

Pulled Up Short with Stanton Wortham

What if art and science aren't opposites?

Featuring Ellen Winner with Stanton Wortham (host) and Keith Sawyer (commentator)

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Stanton Wortham 0:00

Welcome to another episode of Pulled Up Short. Thank you very much for being with us. We're excited today to have Ellen Winner, a professor at Boston College, and as our discussing Keith Sawyer, a professor at the University of North Carolina. It's great to have both of you with us today. Ellen, I understand you're going to talk to us about art and science and how it is that perhaps they're not as distinct as we sometimes think. Right?

Ellen Winner 0:11

I'd like to give an informal title to what I'm going to say: art and science are not opposites. So, you know, we typically presuppose a pretty sharp division between art and science. We see science and scientists as hyper rational and logical, and artists as emotional and art as kind of ineffable. This leads to the view that science is all about truth and fact, but art is about fiction and fantasy. If we have that view, it follows that if we want to learn truths about human psychology - how we tick - we should use scientifically-devised personality tests; we should look at brain imaging, instead of reading novels like Tolstoy's *Anna Karenina*, or instead of looking at Picasso's *Guernica*, or instead of going to the theater and watching Hamlet or King Lear. If the arts don't tell us truths about the world, and they just give us fictions, it would follow that the arts are not very serious endeavors. They're just for fun and pleasure. A lot of newspapers have a section called "Arts and Entertainment," rather than separating the two. Some have stopped doing this, but some still do it. I think this reveals a view of the arts as nice, but not necessary. What I'm going to try to convince you of today is that these stereotypes of art and science are both wrong.

Stanton Wortham 1:56

I certainly recognize those stereotypes. I think they're very common, where art and science are opposite ends of a continuum and quite distinct from each other. If those common sense assumptions about art and science are false, then how do you recommend we understand the two domains?

Ellen Winner 2:16

Well, you can think about this with respect to 'the psychology of the scientist' versus 'the psychology of the artist' on the one hand, and you can also think about this with respect to the epistemological status of science versus art. I think I'd like to make two points.

My first point is that art and science really both involve a mix of reason and emotion. Art makes us feel strong emotions. This is not a surprise to anybody. We feel joy, grief, terror. We feel sad when fictional characters suffer. We are brought to tears when we listen to certain pieces of music. Our hearts pound in suspense when we watch a villain being chased in a Hitchcock film, and we can feel powerfully moved when looking at works of art that we think are really great, like a Rembrandt portrait. But that's not all.

Counter to the stereotype of art as pure emotion, art also makes us think. It's not that art gives us propositions that can be proven true or false, but what art does give us are authentic understandings and insights about things that are important to us, like human relationships, loneliness, connection, love, betrayal, deceit, self-deceit, pride, arrogance, (I could go on) guilt, striving, how we relate to nature, do we dominate it? Are we tyrannized by it? Is it comforting? Art doesn't only make us think about these big questions; art also makes us think about art. Because a full encounter with a work of art prompts us to try to understand and interpret it. You might find yourself asking yourself philosophical questions like these: What's the purpose of this work? What does it mean? If it's beautiful, what makes it beautiful? How come I feel one work is great and one work is not so great? Why does something so sad and so tragic make me feel uplifted? Why does a really distorted head in a sculpture by Pablo Picasso look beautiful, when if we saw such a head in real life, we would close our eyes and horror? Why do I appreciate a work of art the longer I experience it and the more I come back to it? And why do I feel the need to convince other people, especially other people I care about, to feel the same way about the work that I do? Why is that important to me? The meanings that we take from a work of art are not in the form of propositions that can be refuted by empirical evidence. Of course not. But nonetheless, the meanings we take away from works of art feel very important and authentic to us.

Now, turning to science: science obviously, of course, makes us think. From science, we learn about the world from propositional information. The Earth goes around the sun, not the reverse. The heart is a pump. The brain is the seat of our thinking and feeling. These are propositions which we accept today because we know they're true, because they've been supported by objective evidence. They are testable; they're potentially replicable; and they could also be disproven, in principle. These propositions are, of course, the result of the use of the scientific method, which began in the 17th century, which essentially boils down to observation, development of a hypothesis, testing of that hypothesis, and then either confirming or rejecting that hypothesis. But counter to the stereotype of science as hyper-rational, science also makes us feel and feel strongly, like the feeling of wonder, or the passion to find out more, or the feeling of awe at the beauty of a discovery, the beauty of an equation, the beauty of a number. Of course, scientists feel these emotions as well as those who are consuming science.

Stanton Wortham 6:15

This is helpful. Art and science, we might initially think, are quite distinct. Science does reason and reality, and art does fiction and emotion. But you're pointing out that, in fact, both of them are amalgams of different inputs. They're different ways of reacting to or understanding the world, and

each of them involves reason and emotion and other aspects that humans put into them. They yield different kinds of products, but neither one is pure reason, pure emotion, or pure anything else. They're each a mixture of different components, and that gives each a distinctive orientation. Is that right?

Ellen Winner 7:00

Yes, exactly. Scientific discovery involves rational thinking, but it also involves passion and curiosity and joy. Understanding of discovery requires reason and may also stimulate joy and wonder. Turning to art, the experience of a work of art also involves both thought and feeling, and actually these are inseparable. The arts are valuable for many reasons: pleasure that we get from beauty, pleasure from feeling moved, but they're also valuable because of the philosophical reflection they can stimulate. There's a quote from Hegel that I think really says this well: "Works of art are all the more excellent in expressing true beauty. The deeper is the inner truth of their content and thought."

I'd like to go on to make another point. Because science gives us testable propositions that can be refuted and replaced by new ones, the history of science is really a history of progress. New Science replaces old science. If you want to get treated for a disease, you don't want an ancient Greek medical remedy, you want a modern 21st century remedy. The germ theory of disease has replaced the belief that evil spirits cause disease. Copernicus's discovery that the Earth goes around the sun has replaced the belief (that we now know is wrong) that the earth is at the center of the solar system.

But think about art. Do you think art is a history of progress? Actually, no. It's not a history of progress. There are no propositions in art to test and to prove wrong. If you look at the art of our earliest human ancestors - what we call the cave painters - these works are just as great, just as powerful, just as innovative as any works of visual art created since then, up into the present day, and all artists have recognized this. So new art does not replace old art. You can say the same for literature and music. I mean, did Shakespeare replace Sophocles? Of course not. Chopin did not replace Bach. Art doesn't test and disprove things. It just makes us think and question and wonder and feel. So the understandings about ourselves and others that we take away - say from an ancient Greek tragedy, like *Oedipus Rex*, or from the Sistine Chapel painted in the 16th century by Michelangelo - these are just as authentic and true as those we take away from the 19th century novel *Anna Karenina* written by Tolstoy, or the 20th century novel, *Animal Farm* written by George Orwell. Nothing is replacing nothing. Art doesn't build on itself, the way science does. I don't mean by that, that artists aren't influenced by other artists, but artists are not proving other artists worthless and worthy of rejection. So in short, what I'm trying to emphasize here is that both science and art involves a combination of thinking and feeling. But, as you said, Stanton, they each capture something about the world in a different way - science through testable propositions and art through capturing something that feels deeply authentic about ourselves and our world.

Stanton Wortham 10:18

Now, I think I understand the central point. You're actually describing the complexity of both science and art along two related dimensions. So in one respect, both scientists and artists do intellectual or cognitive things. They use reason, and they also both have emotions, engage in relationships, and live in social contexts. One of your points is that science and art are not completely distinct in the components that go into them, in the aspects of human life that the scientists or the artists employ in order to do their work. They're each an amalgam or a mixture of these different components.

Stanton Wortham 11:00

The second point that you're making, also very interesting, is that science and art both capture something about our experience. They both communicate something about what it is to be human in the world, but they do it very differently. They have different kinds of ends and different sorts of warrants to the representations that they offer us. So science and art are not opposite ends of a spectrum with one rational on the other emotional, with one about reality and the other about fantasy. They're each complex, because they involve multiple components, and they each communicate something about the world to us, although the content of what they communicate is different because they're fundamentally different enterprises. One of the things about this claim that you're making that's particularly intriguing to me is the notion that art is cognitive too, that art involves thinking and represents something about the real world. Could you give us an example to help us understand that?

Ellen Winner 11:59

Sure, I'd like to try out two examples for you, both with reference to painting. So my first example has to do with the kind of thinking that is involved in looking at a realistic painting. So when you look at a work of visual art that's realistic, it actually involves cognitive construction on your part. Pictures would be seen as flat, non-representational arrangements of color and line, if it were not for what has been called "the beholder share:" you, the beholder, have to read into the picture to recognize the objects depicted and to perceive three dimensional depth. In a sense, a painting is kind of like an inkblot in a Rorschach test. Both are just vaguely suggestive of objects in the world, and because of that, they invite projection. You may think you're looking at a highly realistic painting of a landscape, but actually, no painting can contain all of the detailed information that nature gives us about that scene. Just to prove my point, I would ask you to move closely up to the painting, so that you're almost an inch away. Look at the trees that look so realistic from two feet away, and all you see suddenly are dobs of paint. But if you moved back and start to project, your imagination transforms these dobs into trees. So you, the perceiver, are taking the artist's hints and you're 'reading in' the rest. And what you are reading in is actually guided by your knowledge of the recognized objects are like. So in other words, we see what we expect to see: a vague shape next to a cluster of trees is likely to be read as another tree, but that same shape next to a group of cows and the distance is likely to be read as another cow. This kind of reading in and construction is a fully cognitive activity. One of the writers who makes this most clear is E.H. Gombrowicz, an art historian, in his book, *Art and Illusion*.

Our perception of depth when we look at a flat picture plane is also made possible by projection guided by knowledge. Imagine an oval shape that you see on a canvas. Is this representation of something that

actually is an oval shape? Or is it a representation of a circular form, but it happens to be viewed obliquely, receding in the space. Suppose this oval shape is seen sitting on a table in the picture, then you're likely to see it as a circular dinner plate receding into space. Or take another example: train tracks whose edges converge higher up on the canvas. When you look at this, are you looking at a trapezoidal form that goes up vertically? Or are you looking at a representation of a rectangular form that is receding horizontally. Because of your knowledge that you're looking at train tracks, you read it as a rectangular form, receding horizontally into depth. These are some examples of visual thinking on the part of the viewer. And of course, the artist who is painting in a realistic style has to use visual thinking to create these illusions. The artist has to understand how to create the illusions of detail and the illusions of depth.

Stanton Wortham 15:40

So in that way, cognitive processes or reason are central both to the production of art and also to the understanding of art. In this way, art involves thinking as well as feeling and other modalities. So that piece of art that you're describing could very well have a big emotional impact, painted in the realistic style, but in order to accomplish that, the artist had to use a lot of reason. The viewer also has to use cognitive processes. In this way, we would get a distinctive package of modalities - thinking, feeling, and others - that go into producing a work of art and appreciating a work of art. So can you tell us a little bit about kinds of art that we don't typically think of as realistic, things that aren't representational or that are more childlike? Is their cognition or thinking also involved in that kind of art?

Ellen Winner 16:37

Yes, I would like to say something actually, about child art. But can I say one thing, in response to what you just said? I don't want people to think that I'm saying that when you look at a work of art, you reason out what you're seeing consciously. You just look at the train tracks, and you know, you're looking at horizontal lines receding in the distance. This is an automatic process. You don't have to reason it out consciously, but it's still a fully cognitive process, just like perception is cognitive.

So you asked about non-realistic art. I'd like to say something about child art, which I've studied quite a bit, because child art is not realistic. I'd like to explain how child art actually involves a lot of thinking on the part of the child. We often think of child art as deficient, because it's not realistic, just underdeveloped. But in fact, children are not aiming at realism. They are not under the sway of realism. I want to show you two ways in which children's art reveals thinking. The first way I'd like to talk about is abstraction, and the second way is in the depiction of conflicting viewpoints. It turns out that adult artists do both of the things that I'm going to describe kids do, though less blatantly.

So let's talk first about abstraction. Children have a natural genius for abstraction. You know, we're all familiar with young children's first drawings of humans, which look like tadpoles. They're commonly called the tadpole man. It's a circle with legs and sometimes arms emanating from the circle. Psychologists and parents have wondered, do these indicate that children have a deficient understanding of the human body, that they think that legs come out of the head? No, of course not.

There's lots of evidence that children know perfectly well that legs don't come out of the head, and they know that arms don't come out of the head. But as one child told us, "This is how I like to draw it." These children have abstracted a simple form from the complexity of the human body. It's a form that's clearly readable by anyone as a human. They have invented a structural equivalent of a human: something that says human very clearly, even though it's not realistic, and that's what matters to them. Let me just give you one other example of abstraction and child art, and this comes from the Gestalt psychologist of art, Rudolf Arnheim. It's about how children draw a fir tree. When children look at a fir tree and draw it, they create a much more regular, simpler form from the complexity of the trees' actual form. They draw a hierarchical structure: a vertical trunk, with branches extending to the left and right, and then on each of those branches, there are smaller branches coming off each of them, and then either even smaller ones coming off these secondary and tertiary ones, and so on. The pattern is a fairly symmetrical abstraction from the more irregular form of the tree and nature. This kind of abstraction actually involves far more intelligence, far more cognition than a mechanical imitation of the form of the tree in nature, which is what a camera could do.

Stanton Wortham 20:07

So you're suggesting that child art that seems simple, actually demonstrates a distinctive intellectual process: a process of witnessing and experiencing reality, then rendering a clear, understandable abstraction to represent that reality. This really doesn't comport with how I used to think about child art, so this is particularly interesting to me. Would you say that adult art also uses abstraction in the same way? Or is it different?

Ellen Winner 20:39

Actually, that's exactly what I'm saying. Let me say something about abstraction and adult art. Even the most realistic adult art involves some level of abstraction, because you cannot capture the infinite detail of an actual scene and put it on a small, two-dimensional surface. Rendering the three dimensional world on a page always involves some kind of abstraction. Imagine that you're painting a portrait, artists will typically sketch out an oval for the head, but that's an abstraction. No head is a perfect oval. Of course, the artist then goes on to complexify the oval, but the first step is the oval. This is an abstraction from nature, and it involves simplification. The difference between the child's and the adult's representations is that the child's abstractions are much simpler than those of the adults. The adult goes on to complexify that abstraction, but both involve abstraction at the beginning, even though the adult complexified it more. Abstraction is a cognitive operation, much like concept formation, and so it really is a form of thinking. Now, we can also see similar forms of abstraction in so called "primitive" art and in modern art that actually are very reminiscent of the kinds of abstractions we see in child art. "Primitive" art, modern art, and child art - none of these are under the sway of realism.

I've said something about abstraction, but let me say something about how children show conflicting viewpoints in their art, and how adult art does the same thing. This is something that makes it look like it's not very realistic, but it's actually something that involves thinking. Children will often draw a

scene as if it was seen from two different vantage points. So for example, a child might draw two people in profile sitting at a table, but the table top is shown like a perfect square so it looks like it's standing upright, or it looks like it might be drawn from an aerial view. So the question is, why do children do this? The argument that's been made, which I find convincing, is they want to show the shape of the table in its undistorted form. A side view would require distorting the form because of the laws of linear perspective. Now, of course, children don't yet know how to draw in linear perspective, but the point is, they're not striving towards optical realism. They're trying to show objects in their clearest form. Or maybe a simpler example is that children will sometimes draw a face in profile, but with two eyes, which means the eyes are being shown from a frontal viewpoint, but the nose is shown from a side viewpoint. So why are kids doing this? Well, a very convincing answer to me is because showing only one eye would distort what we know about a face. Now it turns out that adult artists have done exactly the same kind of thing. We see the same phenomenon, not in realistic adult art, but in primitive art, which is untouched by the invention of linear perspective and in 20th century modern art, which rejected linear perspective. Just think about the Cubist paintings by Picasso and Brock, which showed objects from multiple perspectives, capturing their actual forms undistorted by linear perspective. You know, the point is there many ways to represent the world in the drawing. Realism is not the only way. It is just one way - the way in which we draw objects from one vantage point, as if we were a camera. But realism is no more true than the ways that children and modern artists have invented. So remember the tabletop that was shown as a square; well, the tabletop is a square. So in a sense, maybe that's truer than representing it as an irregular trapezoid as it might be seen in linear perspective. They're just different ways of representing and one is not any more truer than the other.

So I think there's a clear lesson from all of this. And that is the parents and teachers should take child art seriously. Child art is not just undeveloped. It's not just deficient. It's not just endearing in its oddness. But instead, it's revealing the child's visual logic, their ability to abstract simple forms from complexity, or their ability to show forms undistorted by perspective. That's what gives their drawing a certain power and boldness. Twentieth century modern artists recognized that there was something very special about child art. They recognize the child as an artist undominated by the realistic tradition and therefore bringing something fresh and very direct to art. Many modern artists were actually inspired by child art. There's a very famous quote by Picasso who said, "It took me four years to paint like Raphael, but a lifetime to paint like a child."

Stanton Wortham 26:17

So child art, it turns out, captures a different way of evoking or representing something about the world and about experience. It's very interesting to see the similarities between that and different kinds of adult art as you've laid them out. There was a tendency, at least in my thinking, to try to oppose the child and the adult art. You've made it clear that it's a more complex scene, where they have many interesting similarities. Some people, I imagine, have used these similarities between child and adult art to disparage the adult art, saying that, "It's just something a child can do. It's not something that we would expect of a full fledged artist." How do you think we should respond to them?

Ellen Winner 27:08

That's something I've thought about a lot. We've even done a little research into this. Those people who disparage modern art will probably also see little value in child's art besides cuteness. These are the people who you might see standing in front of a modernist painting, either a representational one by Paul Clay for example or a completely abstract one like something by Jackson Pollock, and those are the people who might say, "My kid could have done that." But those who value modern art need to understand the extent to which modernist artists were inspired by the boldness of child art - by its flatness, its refusal to aim at realism, its bold line and color. But while there are striking similarities between child art and modernist 20th century art, I think that lovers of modern art can also be comforted by the results of a series of experiments that we did in my Arts and Mind lab at Boston College showing that actually, your kid could not have done that. We showed people pairs of carefully matched paintings, one by a child and one by a modern artist, like Cy Twombly, Helen Frankenthaler, Hans Hoffman, and we matched the pairs so that the members of the pair would look as similar as possible in color, composition, and line. Then we asked people, which one was by the artist and which one was by the child. We actually did the experiment many different ways, but we got the same result each time. Even people who professed a lack of familiarity with modern art were able to tell the difference, despite the superficial resemblance, at a rate significantly above chance. They weren't 100% correct. They were about 66% correct, and it was always significantly above chance. We went on to show that the difference that they perceived was that the ones they called "adult art" had more structure and also more intentionality. They looked more planned. It was as if they were perceiving the mind behind the art, and we actually called that first paper on this phenomenon, "Seeing the mind behind the art."

Stanton Wortham 29:26

This is great. So we started out talking about the distinction between science and art, which led us to certain stereotypes about art as just fantasy or fiction, not reality, involving emotion, not involving reason and cognition, but you've made a strong case that in fact, the arts are systematic, logical, cognitive, effective, emotional, and relational. So the arts are a distinctive package of different components or capacities that are put in service of evoking or communicating something about human experience. Of course, science is a different package involving some of the same components, but in different proportions and put together in different ways, trying to represent reality in a different mode with a different kind of purpose. The kinds of knowledge communicated by these two different systems vary substantially, but they both involve an amalgam of cognition, emotion, and other things. They also both can communicate truths about reality as we experience it and as it exists. This has been very helpful to me to get a clearer understanding of how art is a more complex way of representing, a more complex thing than our stereotypes lead us to believe. In fact, you've even shown us that art is heterogeneous. There's not just one way of doing it, but there are different mixtures of components that go into different approaches to art, which yield different kinds of effects: child art, modernist art, other kinds of realistic art, and so forth. So to wrap up, can you give us a sense of the implications? How should we change our approach to understanding science and art as we encounter them in everyday life?

Ellen Winner 31:19

I think we mostly need to change our feelings about art. Let me try to lay out a few implications. First of all, I think we need to take the arts more seriously, and stop dismissing them as sheer emotion or sheer entertainment. Because think about how our cultures are remembered: they're remembered for their arts. How long have the arts been around? Well, since the earliest humans, maybe even before, and certainly before science. Has there ever been a culture without one or more forms of art? No. Do any other animals spontaneously make art? No, even though chimps and elephants have been given brushes loaded with paint, and they've made very pleasing designs (at least humans find them pleasing), but no animals in the wild actually spontaneously make representational or non-representational designs, then stand back and look at them, making a kind of aesthetic judgment, and then come back and make a change. That is distinctly human. I think we need to recognize that the arts are a fundamental part of being human. They're not a luxury or a frill. We need to remember that they involve serious thinking, both on the part of the Creator and on the part of the responder. This is true whether the artist is an adult or young child. So that's one implication, taking the arts more seriously.

I think there's educational implications for this. The arts should not be treated as a frill in school, which they usually are, but should be given a role as central as that of the sciences and the humanities. They shouldn't be justified extrinsically. All too often, you hear art educators being told that they have to make sure that the art lessons they give help kids do better academically, because there is this belief that art education raises academic performance, test scores, and IQ scores. The IQ argument has been made most often for music. Art education has all too often erroneously been justified in terms of its positive effect on things like test scores, which in fact, it does not have. We need to think of art education as important for its own sake and for the kind of visual thinking that it teaches, for the kind of authentic truths that art gets us to thinking about. And for the kind of authentic truths that making art and looking at art gets us to think about.

I'd like to just add one more word to listeners out there. The next time you go to an art museum, spend a long time looking at a few paintings that grab you, instead of quickly stopping by many. And ask yourself the kinds of philosophical questions I laid out earlier, like, what does this mean to me? Why does this move me? Or how can something this distorted be beautiful? How can this looking and thinking experience enrich your life both intellectually and emotionally?

Stanton Wortham 34:33

That's great, Ellen. Thanks very much for those provocative insights. At this point, I'd like to invite in Keith Sawyer. Keith, do you have a couple of questions?

Keith Sawyer 34:42

Thank you, and thank you for that wonderful interview. I have so many questions. I'll just try to squeeze in a few in the time we have left. One thing I've noticed when I've talked to professors who teach art and who teach design, they often talk about creativity as a deliberate process. They tend to

dismiss views of art as being based in unconscious inspiration, but rather to compare it to a conscious and deliberative activity. It sounds like when you compare art to science, that would resonate. Would you say that somehow, they're similar in their conscious intentionality, their deliberate nature?

Ellen Winner 35:29

Well, you're raising a really, really complicated question about whether creativity is something that we can all try to do and achieve. I do think that a lot of creativity is deliberative. I don't know if I would call it entirely deliberative, because then we can all be creative by just trying. But if you look at how artists work, they often talk to each other, they look at each other's works, they think about what they are doing, and how they can make it new, how they can make an impact. That is all conscious reflection on how to be innovative. I think that creativity does involve a lot of deliberation, a lot of thinking, a lot of intentionality. You have to really want to be creative. However, I want to make sure that this doesn't also lead to the view that anybody can achieve greatness by hard work. This is the view that was developed by Anders Ericsson and has led to the popularization of this view as the 10,000 hours myth - that anybody who starts early and slaves hard at their craft can actually achieve greatness. I believe that people who say this probably have not seen a very gifted child who's going to go on to become an artist, because they do stand out from their peers as being much more precocious and intense in their motivation.

Keith Sawyer 37:04

Thank you. Of course, you've spent many, many years studying giftedness and children. That made me think of another reaction I had in your comments about children and child's art, and this connection between modern art and people like Picasso and Paul Clay, who were inspired by children and so called "primitives" and even mentally ill. They were inspired because they thought these were individuals who were pre-civilization, that were uncorrupted by convention. They were going for that deeper "inside-ness" of creativity that they thought they'd find in children. It sounds like something you were getting at. Is that right?

Ellen Winner 37:53

I wouldn't say it the same way they said it, that these are "pre civilization" because of course, "primitive" people have their own civilization. Children have a civilization. I do think that they romanticize child art as "the savage mind." I would say that what inspired them was the fact that children didn't know how to be realistic in their art, and therefore they weren't striving for it. They weren't dominated by the conventions of realism. So they didn't care if they made a sun purple and a face green. They didn't care if two eyes were not the same color, because they weren't striving towards realism. I think this delighted modern artists who were also trying to break away from realism. They might have added this verbiage about "these are the people that are uncorrupted by civilization." But I think what that means is they simply were uncorrupted by having learned the rules of graphic representation.

Keith Sawyer 38:53

Right. Thank you. And yes, of course, they've been roundly criticized - these mid century artists - for having this view of these gifted artists as having been "pre-civilized" or whatever, right? And so that is absolutely problematic. When you were comparing science and art, it made me think about cognitive psychology, where we are always thinking about domain specificity and domain generality. To what extent is a cognitive ability domain-general, where you can sort of apply it to anything you do, or is it domain-specific, meaning that it's a cognitive ability that falls in one area? So in this case, painting or physics would be domains. Would it be fair to say you're going for a domain-general approach to creativity and creative thinking?

Ellen Winner 39:50

Well, I actually believe that domain specificity is very, very strong. I think that's why it's very hard to achieve transfer, where you learn something in one domain and it spills over into another domain. I'm not saying it's impossible; I'm saying it's hard, and you can't assume domain generality. So let me just give you an example. We've studied the kind of thinking skills that we see being taught in a good visual arts classroom; we call them "studio habits of mind." They're things like, learning to look really closely, or learning to reflect on your process, or learning to generate mental images as you plan to work. They are a bunch of other ones, but the question is, we definitely see teachers teaching these habits of mind. Does this mean that a child who learns to look really closely in an art class, or child who learns to evaluate work in a critique session in art class, carries that skill over say, to a biology class and looks more closely, or to a literature class and knows how to evaluate better? That has not been demonstrated, and it's just extremely hard to demonstrate. It may well not carry over. I don't know. Somebody is going to have to really test that out. But what I would say is, even if it doesn't generalize, what you learn in visual arts are important habits of mind. They're part of the human mental equipment: thinking like an artist. When you when you study science, when you study mathematics, you should learn to think like a scientist, think like a mathematician, think like a historian. Same goes for art; you should learn to think like an artist. If these things generalize, great, but it's very hard to demonstrate that they do. I don't know if we're going to disagree about this or not Keith, but I think of creativity as more domain-specific than domain-general. Because you can be very creative in art, and maybe not so creative in writing. I don't know, what is your view on that?

Keith Sawyer 41:52

Oh, I completely agree with you. I know the research. I often tell my students: everything in psychology is half and half. Half domain-general and half domain specific. But I thought all of your comments sounded more like a domain-general argument of what science and art had in common?

Ellen Winner 42:10

Well, I think that they do have that in common, but I think there are different ways of thinking. So science involves testing a hypothesis and thinking about the evidence. Art involves a different kind of thinking. So while I think they both give us truths, I think that the kind of thinking you learn to do as a scientist would not necessarily lead to the kind of thinking that artists do. I think you have to really learn in each domain to think like an artist or to think like a scientist.

Keith Sawyer 42:42

Right. And then learning in art and engaging or an art is valuable for its own sake, not only because it makes you better at science, right?

Ellen Winner 42:50

Which we don't even know whether it does. Absolutely, it's got to be important for its own sake. I mean, that's a question of values. You know, that's not something we're going to solve in an experiment. What do we value? Nobody questions why we need math. We value math. We just know that's important. We don't even question it. Why do we have art? A lot of people think it's a frill, and that's why they justify it by its putative effect on test scores, which it doesn't have. But if you think about art as a fundamental part of being human, then we shouldn't have to justify it in terms of anything else.

Keith Sawyer 43:23

Right. Absolutely. Thank you.

Ellen Winner 43:25

Thank you for these questions. I wish we had longer to keep on discussing this.

Stanton Wortham 43:29

Great. Well, thanks very much, Keith. We appreciate the questions. Ellen, we appreciate your presentation. This has been a fascinating topic. And now I have a much more complex view of art and science and how they are both similar and different. Thanks for joining us for this second episode of our second season of Pulled Up Short. We hope you enjoyed it.

Take a look, if you have a minute at the American Anthropological Association's news site: anthropology-news.org, where they have lots of interesting features about current work and anthropology. Next week's episode on Pulled Up Short, we'll have Andrea Vicini talking about whether or not we're alone in the universe, and if we're not, what it would mean for our conception of our own humanity. Please join us for that episode next week. And also, remember to subscribe. We have new episodes every week. You can also access the first season at the website, pulledupshort.org.