Creativity and The Value of Questions

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Chapter 8 in Yager, R.E. (ed.) (1995). *S/T/S as reform in science education.* New York: SUNY Press.

The ability to ask questions is the most important of all creative skills.
Hanks and Parry, 1983

Introduction

As Brandt (1986) pointed out, creativity is a personal way of using and directing your own abilities. In the process, the creative person may restructure the problem rather than merely seeking solutions to the problem presented. Questions about the problem needing solution often, then, become questioning of the problem itself. Such questions give rise to ideas which would never have been considered initially.

Beginning with Socrates, scholars have pointed out that questions are the midwives which bring ideas to birth. Many great thinkers, scientists, and inventors gave credit for their inspirations to rather unscientific ideas and thinking. And, as Einstein put it, "The formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill. To raise new questions, new possibilities, to regard old questions from a new angle, requires imagination and marks real advance in science (Getzels, 1975)." A creative solution is the response to a creative question. Gertrude Stein is reported to have said, "If no one asked the question, what would the answer be?"

Not only is creativity an integral part of science, creative persons have been shown to be more observant (Barron, 1963); have better self-concepts, more self-confidence (Davis, 1983), and self-reliance (Moravcsik, 1981); more willing to take intellectual risks (Rubin, 1963); and to score higher on normed achievement tests (Getzels and Jackson, 1962) as well as other achievement measures (Blosser, 1985). Creativity also affects gender roles as well with creative men more willing to accept traditional feminine interests (Bem, 1974) while creative women are seen as taking more risks. Creativity is sometimes called an androgynous trait, one which combines the best of masculine and feminine roles, ideas, and actions (Helson, 1967).

Creative people also desire to evaluate their own work, a pattern in those with strong self-confidence and inner-direction (Dacey, 1989). Self-evaluation also reflects the risk-taking and adventurous nature of many creative people as well their regular reliance on intuition and reflection as essential parts of the creative process. Besides, since creativity itself is often the person's goal (Brandt, 1986), who but the individual is in the best position to provide a creative evaluation?

Obviously, we want and need creative students in our classes and creative citizens in our future. Unfortunately, being creative is often likely to imply being unconventional (Moravcsik, 1981). Even more unfortunate, creative students, often the ones with the greatest potential, are over-represented among high school and college dropouts (Davis, 1983). On a more positive note, many studies indicate that creative thinking skills can be learned with practice (Cronin, 1989). How students learn and their roles in the classroom determine to a large extent how much opportunity for creative learning they actually have. The role of the students must be carefully considered and planned for in a creative learning environment.

The Role of the Student

In general, students prefer to learn in creative ways by exploring, manipulating, testing, questioning, experimenting, and testing ideas (Torrance, 1963). Individuals are natural curious and their curiosity and creativity "are stimulated by relevant, authentic learning tasks of optimal difficulty and novelty for each student (APA. 1993)." Questions one raises independently are often the most effective way to ensure relevance to the individual.

Through questions, students create clear mental images of objects, phenomena, and their own understanding. Questions further serve to delineate problems, potential solutions, and other points of view. Questions are often a way of playing with ideas and a close relationship exists between play, creativity, and developing strategies for problem identification and resolution (Iverson, 1983). Such playing with ideas occurs when restraints on time, materials, and tasks are reduced and generated ideas are treated with respect. And, like most play, self-initiated action is the most satisfying to the learner.

Students with creativity, curiosity, and questions often desire to communicate (Risi, 1982). When you discover, do, or invent something, a natural first response to let others in on the excitement. This, "Hey, Mom. Look at me!" syndrome is both a feature of creativity and of science. Without communication of ideas, science would not exist as we know it. Chaudhari (1986) noted that, "Students' questions are their curiosity in action, their mind hunger." But, for students communicate effectively and to formulate and follow up on questions, they must have a classroom climate conducive to their development. The teacher plays a key role in creating that environment where creativity is valued, encouraged, and rewarded.

The Role of the Teacher

Creativity does not happen by chance alone. Teachers wishing to teach for creativity must carefully and consistently structure the classroom to maximize opportunities for creative endeavor, paying special attention to time, teacher role, available materials, and expectations of and for students. Teachers must provide students with considerable intellectual freedom and safe opportunity and time to be spontaneous, explore, test, decide courses of action, and take risks. Students will not ask questions if they feel they and their questions may be pushed aside, rushed, or subject to ridicule. A rush to judgment is the opposite of creativity.

In creating a safe environment, one must treat all questions as valid and important. As soon as a teacher labels a question trivial or even tangential or divergent, some students will vow never to respond again. And, in reality, no questions are trivial if they are approached as evidence of what the student thinks is important or needs to know. While seemingly trivial, a question may give a teacher insight into the student's thought process, logic, or experience. After a simple question, ask the student to clarify or elaborate and often one will find they answer their own question. Routinely, teachers find that students can answer their own questions but lack confidence in their answers or want teacher approval.

Interestingly, providing students with creative and safe time enhances creativity regardless of the role of the teacher (Carter & Torrance, 1978). A teacher who systematically designs the classroom for development of questions and creativity is even more likely to have desired results. We know well that students tend to copy the teacher's behavior (Anderson & Brewer, 1946). Since much of creative thinking centers around experience, observations, questions, and possibilities, so, too, must the teacher's behavior.

The teacher is quite important in enhancing such creativity. Well-posed questions stimulate thinking, revealing alternate points of view and logic, and may be viewed as the embodiment of curiosity. But, to be a model of creative inquiry, a teacher must use questions which go beyond mere description. Questions to stimulate creativity must require and allow multiple possible answers and demand action. Questions model thinking as relevant problems are pursued. Questions act as windows on the phenomenon in question as we ask a question, select the best answer, and ask the next logical question, continuing the process until the desired evidence or explanation has been revealed.

Often, the tendency is to ask the ultimate question, "Why?" When a phenomenon is introduced and teachers ask "Why did that happen?" students are put off because the "why" sounds very absolute and threatening. "Why" implies someone knows (or should know) the answer or is even possibly wrong ("Why did you hit your little sister?"). A better approach is to begin with the concrete, asking questions about what students did or observed. Then, ask how they might do it differently and what might happen if...? Predictions are a reasonable next step as well as questions seeking to determine relationships with other, similar phenomena. Since we are consciously modeling good question asking behavior, these types of questions follow a logical hierarchy which student can emulate. We want them to delve into the problems and these questions assist in that endeavor. The "why" questions sound like test questions and are best if never asked.

We should ask questions to obtain information, not to test students. When we seek information, we do not ask questions if we already know the answer. In good adult conversation, adults ask each other questions to find out, not to examine. We would not spend much time with an adult who continually quizzed us, particularly if they followed up by evaluating our answers. Our students are not different except they are captives of our classroom. As a rule of thumb in the classroom, if you wish to stimulate student involvement and creativity, never ask if you already know. We should also seek opinions and points of view as "How would you design an experiment to...?"

Table 1: A Hierarchy of Questions.

1. *Ask questions which describe—*
   - What did you do?
   - What happened?
   - What did you observe?
2. *Ask questions which predict—*
   - What will you do next?
   - What will happen if you...?
   - What could you do to prevent that?
3. *Ask questions which relate to other phenomena—*
   - How does that compare to...?
   - What did other people find?
4. *Seek explanations—*
   - How would you explain that?
   - What causes it to happen?
5. *Ask for evidence—*
   - What evidence do you have for that?
   - What leads you to believe that?

To stimulate multiple answers, we must accept all answers, regardless of how good they may be. To encourage students to tell us their thinking, we must show them that each of their ideas has value, that we are paying attention to them. And, since evaluation stifles creative thought and reduces thinking to imitation, we must avoid judgment. But, this does not mean we let everything pass by without comment nor is evaluation avoided.

Evaluation, rather than arising from the teacher's singular perspective, the norm, or tradition, must be based on causes and consequences. For instance, a student, using a two-pan balance asks, "Is this balanced?" The teacher could easily say "Yes" or "No" and get on with the activity. But, such a response does little to help the student understand or be confident. Think how different is the scenario where the teacher, instead, replies, "What do you mean by 'balanced'?" The student is now forced into considering the meaning and the teacher learns more of the student's thought process. And, in talking it through, the student will probably answer his/her own question. In real science, evaluation always comes from causes and consequences, not from authority alone. Why should our science classes be any different?

Students may also become dependent on the teacher for the praise associated with positive evaluation. And, the more dependent students become, the less likely they are to stray from the conventional and the teacher's certain praise. All scholars and practitioners who study creative thinking agree that evaluation must be totally avoided in the early creative stages and, when evaluation does appear, must arise from individuals as they analyze their ideas, actions, and products in terms of personal needs, utility, prediction, or logic.

In the Classroom

Teachers can easily make a difference by the structure they provide and the atmosphere they create. If you wish to see creativity flourish in your classroom:

Provide opportunities for creative work;
(Time, materials, expectations)
Ask questions that demand answers;
(no "yes/no," recall, or answers you already know)
Wait for responses;
(Don't rush, if you really ask a question, wait for the answer. And wait again for multiple responses)
Accept unusual ideas, questions, or products;
(No judgment, just acknowledge and ask for more)
Ask students to examine causes and consequences;
(If that's true, then...?, What may have caused that?)
Allow students to make decisions;
(Structure activities so that decisions must be made and allow students to do so)
Model creative thinking, action, and decision-making.
(Ask questions yourself, express curiosity, make the classroom stimulating.)

As teachers model creative behavior, they ask good questions, wait, expect, and encourage multiple responses, and seek evaluation based on causes and consequences. Teachers and students change. The change will be in the direction of being more creative, having more ideas, seeing more possibilities. To see more possibilities, students must also become more observant.

Teachers Helping Students

Students need something to view if they are to make observations and raise questions and we must teach them how to observe carefully and systematically. Typically, students are told to observe, observations are counted and commented on, and the lesson moves on. Instead, if a teacher's goal is better and more creative observations, he/she must follow bare observations with teaching strategies designed to help students learn to observe more and in new ways and to see questions and possibilities as they work. If students exhaust their supply of simple observations, they should be helped to focus on applications (the candle burns string, will burn hair, won't burn foil, ...), possession (her candle is burning, Megan's candle is burning, Lucas' candle is not burning, ...), location (the candle burns on the table, sideways, while swinging, ...), or time (the candle is burning now, is burning at 9:07, still burning at 10:00, ...). Each of these observations could also be used to generate questions about the phenomenon being observed.

These are not trivial observations. Each, in a scientific context, could potentially carry considerable meaning. But, students who do think of these observation strategies may feel they are not worthy because they are unconventional and few students will think along these lines. Increased creativity, however, allows students to stray from the norm, to take risks, to seek the unusual. The creative individual looks at one thing and sees another; asks questions with difficult answers, and sees value in unusual ways.

Research by Carlsen (1990) revealed that teachers usually ask far more questions than students. While questions are usually viewed as positive, Dillon (1978) pointed out that teacher questions, rather than being stimulants to student thought, are often depressants. How can students think or work if they are bombarded with questions? How can they learn to structure their own questions if the teacher is the one who does the structuring? Fortunately, it has been noted (Carlsen, 1990) that there are more questions in a laboratory setting than in more traditional instruction and the ratio of student questions to teacher questions goes up quite dramatically. In addition, student rates of questioning went up in small groups. This research provides strong evidence that, if student questions are a serious goal, we can structure the classroom environment to maximize the generations of those questions.

Teachers who ask extended thought questions, listening and acknowledging student ideas, and observing are more likely to encourage creativity than such behaviors as giving directions, transmitting information, and asking recall questions (Foster & Penick, 1985). And, teachers, must help students know their ideas have value for their own sake, as stimuli for others, and in varied applications.

Enhancing Creativity

What is interesting about enhancing creativity is that usually one needs not make creativity the dominant issue. Rather, as changes in teaching behavior are made creative growth results by accepting and encouraging divergent thinking, delaying judgement, and using stimulating brainstorming activities (McComas, 1989). Unfortunately, one of the most difficult tasks is to ask more open-ended questions. Being less directive, a behavior which is necessary to stimulate both thinking and good questions, requires conscious restraint on the part of the teacher as well as a well thought out rationale for teaching. Teachers will not ask better questions or create an environment conducive to learning just by telling themselves they will. One must plan, practice, and reflect on one's own teaching. And, even then, it takes considerable time and effort before one achieves an acceptable level.

But, the results are worth it. Consistently, the best teachers are described as encouraging discussion and conversation by accepting what students have to say and think. Teachers will change as their behaviors change. Effective STS teaching demands it. At the same time STS teachers are viewed differently, as persons who both care as well as being capable and competent.

Table 2: Some Practical Tips on Asking Questions and Creating a Safe Environment.

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1. Ask questions when you want information; don't ask test questions.
2. Seek opinion, perception, application, or experience rather than fact or accepted standard.
3. Do not rephrase questions immediately; if you are unclear, students will let you know.
4. Wait, sometimes interminably, after asking any question. Wait again after a response.
5. Create a safe environment by accepting, without evaluation, responses to your questions. Allow students to evaluate their own ideas.
6. Use student responses in your next question or statement.
7. Ask students to clarify or elaborate on their answers; never elaborate or clarify for them.
8. Think of your questions with students as an adult conversation; elicit ideas, use those ideas, and make it a two-way conversation.
9. Provide stimulating opportunities and materials for creative work.
10. Make the environment safe for exploring, risk-taking, experimentation, and speculation.

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