

Gave projects, tests, or assignments that required original or creative thinking

Series Editors: Michael Theall, Youngstown State University; Derek Bruff, Vanderbilt University; Amy Gross, The IDEA Center
Author: Cynthia G. Desrochers and Deone Zell, California State University, Northridge

Why this Teaching Method Matters

Original, creative, higher-level thinking is seen in many forms in all disciplines from writing, music, and art to a unique approach in the social sciences, a well-crafted curriculum plan in education, a new procedure in medicine, or an original experiment in the natural sciences. However, this creativity usually comes after students have acquired foundational information in the various dimensions of knowledge and worked through the levels of cognitive process identified by Bloom (1) and Anderson and Krathwohl (2). As well, there is knowledge and there are skills and habits of thought specific to particular disciplines. Even with this array of knowledge there must also be conditions that encourage the freedom necessary to think creatively. Creative thinking involves an integration of past learning to produce and organize new ideas. Student motivation is enhanced as students experience the personal satisfaction that comes with creating some-

thing that is their own. When students are asked to think outside the box (3), divergent processes and projects emerge, with no two student efforts looking the same and no clear right or wrong answers being sought. Creativity occurs when students are asked to become deeply absorbed in complex tasks and problems in order to create new forms and styles of expression (4). These tasks are effective and they also provide tangible evidence of student accomplishment and learning. Item #19 highly correlates with IDEA learning objectives #26 (developing creative capacities), #28 (developing skill in expressing myself orally or in writing), #29 (learning how to find and use resources for answering questions or solving problems), #31 (learning to analyze and critically evaluate ideas, arguments, and points of view), and #32 (interest in learning more).

Applying this Teaching Method in the Classroom

If students are to show original or creative thinking in your course, their projects, tests, and assignments must be designed to encourage this. Conditions for stimulating creativity include 1) a solid foundation in the discipline, 2) open-ended and flexible projects, tests, and assignments, and 3) time to create. **Creativity generally begins with a solid understanding of the knowledge base** upon which it flows (e.g., learning about aerodynamics precedes redesigning the tail assembly of a 787 jet [5]). The greater the student's knowledge about the discipline, the more capable (s)he is in creating with it. Generally, this requires that students learn facts, concepts, and generalizations before they venture into creative projects. Moreover, you may need to determine if these building blocks of creativity are in place at the beginning of your course. A simple, teacher-made diagnostic test may uncover students' knowledge gaps and signal the need for you to review essential elements leading to student mastery of basic principles. Be sure, however, by focusing on foundational material early in a course not to give students the impression that creativity is not import-

ant. Look for ways to allow student creativity early in a course to set the stage for later creative work.

A second necessary condition for student originality and expressiveness is the **freedom to experiment** (5). Even without a deep knowledge base, students can benefit from "discovery" activities (6, 7) that require the development of plans of action, strategies for investigating new ideas, and the creation of plausible explanations for observed phenomena. Designing open-ended projects, tests, and assignments, as well as establishing a classroom climate that accepts trial and error and consciously takes steps to build students' self-confidence accomplish the purpose of allowing freethinking without penalty. Students should not feel pressured to adopt a specific viewpoint or be stifled by too much control over their creative work. Although we often show models or demonstrations of expected student products in order to further learning, when creativity is our goal, the display of previous outstanding projects may inhibit student creativity, either by blinding them to think only along

the lines of the example or by intimidating them with a “perfect” model.

Time is another important condition if student creativity is your priority. Students must explore various approaches, interpret and analyze materials, and experiment with various schemes of organization. Because this may take weeks, our challenge is to stimulate creativity over the course of the semester. Students might develop multiple drafts of a project or complete it in segments, followed by feedback. Because writing often shapes our thinking, encourage students to write out their plans where appropriate, as a draft, journal, log of activities, or 3 x 5 card update, often followed by peer-group discussions. It may be possible, under special circumstances, to assign creative work without the foundation of basic knowledge. For example, in an introductory course in photography, students might be given cameras and asked to document campus life. This task might provide a pre-measure of native composition and subject selection skills and as the course progresses, students could revisit the original assignment to make changes and improvements, thus documenting their progress and developing sophistication. In other fields, there may be fewer opportunities for such work, but there will always be chances to engage even beginning students in creative activities such as brainstorming possible solutions to problems or devising work plans.

Applying this Teaching Method Online

Online courses can facilitate creative thinking in various ways. First, online tools can make sure students have the “building blocks” in place – the facts, concepts, and generalizations needed for creative thinking. This can be done either through formative or summative quizzes or other assessments that can be self-paced, giving students control over their own “brushing up.” Exploration, interpretation, and experimentation with various schemes can be accomplished in days rather than weeks because students have access to materials 24/7. Online courses never go to sleep; they are always available and match the hours of students who work various schedules so that students can create whenever they feel inspired. Student can scour the web, and aggregate or curate their discoveries through various social bookmarking tools. Results of photography experimentation can be immediately uploaded into a photo or video repository such as Flickr, Picasa or YouTube and shared, yielding ongoing cross-pollination and an endless feed of new ideas. Instructors can post creativity exercises online and encourage brainstorming through synchronous collaboration tools including chats, shared

whitespaces, free-flowing forums, or Google Docs, which allows for simultaneous editing. Students can share and edit each others’ photographs and videos into “mash-ups” that represent extreme forms of creativity. Online platforms can also help connect students with authentic audiences (10) for their work, providing an additional layer of motivation for creative experimentation. When the divergence phase is complete, students can arrive at creative solutions to problems through convergence. They can keep online journals or blogs that are private or public for others to comment. Wikis can be used to enable co-creation of a common product, while tracking and versioning technology ensures that student receive the individual recognition they deserve and that data is not lost. In short, online environments accelerate the creative process, spurring idea exploration and convergence by providing tools that are available to students through their digital devices anywhere, anytime.

Assessing this Teaching Method

Who is the judge of creativity? The answer depends upon the standards of quality that have been set for the project, test, or assignment – all three being forms of assessment in themselves. Moreover, when we design our graded assessments before the first day of class, we can align our student-learning activities throughout the course to appropriately “teach to” these assessments (3, 4).

Good assessments 1) measure intended creativity outcomes, 2) are clear about student expectations, and 3) allow students to personally connect with the discipline (7). Although it is what the student produces that matters, our directive verbs can signal creativity, for example: students will “compose, construct, create, design, perform, produce, or rearrange,” to identify a few. For projects and assignments, you can increase students’ understanding of your expectations by constructing a rubric with the students, identifying 4 to 6 essential characteristics of the final product, and including qualitative statements for an excellent, satisfactory, and below standard product. This student-learning activity not only clarifies student expectations but also gives them a voice in determining what is being assessed as well as the rationale for how quality will be judged. Authentic performance assessments, where students create in real-world contexts, are preferable in order to increase student engagement and retention of learning (3, 4, 6, 7). Although performance assessments are common in art, music, or drama, they can be designed for all disciplines through creative written expression, oral presentations or poster sessions, demonstrations, portfolios and webfolios, exhibitions, or experiments.

Creative tests, considered here separately from creative projects or assignments, can be take-home exams. They give your students the time needed to create, and reduce the likelihood that you will administer the test on a creatively bad day for some student (even literary

geniuses have dry spells). However, if an in-class exam is necessary, students should be given readings, materials, and key questions to analyze well in advance of the test, so they can do the necessary idea percolating required for original and creative expression.

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