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Abstract

Both creativity and intuition are traits that have led to humanity's greatest innovations. Creativity is a form of problem solving that can be found in all areas of human endeavor. There are certain personal traits that highly creative people seem to possess; however, there are also creative dispositions that can be developed in order to enhance people's creativity. Creativity relies on a knowledge based and involves four types of thinking: fluency, flexibility, elaboration, and originality. Creativity is a process not an event. This process can be represented by the Wallas Four-Stage Model of Creativity. Intuition is a sudden knowing or insight glean apart from logic or knowledge. Three levels or types of intuition are identified here: rational intuition, predictive intuition, and transformational intuition. There are a variety of things that can be used to enhance the intuitive process such as quieting the mind, focused attention, developing an attitude of receptiveness, validating images and impressions, and free writes. Finally, intuition can be a valuable resource to use in problem solving and decision making.

Keywords

creativity, intuition, education

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Creativity

Creativity is a trait that has helped to produce the most important innovations in human history and solve some of our most complex and compelling problems. So what is it? Creativity is a type of thinking that enables people to generate ideas, invent new ideas, improve old ideas, and recombine existing ideas in a novel fashion (Gallagher & Gallagher, 1994). Creativity is an encounter of the interestedly conscious human being with his or her world; the process of bringing something new into being (May, 1975). Behaviorally, creativity can be defined as the ability to produce work that is novel, high in quality, and appropriate (Feldman, Csikszentmihalyi, & Gardner, 1994; Sternberg & Lubart, 1999). Novel here means that the work is original or unique, something nobody has thought of or done before. Appropriate in this context means that the work is of some aesthetic or pragmatic value (Starko, 2005; Swartz & Perkins, 1990). Torrance describes creativity as *“the process of sensing difficulties, problems, gaps in information, missing elements, something askew; making guesses and formulating hypotheses about these deficiencies; evaluating and testing these guesses and hypothesis; possibly revising and retesting them; and last, communicating the results”* (1993, p 233).

Creativity as Problem Solving

Creativity is essentially a type of problem solving (Gardner, 1994). Problems can be found in all areas including the arts, business, and science, the military, and even education. Examples: How can we design a car to run on electricity? How can this feeling or idea be expressed through movement, dance, music, or visual art in a way that entertains? What kind of a play will enable our team to score a touchdown? How can I make this relationship work? How can this concept be explained so that people understand it? How can this skill be taught? How can I keep my 7th hour social studies class actively engaged? How can I write a book so that undergraduates can easily understand important concepts in educational psychology? These are all problems that require creative thinking for their ultimate solution.

When looking at creativity as problem solving you will note that this definition sounds similar to Gardner’s and Sternberg’s description of intelligence. Indeed, the line between intelligence and creativity becomes blurred when both cognitive traits are seen as having equal importance in solving problems and creating products (Sternberg & Lubart, 1991). A creative person is going to be better able to solve problems because the process of generating ideas provides more alternatives from which to evaluate and ultimately choose.

But if you are not aware of a problem in the first place how are you going to be able to solve it? You are not. Thus, being able to perceive problems is also an important part of creativity (Csikszentmihalyi, 1994). A problem is a difference between the current and ideal state. Creative individuals are able to sense this difference (between what is and what could be). Examples of problem perception can be seen in Figure 1.

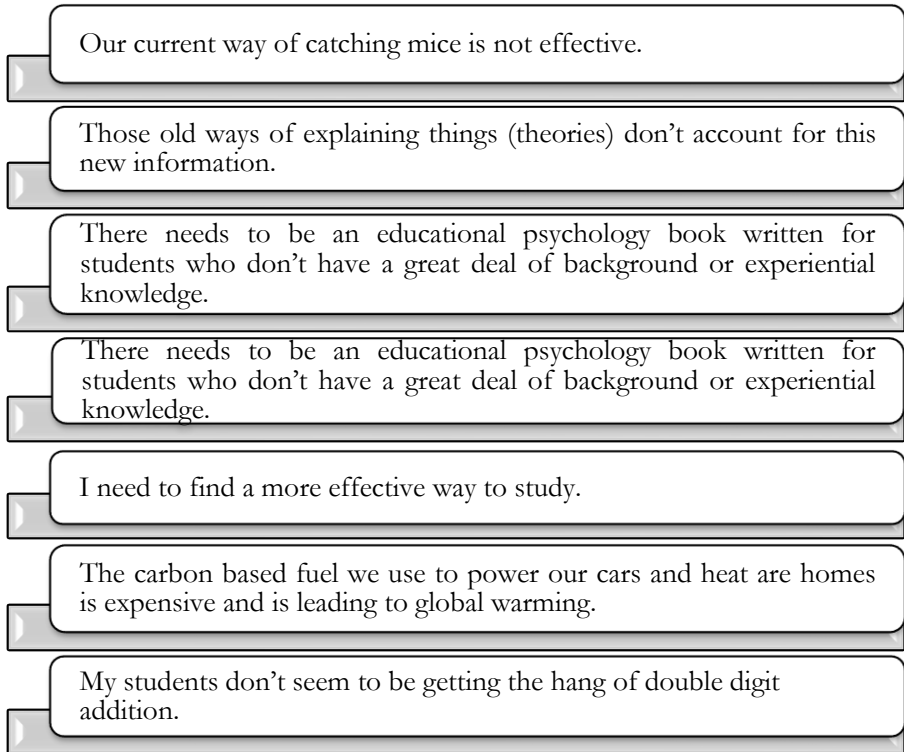


Figure 1. Examples of perceiving problems.

Redefining Problems

Another trait that enables highly creative people to solve problems is their ability to look at them in different ways (Lipshitz & Waingortin, 1995; Sternberg & Williams, 2002). This is called redefining the problem (Sternberg & Grigorenka, 2000). Creative problem solvers are able to go of the old ways of thinking, which in turn enables them to generate a variety of novel solutions. This is the “thinking outside the box” cliché with which you are most likely familiar. By freeing themselves from conventional ways of thinking and by examining problems from a variety of angles, highly creative people open themselves up a variety of new possibilities. Figure 2 contains three examples of problems that have been redefined.

The problem: Currently there is great debate about how to stop illegal immigration along the Mexican border. Solutions being put forth include fences, border patrols, and cracking down on employers who hire illegal workers.

- **The problem redefined:** How can we create economic environments in both Mexico and the US so that illegal immigration is not necessary?

The problem: Many new teachers are faced with the problem of classroom management. One way that is often used to define the problem is this: How can I control these students? Solutions often include getting tough, offering rewards, looking for gimmicks or programs.

- **The problem redefined:** How can I create a learning experience that offers structure and choice and encourage students to learn in ways that are natural to them?

The problem: How can we ensure we have a plentiful supply of oil?

- **The problem redefined:** What alternative source of energy might be used to power our vehicles?

Figure 2. Examples of redefining problems

Other Traits Associated with Creativity and Highly Creative People

Most would agree that, from a practical point of view, creativity is a good thing. Think of all the gadgets and innovations you enjoy today that are a result of creativity and creative thinkers. It is also good from an emotional or intrapersonal point of view. Humanist psychologists describe creativity as a trait that represents the highest degree of emotional health and something found in all humans (May, 1975; Maslow, 1968; Rogers, 1961). Creativity is a part of being self-actualized and fully human (Maslow, 1971). So are healthy people more creative or are creative people healthier?

In a thirty year longitudinal study Torrance (1992) found that highly creative successful people have the following characteristics: delight in deep thinking, tolerance of mistakes, love of one's work, clear purpose, feeling comfortable being a minority of one, and comfortable being different. Other personal traits associated with creativity, creative thinking, and creative people include the following:

- Self-confidence, independence, risk-taking, energy and enthusiasm, self-confidence adventurousness, curiosity, playfulness, humor, idealism, reflection, sensitivity to problems, ability to define problems, ability to resist premature closure, visualization, analogical thinking, intuition, concentration, nonconformity, unconventionality, and logical thinking (Davis & Rimm, 1998).

- Tolerance for ambiguity, willingness to surmount obstacles, intrinsic motivation, moderate risk-taking, desire for recognition, and willingness to work for recognition (Lynch & Harris, 2001).
- Boldness, courage, freedom, spontaneity, perspicuity, integration, self-acceptance, ability to embrace paradox, ability to put order to chaos, and playfulness (Maslow, 1968).

Creative Dispositions

Very much related to personal traits, Carl Rogers (1961) describes three inner conditions necessary for creativity. These are not static attributes; rather, they are dispositions that can be developed.

Openness to experience. You are free from psychological defenses. This allows thoughts and memories to come into awareness without distorting them. This means also that you are not inclined to see things in predetermined categories or through the lenses of your cultural conditioning. Very much like the concept of right-mindedness found in the Buddhist Noble Eightfold Path, you are non-judgmental in your attitudes, able to accept without pre-conceived judgment, and able to try on new ideas with which you may not always agree.

Internal locus of evaluation. You strive primarily to produce what you believe to be good products and performance rather than what others to believe these to be. You are not trying to please somebody else in your creation; rather, you are motivated internally, relying on your own standard of evaluation, attempting to create what is of aesthetic and pragmatic value to you.

Ability to toy with elements and concepts. You have a certain child-like quality that invites you to explore and play with ideas. What you believe to be true is not a limiting factor in your exploration. You allow yourself to imagine a variety of possibilities regardless of their likelihood or basis in reality.

Creative Thinking

Think for a minute about the types of thinking specifically used in the creative process. What qualities of thought produce work that is novel, high in quality, and appropriate? Torrance (1992) identifies four: fluency, flexibility, elaboration, and originality.

- *Fluency* is the ability to generate a great many ideas. This type of thinking can be used when looking for possible solutions to problems. This is often known as brainstorming (see Figure 3). The important thing with this type of thinking is not to evaluate ideas initially. Evaluating ideas comes only after a great number have been generated.
- *Flexibility* is the ability to generate a variety of different ideas or to produce a number of different approaches. For example, what are some other ways we might be able to get a telescope into space? What are some other ways in which we could generate power for our cars and homes? What are some other ways I might learn this material and pass the midterm exam?
- *Elaboration* is the ability to examine the original thing and generate ideas that can be used to make the original thing better, more interesting, more detailed, or more complex, or more refined. For example, what

- could I add to a bike, birthday part, or bathtub to make it better?
- *Originality* is the ability to design or create things that are totally new, unique, or novel; things never before imagined. What are some new types of transportation that we have not yet considered? How else might we prepare pre-service teachers to meet the demands of the classroom? How could this theme be expressed in a movie in a way that is unique, novel, and interesting?

The Torrance Test of Creative Thinking (TTCT) (Torrance, 1999), the most commonly used creativity test, is designed to measure these four types of thinking. But can creativity really be measured? The jury is still out on this one. While the ability to predict creative achievement is questioned; the TTCT may predict creative potential (Corpley, 2000).

Table 1. Tips for brainstorming

Students (and adults), do not naturally know how to brainstorm; thus, they must be taught the process. Initially, this process should be modeled in large group with the teacher writing down the ideas generated by the class. Later, students can move into small groups. Idea generation works best in pairs or small groups, as students are able to hear a number of ideas. These initial ideas, in turn, serve to generate more ideas. There are four rules for brainstorming. Put these rules in poster form to assist your initial instruction, and then use this poster for quick review when needed:

First Tip: All ideas must be accepted.

No criticizing or evaluation is allowed. At this stage, bad ideas are just as important as good ideas.

Second Tip: Freewheeling is celebrated.

Creative, bizarre, unusual and silly ideas are welcomed along with smart aleck comments and random associations. All of these can be used to stretch our thinking and get us thinking more broadly.

Third Tip: The goal of brainstorming is quantity.

The more ideas we have, the greater our choice is in finding a solution.

Fourth Tip: Hitchhiking is welcome.

Hitchhiking is when you add to an idea that has already been state or combine two or more ideas. This is a technique many creative problem solvers use. Encourage your students to do this as well.

Knowledge, Intelligence, and Creativity

To be creative you must first have a body of knowledge (Feldhusen, 1995; Gallagher & Gallagher, 1994; Gardner, 1994; Piirto, 1994). Creativity involves the manipulation of ideas from a knowledge base. Without a body of knowledge there is nothing to manipulate. Without a box there is not a box of which to step outside. This is one of the reasons why it is important to have well-structured curriculums that lay out a plan for presenting students with a fair amount of knowledge in an organized fashion. Among other things, a body of knowledge enhances students' ability to think creatively and to solve problems (Chi, Feltoich, & Glaser, 1981; de Groot, 1965).

There is also some relationship between creativity and intelligence (Good & Brophy, 1995). Intelligence is used to facilitate the development of a well-organized knowledge base, thus making it easier to retrieve ideas, relate new information into existing schemas, and to manipulate ideas in new and interesting ways (Feldhusen, 1995). However, while some amount of intelligence is required for creative achievement, highly intelligent people are not necessarily highly creative (Starko, 2005). And as pointed out earlier, the line between creativity and intelligence can become blurred as both are instrumental in solving problems.

The Creative Process

The last area examined here is the creative process. Creativity rarely happens by accident. It does not just occur; rather, it is a purposeful act requiring preparation, hard work, and discipline (Marzano et al., 1988). The sudden creative insight that inventors and artists sometimes describe is usually the last step in a long thinking process that occurs over time. Creativity is not a drive through experience. It is not an event, but a process. We can enhance our creativity by attending to the process. The Wallas Model of Creativity (Wallas, 1926), one of the most common models of creativity, proposes four stages of the creative process:

First Stage: Preparation. This is the stage where the problem is first perceived and defined, information about the problem is gathered, and ideas are generated. As examples, we will look at two college students, Polly and Pat, who both attend Moosebutt University. Polly, an English Creative Writing major is assigned to write a piece of fiction for her creative writing course. During the preparation stage she has a sense of her topic and she starts brainstorming or listing ideas, and gets background information to help her with her story. Pat, a sociology major, is looking for a research project for his senior paper. During this stage he selects his topic and begins to review the literature and takes notes. Both Polly and Pat have a sense of where they are going at this stage, but it is still unclear what the final product is going to look like.

Second Stage: Incubation. Here, both the conscious and unconscious mind manipulate the problem and think about possible solutions. New information is related to existing information and existing schemata are reorganized to accommodate new information. Sometimes stages one and two merge into each other slightly. At this stage Polly is creating outlines and initial drafts. Pat also is creating outlines and initial drafts, but for both, the path they'll take is still unclear. Their writing may seem labored at this point. A lot of work at the incubation stage takes place unconsciously. Polly and Pat, who are both good students, know the importance of starting their projects early. This gives them lots of time to process information, to think about their projects with the conscious part of their mind, and to percolate with the unconscious part.

Third Stage: Illumination. In this stage, the creator suddenly sees the idea, concept, or solution to the problem. At some point, as Polly and Pat have been preparing, processing, incubating, and percolating, they get a sudden insight about exactly how their story and research project should go. Their projects

appear to fall together instantly. At this point, their writing and researching seems almost effortless. However, this “aha” moment would not have occurred had they not prepared, processed, incubated, and percolated.

Fourth Stage: Verification. This is an evaluative stage where the creator verifies or tests the idea, concept, or solution. At this stage, Polly and Pat have finished their initial drafts and are in the process of revising and getting feedback on their projects. During this stage there may also be a series of little illuminations. The “aha” moment occurs in varying degrees and dimensions. And of course, the ultimate verification is the grade of A they received on their projects and the recognition they received from Moosebutt University for their outstanding creative and scholarly achievements.

Their grade of A also verifies the creative process. A bit of advice for undergraduate students: It *always* pays to start your assignments and projects early. Some student claim they work better under the pressure of a deadline at the last minute. While this may strengthen their motivation, it does not result in a better product or performance. By starting early you will find that you will spend less time and end up with a better product than by starting at the last minute.

Intuition

Along with creativity, intuition has been an important element in some of humankind’s outstanding innovations and breakthroughs. If our goal is to enable all students (and teachers) to reach their full potential, it would seem to make sense then that we might teach this or, if possible, at least try to develop it.

What Intuition Might Be

There are many conceptions of what intuition is or might be. It is a cognitive function, something our brains do naturally (whether you are aware of it or not), but it is also a mental operation that can be taught directly and deliberately applied. It is a type of thinking that is nonlinear. As well, intuition is a level of awareness or state of consciousness. Nel Noddings defines intuition as, “... *that function that contacts objects directly in phenomena. This direct contact yields something we might call ‘knowledge’ in that it guides our actions and is precipitated by our own quest for meaning*”, (Noddings & Shore, 1984, p.57). Jerome Bruner (1977) defined intuition to intuition as “. . . *the act of grasping the meaning, significance, or structure of a problem or situation without explicit reliance on the analytic apparatus of one’s craft?*” (p. 60).

Intuition is defined here as a sudden knowing apart from logic or knowledge. It is the ability to make the leap from the known or predictable to something totally different or to realign known information or see facts in totally new ways.

Traditionally, our schools and Western culture have valued logic and reason and devaluated intuition and emotion (Miller, 2001). Intuition (and emotion), have been seen as weaknesses in the problem solving and decision-making process (“*It was just an emotional decision.*”) However, it is not an either/or

proposition. Intuition and emotion can enhance rational knowing. The same brain that thinks and stores knowledge also emotes and intuits. So of course, we can use this to enhance both thinking and knowing.

Three Levels of Intuition

There are three levels or types of intuition: rational intuition, predictive intuition, and transformational intuition.

- *Rational intuition* is thinking that realigns known information. It is that ‘aha’ experience where you suddenly see the solution to a problem or get new insight. Often new information is combined with forgotten information to connect the dots in a different way. This type of awareness seems to come when you are sleeping or when your mind is relaxed or thinking of other things. This demonstrates the importance of moving away from the logical mind.
- *Predictive intuition* is thinking that utilizes known information to form new patterns, sequence, idea, or plan. Here you use information to create a hunch, guess, or hypothesis. You are able to perceive the whole based on only partial information. Again, this is something the brain naturally does. Your brain naturally uses partial data and completes the picture. For example, given the two lines in Figure 4 your brain organizes this into either a chalice or two people kissing. In Figure 5, even though there are no lines to indicate it, your brain naturally creates the picture of a sphere based on partial information.

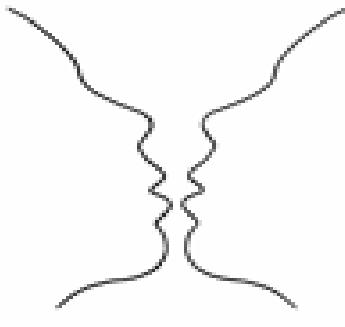


Figure 3. Two lines

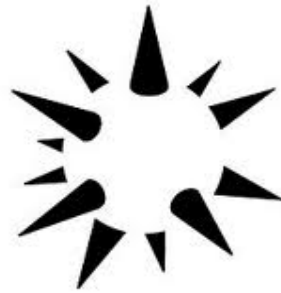


Figure 4. Partial information

Predictive intuition is also the type of thinking Jerome Bruner (1977) saw as an important part of inductive reasoning. Here students would examine many specific examples in order to formulate a general principle. He stressed that intuitive thinking is used in formulating hypotheses used in the scientific model.

- *Transformational intuition* is thinking or awareness that uses a different kind of sensing to pick up information. This defies most traditional scientific explanations. Here information seems to come from a source outside the individual. This can also be the type of B-cognition described by Abraham Maslow that often occurs when we are working or performing at our highest states during peak experiences (Maslow, 1971).

The Intuitive Process

Intuition can be helpful in knowing and understanding as well as problem solving and decision making in the classroom. Master teachers are often able to use their intuition to understand students and situations as well as to identify solutions or make good decisions. Figure 6 has a list of things that can be used to enhance your intuition.

Table 2. Things that enhance or intuition

Quiet the mind
Use any technique to get away from the chatter and clutter of your conscious mind. Techniques such as walking, deep breathing, mediation, or relaxation techniques.
Focused attention
Sustained focused attention with a relaxed mind enables images to bubble up from the unconscious.
Receptive attitude
You must be in a state where you are willing and able to open and amenable to a variety of thoughts.
Validate images and impression
Validate the various images and ideas that come to you when you are using your intuitive process. Everything means something. Even seemingly crazy ideas often lead to useful and creative turns.
Free write
A free write is where you write down the first word or thought that pops into your mind. The goal is to do it quickly without thinking, to get around the logical mind and allow the unconscious mind to speak to you.

Problem-Solving and Decision-Making

In Western society, and by extension our schools, there is a tendency to value and use only knowledge and logic to solve problems and make decisions. These two elements are certainly necessary, but they are not sufficient in making balanced decisions. In both your personal and professional life well balanced decision making and problem solving uses four ways of knowing (see Figure 5):



Figure 5. Four ways of knowing

- *Logic.* Logic is used to determine the possible effect of various alternatives and to evaluate the various solutions. Logic is also used to evaluate emotional and intuitive reactions.
- *Knowledge.* Knowledge of similar situations as well as past strategies and solutions that are stored in long term memory are retrieved. These are compared to the current situation in order to identify effective solutions. Knowledge can be used to put our emotional reactions and intuitive feelings in context.
- *Intuition.* Intuition can be used to connect the dots, to view knowledge in new ways, or to generate new ideas or identify solutions. It can also be used to test the appropriateness of ideas. What does your gut feeling tell you?
- *Emotion.* Emotions can be used to evaluate the appropriateness of logic and knowledge-based decisions. What does your emotional state tell you about each alternative? What decision feels the best? What feelings or other associations come to mind when you think of each decision?

Conclusion

Both creativity and intuition are traits that have led to humanity's greatest innovations yet they are given little attention in our schools. Perhaps this is because they are not as easily quantified as some traits. If it cannot be captured in a box and measured some feel that it does not exist. However, if our goal in education is to help all students reach their full potential, to self-actualize, to become fully human, then creativity and intuition should be addressed in some form in our school curriculums. Likewise, if we wish to maximize our schools' potential for developing human beings who are capable of making impactful changes in society and who have the capacity for developing innovative new

technologies, solving problems, and making good decisions, then we must value and learn to develop students' creativity and intuition.

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