

Assessing Student Creativity

By Mark Runco, Ph.D.



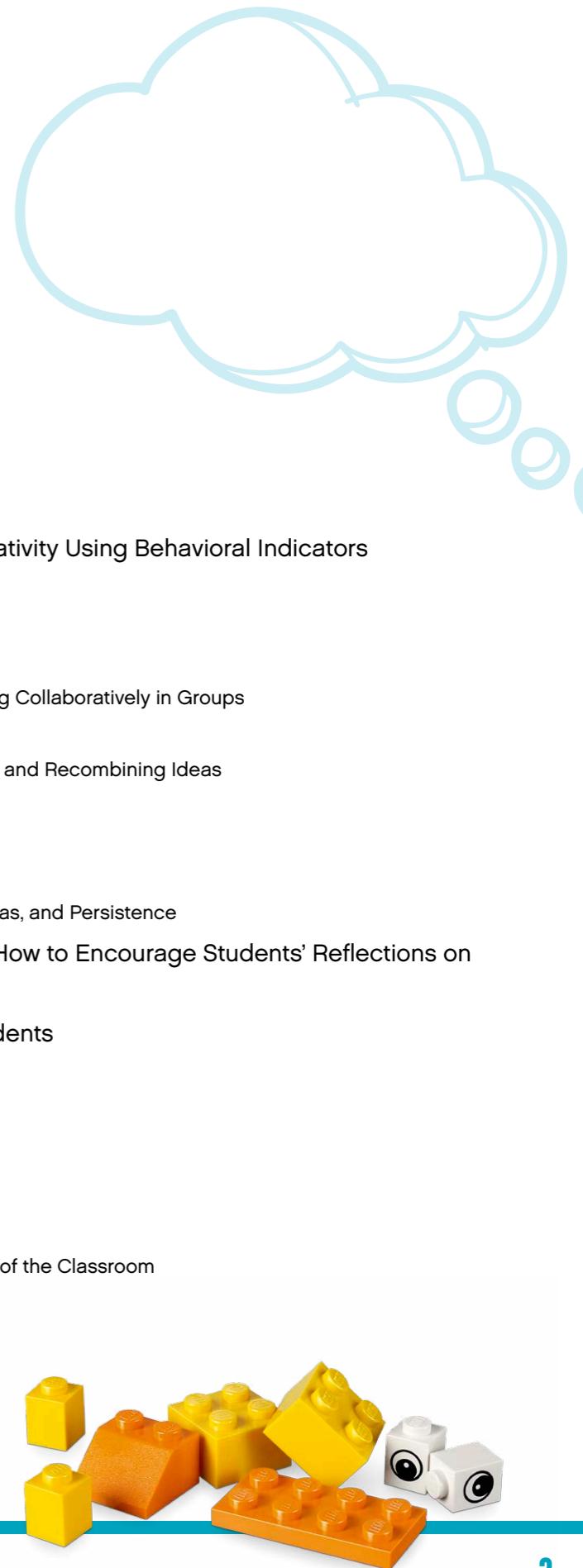
education



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Introduction

Working with LEGO® bricks provides a number of learning opportunities for you and your students, several of which contribute to the fulfillment of creative potentials. The specific benefits are described in this publication, along with assessment tools for your use. Sound scientific research provides a foundation for all of the procedures and concepts that are described.

Creativity Defined

Creativity is often called a “complex” because it can be expressed in a variety of ways and because there are a number of indicators. Sometimes creativity contributes to problem solving. Other times it is demonstrated when a child is playing imaginatively or expressing him- or herself and there is no specific problem to solve. Creativity is consistent with the idea of a complex because it often involves *divergent thinking*, as well as *flexibility of thought* and the capacity to *combine and recombine disparate ideas*. And also, because it is multifaceted.

While this view of creativity sounds as if it could complicate the curriculum, it actually works to your advantage. Instead of having to focus on just one process or skill, you can support several different kinds of behaviors, including those listed above. (A more complete list is given in the *Creativity Rubric*.) Instead of fitting all students into one mold, you can look for signs of creativity in most activities, even those that vary from lesson to lesson. This allows you to triangulate, and is especially useful in giving the kind of feedback that allows your students to use their creativity most effectively both inside and outside the classroom.

Truly creative things are both effective and original. They capture an idea, solve a problem, or express a useful concept. LEGO Education activities are particularly well-suited to creativity because they allow children to express their originality and require effectiveness.

All creative things, whether they are ideas, products, or inventions, are *original* and *effective*. Originality implies that the idea or behavior is unusual, unconventional, novel, or unique, all of which can be seen in LEGO constructions. Students can not only be original in their choice of bricks (e.g., color, shape), but perhaps more importantly, in their interpretation of a design or their choice of what to build to satisfy an assignment. While originality is required for creativity, it is not by itself enough to qualify an idea or behavior as “creative”. Some things are original but impractical and ineffective. Truly creative things are both effective and original. They capture an idea, solve a problem, or express a useful concept. LEGO Education activities are particularly well-suited to creativity because they allow children to express their originality and require effectiveness. When students build with LEGO bricks they can immediately see whether or not their ideas work.

Effectiveness is one of the obvious advantages of the LEGO Education materials. Effectiveness is easily assessed. A LEGO® construction stands, rather than falls. It captures the design requirements and holds together. In some areas of creative work (e.g., poetry, or a collage), effectiveness is a difficult criterion to satisfy and can be quite subjective. LEGO Education activities allow creativity that is easy to judge.

Assessment Defined

When assessing the work of your students, look for originality and effectiveness (as is required by the definitions of creativity found in the academic research). Also look for behavioral indicators that your students are thinking creatively, as provided in the *Creativity Rubric*.

LEGO Education is quite clear that assessment plays several important roles in the educational setting and learning process:

1. Assessment is included throughout the learning process, not just at the end.
2. Assessment is for the benefit of student learning, not just for the teacher.
3. Assessment is for learning, not just of learning.
4. Assessment is qualitative, not just quantitative.
5. Assessment is based on multiple sources of information, not just one form of measurement.
6. Assessment is an integrated part of LEGO Education learning solutions.

These assessment principles apply to LEGO constructions. When students create their own meaning (which they often do building with LEGO materials), they are learning, and not just about the arrangement of bricks. Rather, they are learning in the most powerful way possible—to think by creating meaning. LEGO Education assessment principles also allow for the simple, unstructured observation of students’ self-expression and originality, whether or not it is quantified and a number or score is assigned. And, perhaps most importantly, they allow for the assessment of students’ creativity based on multiple sources of information.

Creativity Rubric For Teachers

You will find the *Creativity Rubric* copymaster on the next page. Specific behavioral indicators of creativity, probable when students work with LEGO bricks, are listed in the left-hand column.

As you observe each of your students in the classroom, consider the following:

1. Does the student show the behavior?
2. Has that student had the opportunity to do so?
3. If the student has had the opportunity, is he or she showing the creative behavior *regularly* or *rarely*?
4. If the student has had the opportunity but is not showing the behavior, even rarely, you have a new goal! You can do whatever it takes to encourage that particular indicator of creativity.

Creativity Rubric

Directions:

For each student, add dates or check marks to document indicated behaviors.



Student Name:	Date:			
Behavioral Indicators	Opportunity	Regularly	Rarely	New Goal
Self-expression While working individually				
While working in groups				
Problem solving Completes the construction				
Problem identification Sees a gap				
Defines task for him- or herself				
Post-conventional decision making Discretion				
Questions assumptions				
Flexible thinking Uses new perspective				
Changes approach to problem				
Fluency with ideas Considers a number of options				
Originality Builds something different from others				
Exploration Tries new combinations				
Thinking with combinations and systems Combines and recombines bricks				
Constructs new meaning Offers a new understanding after finishing construction				
Adaptation Uses bricks in novel ways				
Decision making and generalized creative skills Uses what is learned in new situations				
Mindfulness Concentration				
Attention				
Trying new categories				
Persistence				
Effectiveness				

Creativity Rubric: How to Identify Students' Creativity Using Behavioral Indicators

Self-Expression

Self-expression is one of the most important indicators of creativity during the school years. Students may have an idea, an insight, a question, or sometimes just a feeling, and creative activity can provide a means and medium to express it. This is why creativity is so often associated with the arts. However, creativity is possible in virtually any domain. One of the most common misunderstandings about creativity is known as the *art bias*, or the assumption that creativity is always expressed in art—that *only* the Arts are creative. Several common misunderstandings about creativity, such as the art bias, are noted in the Recommendations section.

Self-expression may be seen when a student builds his or her own LEGO model of a butterfly and designs an attractive pattern in the wings. Attention to the size, position, and color of the bricks used demonstrates an understanding of symmetry, and also reflects the student's individual preferences. In this way, the butterfly is self-expressive. Many LEGO Education activities allow for self-expression.

While evidence of creativity as self-expression may be obvious when students are working individually, working in groups can present some beneficial trade-offs. (See the Post-conventional Decision Making: Impact of Working Collaboratively in Groups section for further advice on balancing opportunities for a student's creativity with other objectives within group work.)

Problem Solving

Creative thinking can help a student solve problems in an original and effective way. LEGO Education activities that challenge the student to solve a problem provide good practice, especially if that challenge allows the student to express him- or herself, explore, or find an original solution.

While problem solving and creativity overlap, they are not one and the same thing. Students can be creative even when they are not solving problems. Self-expression is a good example of this. What's more, some problems can be solved effectively without creative thinking (e.g., students don't need to invent the wheel to fix a flat bicycle tire). LEGO Education activities provide a medium for students to engage in creative problem solving.

The difference between creativity and problem solving is apparent when the concept of "problem" is precisely defined. A typical problem occurs when there is an objective or goal, and some obstacle to that goal. Solving the problem requires that the obstacle be removed or circumvented so that the goal can be obtained—the objective satisfied. Creative thinking can help students avoid or eliminate obstacles either by providing alternative approaches or perspectives or by allowing them to question assumptions. Each of these approaches—generating alternatives, shifting perspectives, questioning assumptions—is useful for creative thinking. And each can be practiced with LEGO Education activities. For example, students can try one brick, then remove it and try a different brick. Students can turn their LEGO constructions upside down, or try a different perspective by examining them from 10 feet away. Alternative perspectives are also likely to occur when a LEGO project is put aside overnight—or longer—and then revisited. These tactics for creative thinking can be helpful in solving problems.



Problem Identification

The possibility that creative thinking often occurs before a problem is identified is also often cited as evidence that not all creativity involves problem solving. After all, if there is no problem (or none has yet been identified), the thinking cannot be classified as problem solving. A great deal of creativity occurs before a problem is identified. (Self-expression, on the other hand, can be entirely independent of any sort of problem.) This kind of creativity is often described as *problem finding* or *problem discovery*.

Problem finding has been found to characterize many creative breakthroughs. Very frequently, the creativity occurs not when an individual is thinking about how to get around an obstacle, but when he or she is playing, exploring, or experimenting—and in so doing, discovers a new problem. The creativity is in the identification or definition of the problem, not in its solving. The terms *problem discovery*, *problem identification*, and *problem definition* have all been used in the creativity research.

Problem discovery helps to distinguish creativity from problem solving. It also supports the idea that creative behavior may depend on a process. The process begins with the identification of a problem, but may also require problem definition and problem redefinition. Problem identification occurs once an individual recognizes

that there is in fact an obstacle or a desired goal. While recognition is the start, the problem may not yet be really understood or defined in a manner that allows it to be solved. More often than not, when problems are first identified, they are not in a form that allows progress towards their solution. They require definition and redefinition.

It is important to keep in mind that most theories of a creative process include some sort of *verification* or *implementation* when the creative idea is applied and tested. Often it is the attempt to implement or verify the idea that motivates problem redefinition. More often than not, problem solving is a cyclical and recursive process. The student may need to go back to an early idea, make an attempt, make some progress, gain some experience, then revisit an earlier stage (i.e., obtain more information, talk to others, redefine the problem).

In summary, creative things are original and effective. Effectiveness often requires testing and retesting—a recursive problem-solving process. LEGO Education activities allow students to build, test, and revise the design of a project. And they allow you to assess students as they revisit early stages and efforts, and as they persist, implement, and verify in order to ensure that their LEGO constructions are both effective and original.



Post-conventional Decision Making: Impact of Working Collaboratively in Groups

Working on LEGO Education activities in groups can be quite beneficial, however there are several considerations. First, age must be taken into account. Concerns about maintaining the capacity for self-expression, while learning to collaborate, point to ages 5 to 13 or 14 as particularly important.

Developmental theory describes how preschool children are *pre-conventional*. Their thinking is not yet capable of processing conventions, and social expectations mean very little. No wonder preschoolers can be so uninhibited! However, as their brains mature, social conventions are recognized and can be used. These conventions include rules, fads, norms, and various social expectations. Around age eight or nine, children become quite adept at fitting in with others. At this age they may very well take things too far! It is quite common for a preadolescent to value what his or her friends think more than just about anything else. When this occurs, children experience a kind of slump in their self-expression and original ideation, at around age 8, and then again at around 12 or 13 years of age. By no means do all children slump, but it may be the majority (just over 50%).

Certain things can be done before “the fourth-grade slump” to protect children and minimize this possibility. For example, children ages five to seven can be prepared not to go too far in the direction of conventional thinking. Conventions are often good things and help students get along with one another, but if the individual is not mindful and considers only conventions when making decisions, conformity is highly likely. Because conformity precludes creative thinking, it is antithetical to originality. The goal is to ensure that children are able to think for themselves, even as they learn to recognize conventions and socially appropriate behavior, to encourage them to be mindful rather than blindly conventional, and to be capable of collaboration while retaining their capacity for self-expression.

Research on optimal group size for creative thinking suggests that groups of two to four students are probably best. Five or more students working together are likely to inhibit the creative contributions.

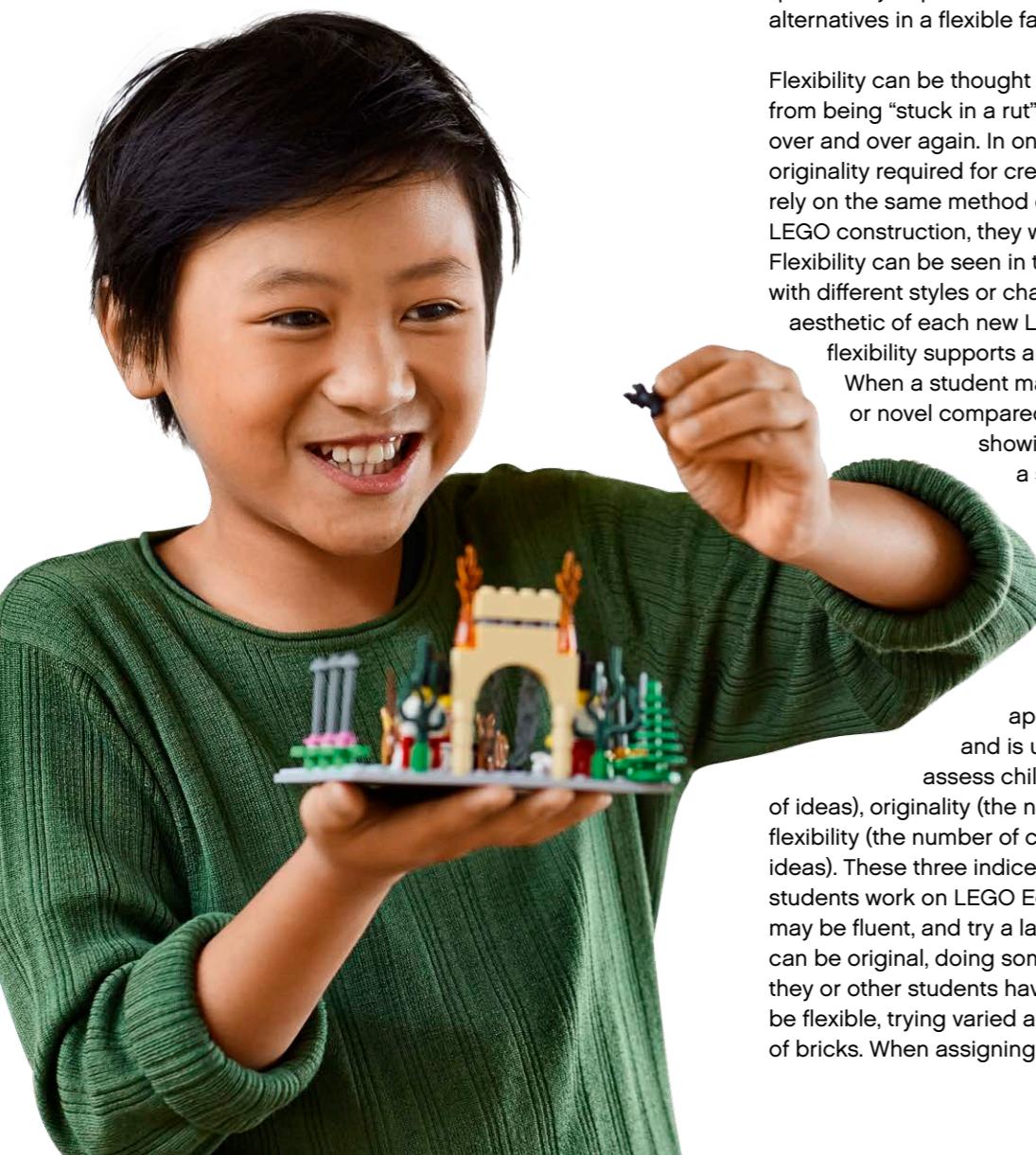
The developmental theories mentioned above point to the value of *post-conventional* thinking, which is the label given to thinking that recognizes conventions, but is capable of individuality and self-expression as well. Post-conventional thinking is likely to develop when students have experiences working together and exchanging ideas and talking about their own perspectives. A common misunderstanding about creativity involves *brainstorming*. A very popular technique for group problem solving, brainstorming can be useful for teaching students to collaborate and appreciate diverse perspectives—good practice for developing post-conventional thinking. However, it should not be assumed that brainstorming boosts originality and creativity. There is, in fact, a smooth but inverse relationship between group size and original thinking: The larger the group, the less originality is displayed.

Group size should be a consideration when planning LEGO Education activities. The larger the group, the less likely it is that every individual will have an opportunity and be confident expressing him- or herself.



Flexible Thinking, Fluency with Ideas, and Originality

Working in teams exposes students to diverse perspectives. On a cognitive level, being able to view problems and tasks from more than one perspective requires flexible thinking. There are multiple benefits of flexibility for creativity, and it is an important behavioral indicator to encourage as you encourage your students to achieve their creative potential. Most generally, flexibility indicates that students can shift perspectives and consider varied conceptual categories when thinking about any one topic.



You can encourage flexible thinking by asking the right questions while students are working on LEGO Education activities, and the right follow-up questions upon their completion. For example, you might ask students to construct a building that might have stood on a street hundreds of years ago. After the building is finished, you may say, "What if the people living here experienced severe weather a year earlier and wanted to be prepared for another year of very cold (or strong winds or monsoon) conditions? How might they change the building?" Students are likely to respond in a flexible fashion, perhaps changing the construction of the walls or roof of their building, or adding other stable structures to withstand high winds or high water. The questions you pose will direct students to think about alternatives in a flexible fashion.

Flexibility can be thought of as thinking that keeps us from being "stuck in a rut" and doing the same thing over and over again. In one sense, it is related to the originality required for creative behavior. If students rely on the same method or assumptions for each LEGO construction, they will all resemble each other. Flexibility can be seen in the student who experiments with different styles or changes the basic method or aesthetic of each new LEGO project. In this way, flexibility supports a kind of personal originality.

When a student makes things that are unusual or novel compared to others, he or she is showing signs of originality. When a student creates things that are new personally, he or she is showing a clear sign of flexibility.

Flexible thinking is part of the theory of divergent thinking. This is a very useful approach to creative potential and is used in many tests that assess children's fluency (the number of ideas), originality (the number of unique ideas), and flexibility (the number of conceptual categories in the ideas). These three indices are often apparent when students work on LEGO Education activities. Students may be fluent, and try a large number of designs; they can be original, doing something that is unlike what they or other students have already tried; and they can be flexible, trying varied and diverse arrangements of bricks. When assigning LEGO activities, be on the

lookout for all three of these indicators and pose questions to encourage each one of them. Students can be told to "try as many different options as you can," or "make it look like something no one else will build," or "try something you have not tried before." For students around age seven or eight, you might want introduce the concept of originality through their focus on friends (e.g., "do something your friends won't think of doing").

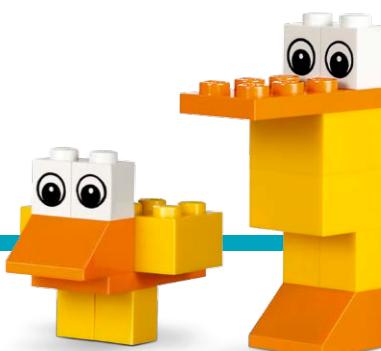
Students can be told to "try as many different options as you can," or "make it look like something no one else will build," or "try something you have not tried before."

Thinking with Combinations and Systems: Combining and Recombining Ideas

Gauging students' ability to combine and recombine ideas is useful for assessing creativity, and aligns well with LEGO bricks as a medium. It is also aligned with extensive neuroscientific research on creativity. Dozens of fMRI studies have been conducted on creative problem solving and improvisation, a form of originality. These confirm that creativity is complex; there is no one brain location or structure that is responsible for creative thinking. Rather, networks are active when an individual is generating new ideas. This is consistent with the idea of divergent thinking and offers evidence for using more than one indicator (e.g., fluency, originality, and flexibility) on assessments.

Neuroscientific research points to a particular process that seems to underlie creative thinking; namely the process whereby divergent ideas are brought together and combined to form a new insight. This *combinatorial* process can be easily related to LEGO Education activities. Working with LEGO bricks allows students to explore different combinations, clearly express their ideational process, and provides a perfect way to practice creative thinking. Ideas about bricks are combined and recombined as the student tries one arrangement of bricks after another. The combination and recombination of bricks both expresses and exercises the underlying process of creative thinking.

Thinking with combinations and recombinations will be obvious as students' new LEGO constructions evolve, and as they assemble new combinations of bricks. It will also be apparent as the student combines brick arrangements from one project with another, possibly unrelated, LEGO project. For example, the propeller from a LEGO airplane may, at a later point, be added to a sailboat, or to form the tail of a duck. Carefully look for new combinations of LEGO bricks, to assess your students, and actively encourage combinations and recombinations.



Without a doubt, there is more to creativity and learning than just cognition and thinking. Attitude, motivation, and engagement are also required.

Constructing New Meaning and Adaptation

The famous developmental psychologist Jean Piaget claimed, “To understand is to invent.” He argued that education should de-emphasize memorization and instead focus on thinking. Invention, for Piaget, occurs when the child constructs new meaning. The child may observe something never seen before (e.g., a white wolf), and assume it was just the same as some remembered experience (e.g., a large white dog).

However, that child would better understand this new experience if he or she noticed differences between the new and old ones (e.g., the size of the wolf or the conspicuous incisors). Piaget described the process of authentic intellectual growth as a kind of adaptation to the world. He felt that it depended on the assimilation of new information and the growth or accommodation of cognitive structures. The result of this adaptation is truly meaningful information—information that is readily used by the individual, and retained, because the individual him- or herself cognitively constructed the underlying meaning. It is authentic precisely because it is constructed by the individual and not just memorized or found in a book. Such construction requires real effort—more effort than merely pulling information from long-term memory or relying on the past.

All of this fits very nicely into the LEGO emphasis on systems for learning, as can be seen in the LEGO Company document, *A System for Learning*:

“Systems are essential for learning because they are used by the mind to generate meaning from the endless onslaught of stimuli from the outside world. They help us to make sense of things and to build knowledge and understanding... Through systems we also channel creativity into ideas or artifacts in a way that can be understood and valued by ourselves and others... They help us to express ourselves. Systems that allow us to build knowledge and understanding, as well as express it, are crucial for learning. We call this Systematic Creativity: the ability to think creatively and reason systematically. It is about making sense of, and

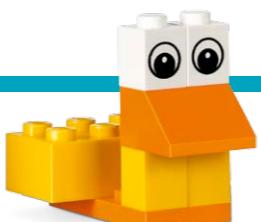
leveraging, human experience. It is marked by a strong push to put imagination and creativity at the service of knowledge and reasoning. (page 8)

The critical idea is that learning and creativity are strongly related processes. For Piaget, they are inextricable. This is why “to understand is to invent”. Children do this best when they are challenged, explore alternatives, test new ideas, and think about situations that are fun and open-ended. Without a doubt, there is more to creativity and learning than just cognition and thinking. Attitude, motivation, and engagement are also required.

Constructing New Meaning and Intrinsic Motivation

Intriguingly, the theory of creativity as a construction of meaning de-emphasizes rewards, grades, and other contingencies. Rather, it emphasizes what creativity research refers to as *intrinsic motivation*. This research has demonstrated many times over that students who work towards a reward tend to think conventionally and less creatively than those who are personally challenged and allowed to follow interests. When there is a reward or other contingency, students tend to think about “what the teacher wants”. Yet authentic learning requires creativity (Piaget’s *invention of meaning*), and this depends on personal engagement. The good news is that this actually makes things easier for you. Instead of motivating and carefully rewarding all student behavior, your critical task becomes finding educational activities that challenge your students. Intrinsic motivation and creative thinking will follow naturally.

In answer to the question “why do students create?” Piaget would say, “Because they are eager to understand things that interest them”. LEGO Education activities can be directed at topics that interest students—without having to circumvent the required curriculum! Give your students the latitude to make their own choices within the boundaries of the curriculum. For example, if the curriculum requires that you discuss the way people lived hundreds of years ago, let your students use LEGO bricks to construct a building from that historical period or tell a story set in that time period. One student may choose to build a vehicle (e.g., a horse-driven cart), and a student who likes boats might choose to build a ship or lighthouse.



Decision Making and the Playful Classroom

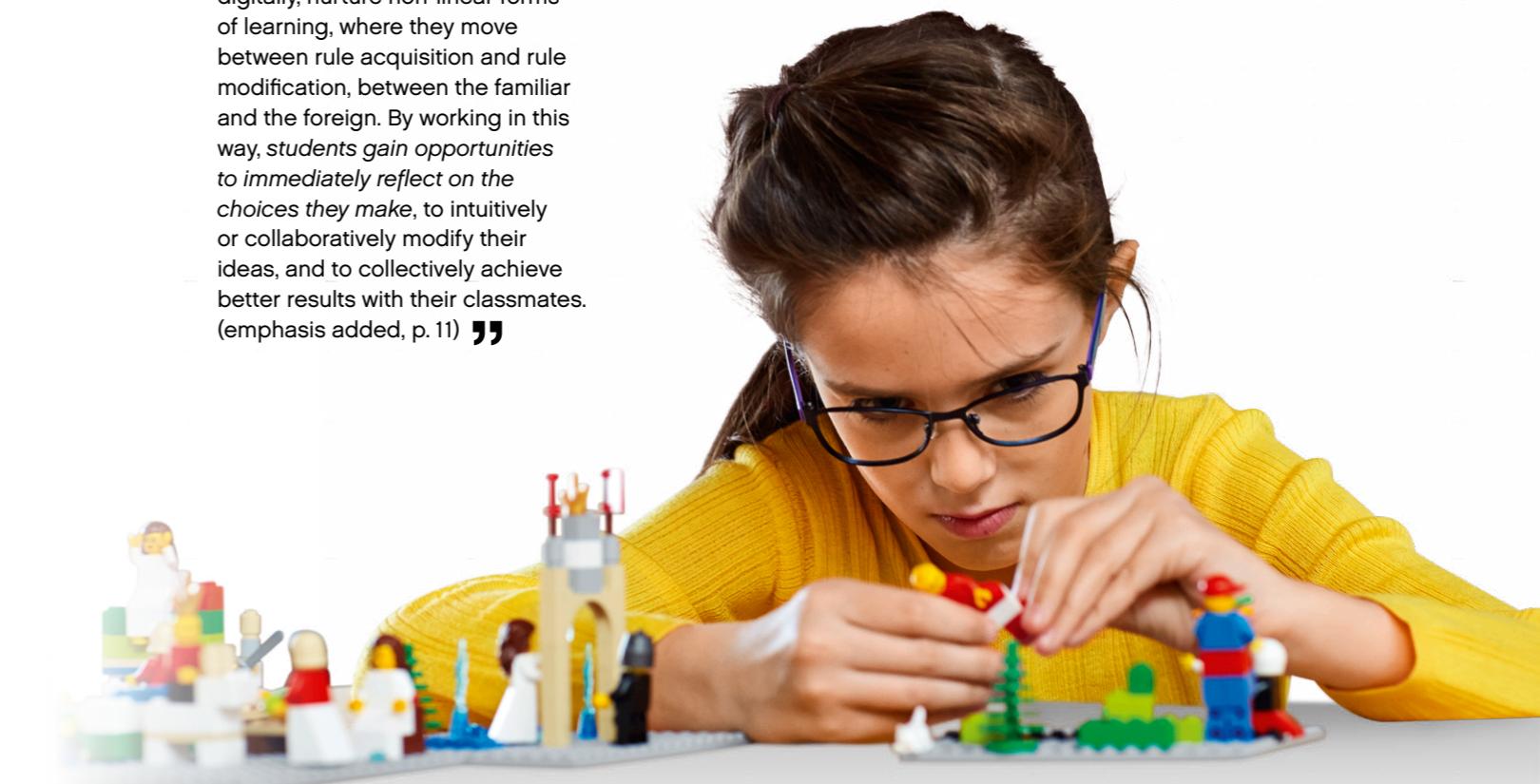
There are many benefits to allowing students to make choices and decisions as they work with LEGO bricks. Choices go a long way towards ensuring engagement and intrinsic motivation, which in turn, increases the likelihood of divergent thinking and mindful concentration on the LEGO activity and the relevant subject matter. Put simply, allowing students to make some (but not all) choices will help with intrinsic motivation and lead to mindful decision making. It may also help to create the kind of atmosphere that is conducive to creativity, namely a playful one.

When students are allowed to make certain choices and decisions, they are exercising their higher order and meta-cognitive capacities. LEGO Education’s *A System for Learning* describes it this way:

“ Young people’s contribution and recombination of LEGO bricks and models, both physically and digitally, nurture non-linear forms of learning, where they move between rule acquisition and rule modification, between the familiar and the foreign. By working in this way, students gain opportunities to immediately reflect on the choices they make, to intuitively or collaboratively modify their ideas, and to collectively achieve better results with their classmates. (emphasis added, p. 11) ”

This quotation underscores the importance of thinking with combinations. What’s more, that choice helps with engagement and intrinsic motivation, and that working with LEGO bricks gives students the opportunity to see how their choices and decisions play out. As you may recall, creativity was defined as originality and effectiveness. The latter requires that creative LEGO constructions be more than just original. They must also be effective. In other words, they must work. If a student construction fails to work, encourage him or her to consider a different choice—a smaller, larger, or rounder brick, perhaps.

Decision making is especially important for creativity in the school years, when there are so many pressures to conform and fit in. Students frequently must choose between going along with the crowd or trying something that is self-expressive or different. Those who have opportunities for original thinking and self-expression will practice these skills, and build their capacity for making choices that are not strictly conventional and popular. The post-conventional thinking mentioned previously depends on such decision making. Building with LEGO bricks—or working on a group activity—can offer students the choice of being conventional or unconventional and creative.



Mindfulness: Concentration, Attention, Trying New Ideas, and Persistence

Mindfulness is yet another part of the creative process.

Mindfulness is strongly related to creative behavior because both require that routine thinking be avoided. If a student does something in a routine fashion, he or she is not doing anything new and original. Original behavior requires mindful rather than routine choices. Without mindfulness, a student is more likely to rely on doing things the way they have been done in the past than choosing to try something new. Not surprisingly, research on mindfulness related this process to flexibility. When mindful, the student is open to new information and the unique features of the experience. Mindful students do not jump to the conclusion, “It’s a mathematics lesson so it will be boring”, but see that today’s lesson is different from previous lessons. As activities using LEGO bricks require interacting with the subject matter, they keep students mindfully engaged.

Mindful students are likely to show great persistence and may even lose track of time. They may very well try working on the activity even when they are not required to do so! Mindful students are unlikely to be distracted. They care about what they are doing. And, as a result, their ideas and work display originality.

There are several indicators of mindfulness you can use in your assessments. For example, when students add something of their own to the task or assignment, or when they find something new and different.



Using the Creativity Self-Reports For Students: How to Encourage Students’ Reflections on Their Own Creativity

Students can assess their own work with LEGO bricks. The type of assessment is age-dependent.

PreK to 2. Children in preschool or grades 1-2 are not yet accustomed to tests and surveys, and vocabulary can be an issue. For these students, it is probably best to conduct any sort of assessment as a structured interview. A structured interview can cover many of the same behavioral indicators as the *Creativity Rubric*, however additional explanation and wording should be given during the interview to ensure complete understanding. As illustrated on the *Creativity Self-Report Tool for Students in Grades K-2*, the “faces” can be used as response options. They are best used when presented in a large format (e.g., a small poster) that allows students to point to the face with the right expression. Or, if you prefer, your assessment can rely on an interview and dialogue—performed on a one-on-one basis.

Grades 3-5. Students in grades 3-5 usually do well with paper-and-pencil format assessments, but the faces response option can also be used (see *Creativity Self-*

Report Tool for Students in Grades 3-5). These students have little experience with survey assessments and self-reports, and the response option is consistent with the overarching idea that assessments should be game-like rather than test-like. Students may be more authentic when responding if they are told that the assessment is not a test and that no points or grades are to be given. Students can complete the self-assessment individually, rather than as part of a structured interview. The assessment may be paper-and-pencil, or converted to a digital format and given on computer.

Grades 6-8. Students in grades 6-8 will have no difficulty with an assessment (see *Creativity Self-Report for Students in Grades 6-8*), but it is probably still best to ask them to play a game, making sure the setting is relaxed. Most students have enough experience with tests that you can simply state that this is not a test. These students can use nearly all of the behavioral indicators on the *Creativity Rubric*. There is no real reason to avoid the response options, other than it may make some students feel as if the assessment is too young for them.

Creativity Self-Report For Students in Grades K-2

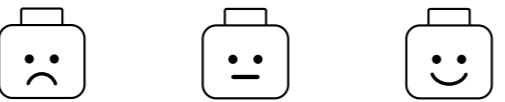
Student Name:

Date:

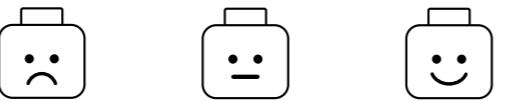
What do you think...?

Directions: Point to or circle the face that shows how you feel.

I had fun.



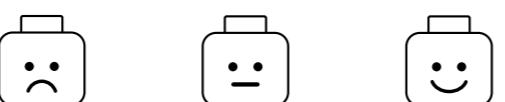
I understood what to do.



I got to do some things my way.



I had lots of ideas.



Creativity Self-Report For Students in Grades 3-5

Student Name:

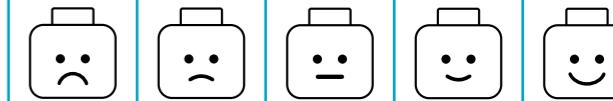
Date:

What do you think...?

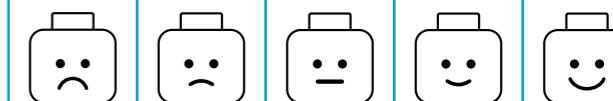
Directions: Circle the face that is closest to how you feel, even if it is not exactly right.

	totally DISAGREE	mostly disagree	neutral	mostly agree	totally AGREE
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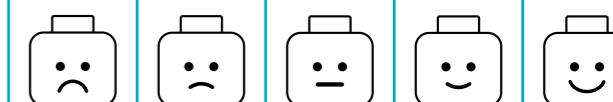
This LEGO Education activity... was fun!



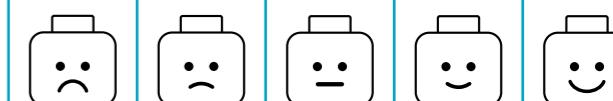
This LEGO Education activity allowed me to think in a creative way.



This LEGO Education activity ... helped me to understand what ideas we were learning.



This LEGO Education activity ... had room for me to do things my way and to express myself.



Creativity Self-Report

For Students in Grades 6-8

Student Name:

Date:

What do you think....?

Directions: Circle the face that is closest to how you feel, even if it is not exactly right.

	totally DISAGREE	mostly disagree	neutral	mostly agree	totally AGREE
This LEGO Education activity was fun!					
This LEGO Education activity helped me to understand what ideas we were learning.					
This LEGO Education activity ... had room for me to do things my way and to express myself.					
This LEGO Education activity ... allowed me to think from another point of view or perspective.					
This LEGO Education activity ... allowed me to explore many combinations of ideas or come up with lots of ideas.					
This LEGO Education activity ... allowed me to create an original and effective model.					

Recommendations

Assessing Student Creativity was written to explore connections between creativity and implementing LEGO activities in the curriculum. Scientific research on creativity has been used throughout this document, as it has in the previous LEGO Education publication, *A System for Learning*. In addition to exploring the bridges that exist between creativity and LEGO Education activities, this document offers a number of specific suggestions for educational assessment. It can help you look for and support the specific behavioral indicators listed as factors on the *Creativity Rubric* and discussed, and use them to provide feedback to your students. It is worth repeating that creativity and learning are very closely related to one another, and perhaps even inextricable. In other words, creativity is a part of learning. By supporting creativity in your classroom, you help make learning authentic, meaningful—and fun.

The *Creativity Rubric* suggests that in addition to assessing your student behavior, you also assess the curriculum, looking for “opportunities”. While the curriculum should allow students to express themselves, not every curriculum does. A curriculum designed to convey a corpus of factual information may have no room for self-expression. A curriculum that presents only one important objective may similarly minimize or even eliminate self-expression. The same can be said for exploration, divergent thinking, problem identification, and the other behavioral indicators in the *Creativity Rubric*.

Assessment should be broad enough to include the curriculum and more. Assessments should also take into account the general educational context. This follows from the creativity research that has recognized the impact of culture on creative behavior (see *Cultures of Creativity*, LEGO Foundation, 2013). Cultures perpetuate particular values, and some place great value on individuality and self-expression. These values have an enormous impact on creativity because what is valued in a culture is also supported. That's why it's so important that you convey the idea that creativity is a valuable thing. Be a model of self-expression, exploration, creative decision making, and divergent

thinking. Display your students' creative projects around the classroom, along with famous creative inventions, works of art, and pictures of creative people. Students will learn that creativity is a valuable thing if they see that you expect it and appreciate it.

Avoiding Misunderstandings about Creativity

To encourage the creativity of your students, recognize and support the behaviors listed in the *Creative Rubric*. Look for creative thinking even if students are not solving problems. Keep in mind that creativity is more general than just problem solving.

Another fairly common misunderstanding to avoid is that important ideas and solutions can only be found when an individual is serious about a particular topic. Scientific research shows that people tend to think in a more divergent fashion and tend to consider a wider range of alternatives when they are in a good mood. An environment that allows playfulness and humor is more conducive to creative thinking and behavior than a more serious setting. Long ago a series of research projects compared *test-like classrooms* with *game-like classrooms* and demonstrated clearly that students are more original, flexible, and creative in the latter.



Supporting Generalization So Benefits Apply Outside of the Classroom

One last topic must be considered, and it is among the most important messages of this document. It involves *generalization*, or the process that ensures that what is learned in one setting can be used in other settings. *The benefits of LEGO Education activities for the fulfillment of students' creative potentials will be maximized if creative behavior is practiced in the classroom such that it will eventually carry over to the natural environment.* Fortunately, there is a refined and tested method that ensures generalization will occur, and it can be used in combination with LEGO Education activities.

The benefits of LEGO Education activities for the fulfillment of students' creative potentials will be maximized if creative behavior is practiced in the classroom such that it will eventually carry over to the natural environment.

One part of this method involves variety and triangulation. It calls for students to practice original thinking, self-expression, and the other behavioral indicators from the *Creativity Rubric* with one LEGO activity, and then practice them again, at a later date, on other assignments. This allows students to separate what they have learned about the creative process from any one activity. It helps them realize that creative behavior applies broadly, regardless of the particulars of the task at hand. You can help by supporting each of the behavioral indicators from the *Creativity Rubric* with a variety of activities. You can identify opportunities for the behaviors in all subjects, not just in areas that are easy to associate with creativity (e.g., The Arts), but subjects that are typically associated with logic and factual information (e.g., Mathematics, Language Arts, History, Science, and Engineering), as well. The variety of practice leads to generalization, and LEGO bricks lend themselves to all subjects.



Summary

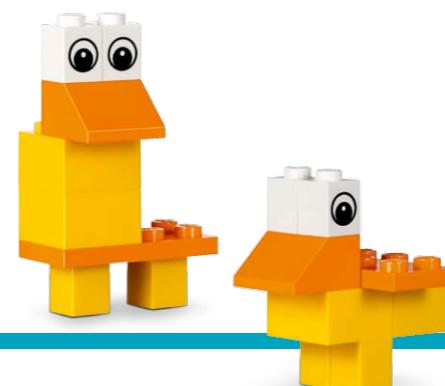
We have now covered several behavioral indicators of creativity that become apparent when using LEGO Education materials. You will see flexibility in the behavior of your students, as well as originality, post-conventional decision making, and self-expression, and perhaps even problem identification and redefinition. As stated earlier, creativity is not a unitary thing and it is most accurate to look for multiple indicators. There is no reason to expect all students to be creative in exactly the same fashion.

Creative behavior is said to be "overdetermined". Quite simply, this means that it does not depend on one event or one experience. Creative behavior is most likely to appear when it is supported over a period of time and, as implied by the discussion of generalization, in a wide variety of settings and with varied tasks. The ideal situation has creativity supported in the school, by every teacher, and supported at home by parents who value and model creativity and provide opportunities for self-expression and original problem solving. It is imperative that parents are informed about the many benefits of creative behavior and exactly how LEGO Education activities contribute to learning and creativity.

Parents are being brought into the discussion just to bring home the point (no pun intended) that creativity is overdetermined and is influenced by various experiences. Not only are there a variety of indicators of creativity, each of which can be used for assessments in the classroom, but there are also a variety of influences, each of which can add to the likelihood that students will develop creative attitudes and creative skills, and that their creative tendencies will be apparent not just in school, but also in the natural environment. LEGO Education activities can be used in numerous ways to accomplish this, as summarized in the list below:

To support creativity in the classroom:

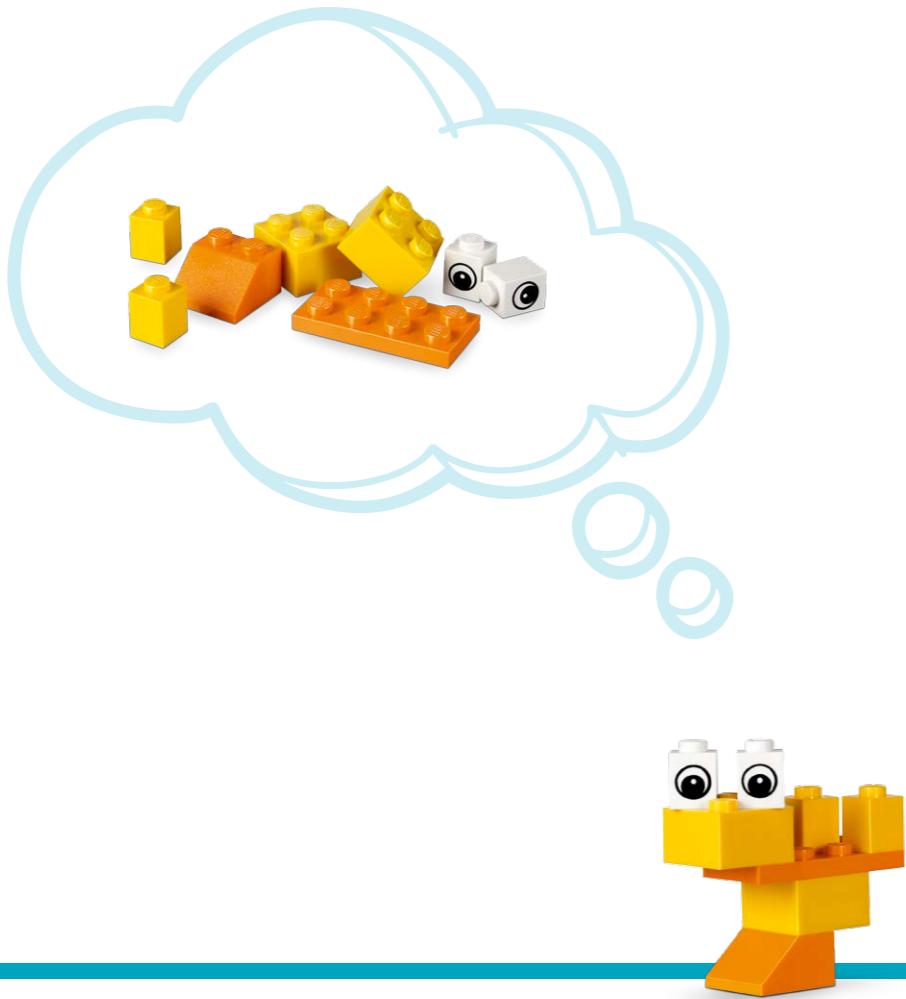
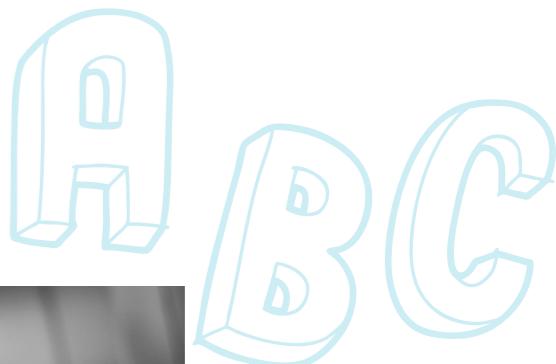
- Encourage self-expression and exploration.
- Ask relevant questions to explore the thinking and meaning of LEGO constructions.
- Build some latitude into the curriculum so students can make choices and practice decision making.
- Recognize the value of both conventional and original thinking and help students learn how to decide when to do one or the other.
- Give group assignments, but keep the groups to four to five students.
- Allow students to work alone some of the time.
- Provide ample time for all LEGO Education activities. Allow incubation and enough time that students can shift perspectives, put projects aside and come back to them with a fresh outlook, build and then take things apart to try new ideas.
- Set up a creative classroom. Have locations to display LEGO®models and other student work. Make sure the LEGO sets are organized and accessible. Set the expectation and reinforce responsibility for taking care of materials. Include other materials to augment the LEGO constructions so that students can see that creativity is valued.
- Model creative behavior. Give yourself permission to play, explore, and think divergently.
- Give varied assignments. Use LEGO materials for language arts, mathematics, science and engineering, dramatic and visual arts, and social studies.
- Communicate with parents so the creativity of students will be understood and perhaps supported both at school and at home.
- Consult the *Creativity Rubric* when assessing student work and when assessing the curriculum.
- Encourage students to think about their own creativity: Use the Creative Self-Report that is appropriate for your students.



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About the Author



Mark Runco earned his Ph.D. in Cognitive Psychology from the Claremont Graduate School. His research has focused on creativity since that time. He has published over 200 articles, chapters, and books on creativity. Dr. Runco was the first E. Paul Torrance Professor of Creativity at the University of Georgia from 2008 to 2015 and Director of the Torrance Creativity Center from 2008 to 2010. He remains a Distinguished Adjunct Faculty at the Saybrook Graduate University (San Francisco, CA) and Distinguished Fellow at the American Institute for Behavioral Research and Technology (La Jolla, CA). In addition to his books and research articles, Dr. Runco developed a comprehensive battery of tests for the assessment of creativity, known as the "rCAB" (described at www.creativitytestingservices.com). The rCAB is used around the world to estimate the creative potentials of all age groups. It is often the subject of his lectures, which are also given around the world.

Dr. Runco is Founding Editor of the *Creativity Research Journal*, which has been published since 1989, and in 2014. He founded two new journals (*Business Creativity and the Creative Economy* and the *Journal of Genius and Eminence*). He is on the Editorial Board of every creativity research journal (e.g., *Journal of Creative Behavior, Creativity and Innovation Management, Psychology of Art, Creativity, and Aesthetics*). Dr. Runco is also Past President of Division 10 (Psychology, Art, Creativity, and Aesthetics) of the American Psychological Association and has been the recipient of several awards throughout the years, including Young Scholar and Lifetime Achievement Award, from the National Association for Gifted Children. Dr. Runco co-edited two editions of the *Encyclopedia of Creativity* (1999, 2011). His textbook, *Creativity: Research, development, and practice* (Academic Press) has been translated into six languages, and was last revised in March of 2014.



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