand for something in the world (shown by DeLoache to emerge at two-and-a-half

years, as discussed earlier) is a major milestone: The child has discovered the relation between the graphic signifier and the signified.

But do children always name their scribbles based on what they look like? Another possibility is that children name their scribbles based on the action they use to make the marks. They may well have in mind the desire to represent something, and instead of drawing what something looks like, they mimic its actions as they move their marker around the page. These kinds of drawings are called “action representations” because the movement of objects is represented through the child’s actions with the marker.

Rudolf Arnheim (1954/1974/2004) noted that sometimes early marks reenact the way in which objects move: “Deliberate pictorial representation probably has its motor source in descriptive movement,” Arnheim wrote (p. 172). British artist and educator John Matthews (2003, p. 10) described a two-year-old moving a paint brush around on a piece of paper producing what looked like a blob of paint. He pointed to part of the blob, saying, “There’s a car there” (Figure 3a), and then, as he moved his brush on the page, said, “It’s going round the corner . . . it’s going round the corner . . . It’s gone now” (Figure 3b). Of course, the resultant drawing looked nothing like the shape of a car. But as he painted, he was enacting his idea of the motions of a car.

Action representations were also described by Jacqueline Goodnow (1977) and Jeanne Bamberger (1991): When children were asked to invent a notation to capture a rhythm, they made a series of marks in a row, mimicking the rhythm in their pauses between dots. But the rhythm was shown only in the child’s actions as she made the dots, rather than captured graphically. These children seemed oblivious to the fact that the final product of a picture is static and cannot show the sequential motions involved in making the picture.



Figure 3 Action representation by two-year-old. As he moved his brush on the page, he said, “It’s going round the corner . . . it’s going round the corner . . . It’s gone now.” From Matthews (1984, Figs. 1–2). Reprinted by permission of Sage Publishing.