Gifted Students' Conceptions of Academic Fun: An Examination of a Critical Construct for Gifted Education

James A. Middleton, Joan Littlefield, and Richard Lehrer
University of Wisconsin

Abstract

Academic fun is hypothesized to consist largely of the degree of success an individual anticipates from an activity. In this context, "fun" relates to the levels of arousal and control perceived to be afforded by the task. Gifted elementary and middle school students' conceptions of academic fun were examined using repertory grid techniques (e.g., Kelly, 1955). Results indicate that students' conceptions of fun are highly similar across age and gender. However, differences in ratings of academic situations suggest that gifted boys view technology and computer activities as more fun than girls do. In addition, confirming many suspicions, age trends revealed that mathematics decreases in perceived fun as children progress through school.

"He had had a nice, good, idle time all the while—plenty of company—and the fence had three coats of whitewash on it! If he hadn't run out of whitewash, he would have bankrupted every boy in the village.

Tom had discovered a great law of human action, without knowing it—namely, that in order to make a man or a boy covet a thing, it is only necessary to make the thing difficult to attain. If he had been a great philosopher, like the writer of this book, he would have comprehended that Work consists of whatever a body is obliged to do, and Play consists of whatever a body is not obliged to do. And this would help him understand why constructing artificial flowers or performing on a treadmill is work, while rolling tenpins or climbing Mount Blanc is only amusement."

—From *The Adventures of Tom Sawyer* by Mark Twain

Recently, researchers have emphasized the importance of taking affective, motivational variables into consideration when investigating students' cognitive processes (Lepper, 1988). The reason for this is clear—human thinking does not occur in an emotional vacuum. All our thoughts are tempered by feelings, purposes, and needs. Likewise, our motivation to engage in an activity is directly influenced by the way we construe the situation and by our predictions of the outcomes of our actions (Kelly, 1955). Cognition and affect exist in a symbiotic relationship. Thus, in order to understand human thought and learning better, this symbiosis must be examined.

An affective variable with direct consequences for the education of gifted students is *intrinsic motivation*, that is, doing an activity "for its own sake." Implicit in this type of motivation is that students consider the activity to be *fun*.

The purpose of this paper is to develop and test a model of how students evaluate academic activities as being either "fun" or "not fun." We draw upon the theory of personal constructs developed by George Kelly (1955) as a framework in which our theory of academic fun can begin to be conceptualized and developed. We also explore gender and age differences in the perceptions of various school activities as "fun."

Fun as a Personal Construct

Kelly's (1955) personal construct theory provides an interesting framework for the development of a theory of academic fun. Briefly, Kelly proposed that individuals function like scientists. They make hypotheses about the outcomes of future events, test these hypotheses through action, and refine them based on the actual outcomes. Although he did not pursue motivational factors directly in formulating his model, Kelly purposefully included emotion and motives as unitary with cognition. Students use all of this information as an aid in deciding whether or not to pursue future engagement in a given activity, that is, in deciding if an activity is *fun*.

Each individual has his or her own notion of what activities are

Putting the Research to Use

Teachers can influence motivation toward academics by giving their students the opportunity to personalize their own education. By understanding the individual differences in childrens' conceptions of academic fun, teachers can effectively determine the areas where students need more control and arousal and can tailor academic activities better to accommodate these needs.

Our model has strong implications for the education of gifted and nongifted children alike. If educators can determine the kinds of activities that give children a sense of control and stimulation and if they make sure that learning content is central to these activities, then children should begin to organize academics into their self-concepts and begin to view themselves as scholars, actively in pursuit of their own interests. Education will then become a life-long affair. Children will grow up believing in the benefits of education and continuing to learn because their self-concept demands it.

fun and what characteristics define a fun activity. The student who loves making guesses and experimenting with data will most likely feel that science lab is fun. The student who loves manipulating texture and color will probably have fun in art class. Reactions such as these develop over time through experience with activities that provide excitement, challenge, and opportunities for enjoyable skill development.

We propose that in deciding whether or not to engage in an activity, individuals attempt to match the activity with their construct of *fun* (a person cannot predict that something will be fun without an idea of what "fun" would entail). If the situation matches the construct, individuals will perceive the experience as fun and want to immerse themselves in it. If, however, the situation does not match their construct of fun, individuals will judge the circumstance to be not fun and will avoid engaging in the activity.

If fun can be adequately described as a personal construct, repertory grid techniques, a method of measuring personal constructs (Bannister & Fransella, 1971), should be helpful in examining students' representations of academic fun. Lehrer and Guckenberg (1988), for example, used this method to analyze children's perceptions of various educational computer games. Their findings indicated that children evaluated the games on personal control and enjoyment, along with aspects of optimal arousal such as whether the tasks were too easy or too hard, whether the children had many chances for success, and whether the games included lots of color. These features determined their enjoyment of the games. Clearly, the study of fun as an educationally relevant personal construct seems to be appropriate and viable—and we found it fun.

A Model of Academic Fun

The perception of having fun in an activity stems in part from evaluating whether or not success in the activity is meaningful. In this context, meaningfulness means the anticipation of both pleasant arousal and perceived control over the activity. That is, if the activity is perceived to provide both sufficient arousal and sufficient feelings of control, success in that activity will be meaningful, and the activity itself will be perceived as fun.

When the individual is involved over a period of time in an activity that consistently meets both of these requirements, arousal and control, he or she is likely to place the activity in his or her system of constructs and label it as an interest. If, however, either condition is violated (i.e., if the situation is perceived as too arousing or not arousing enough, or if the person feels he or she has little control), the activity will cease to be perceived as fun. The individual likely will evaluate it on the basis of some extrinsic motivational criteria such as reward, fear of punishment, and the like.

Figure 1 summarizes our hypothesis regarding the process by which the individual evaluates participation in an activity against a personal constructs system to determine whether or not the activity will be fun. First, given the possibility of engaging in an activity, the person considers whether he or she has been involved in the task and "had fun" before (i.e., he or she checks to see if the activity is an interest). If an "interest" match is found, the label of "Fun" is applied and the individual will engage in the activity without further thought. If a "Not an Interest" match is found, the label of "Not Fun" is attached to the activity, and the person will exit the system and evaluate the activity for sufficient extrinsic motivators or try to avoid it altogether.

However, if the individual has not previously performed the activity, he or she cannot classify it as an "interest" or "not an interest." Thus the activity must be evaluated according to the perceived degree of arousal and the perceived degree of control it affords, and how meaningful success in the activity will be. If these conditions are met, then a tentative label of "That might be fun!" can be placed on the activity, and the individual is likely to participate. During the activity, arousal and control levels are monitored. If they meet expectations, the activity will come to be perceived as fun. If not, the person will exit the system and reevaluate the activity on other criteria ("I better do it anyway!").

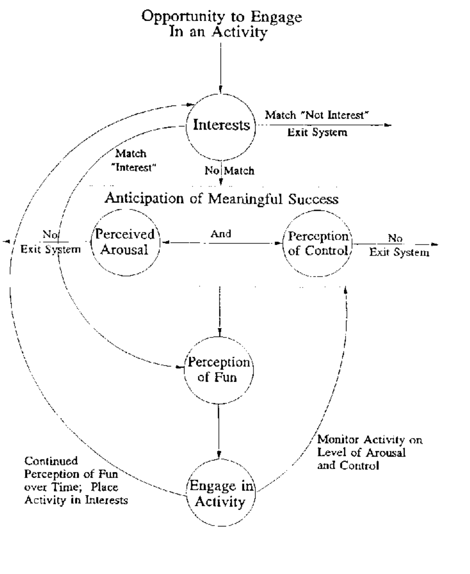


Figure 1. A Model of Academic Fun

After continued engagement in an activity, if the arousal and control requirements are consistently met, the individual is likely to categorize the activity as "fun" and of high interest. The next time the opportunity arises, he or she can immediately anticipate the degree of fun it will afford without having to evaluate it further. Thus, the individual creates and maintains the "interests" construct to predict the motivational characteristics—the fun—of future activities accurately.

Fun and the Gifted Child

With respect to level of optimal arousal, energetic gifted individuals tend to be arousal-seekers. Farley (1986) reported that arousal-seekers search out novelty and uncertainty and are likely to engage in risk taking, both psychological and physical. Thus gifted children should enjoy activities that offer variety, high complexity, and uncertainty and stimulate curiosity.

In terms of interests, gifted youngsters typically find academic activities that are commensurate with their elevated abilities to be more motivating than activities geared toward the average student. In choosing occupations, the gifted wish to avoid explicit, methodical tasks, preferring instead activities where variety, creativity, even ambiguity challenge their talents. Further, activities that concentrate and expand upon their own area of giftedness provide a greater degree of perceived fun than other activities (Besonen, 1984; Whitmore, 1986).

Gifted students also tend to prefer a greater degree of control than average students in determining the activities they will pursue (Whitmore, 1986). Although they may have a more eclectic view of what academic and career activities are "fun," gifted students perceive free choice of activities as paramount for them to be motivated to engage. Perhaps this preference is due to the somewhat nonconforming nature of the gifted population as a whole (Davis & Rimm, 1989).

It seems in this early analysis that fun for gifted children, at least in the academic setting, is a matter of "more is better." Gifted children in general prefer more arousal, more challenge, more aspects of the task tailored to their interests, and more control over an activity in the form of free choice and a preference for independent work, than do average students. Ideally, teaching activities should accommodate these characteristics.

Summary

Activities that consistently meet requirements for arousal and control are perceived as "fun" and become an individual's interests. Gifted children in particular seem to require a relatively high level of arousal and a high degree of personal control to perceive educational activities as fun.

The remainder of this paper will use Kelly's personal constructs theory and repertory grid techniques to evaluate whether gifted children fit this model of academic fun. Students' personal constructs are expected to be organized into three main clusters corresponding to perceived arousal, perceived control, and personal interests.

Method

Determination of the "Most Fun" Aspects of School

Subjects. Subjects for this portion of the study (Group 1) were 85 students (41 females and 44 males) involved in pull-out programs for the gifted in three rural midwestern school districts. Distribution of subjects across grade levels was as follows: Grade 3, 5 females and 9 males; Grade 4, 11 females and 10 males; Grade 5, 15 females and 14 males; Grade 6, 6 females and 6 males; and Grade 7, 4 females and 5 males.

Procedure. Subjects in Group 1 were asked to list the 10 aspects of school that they felt were the "most fun." Duplicate responses were eliminated for each individual. For instance, if a subject indicated that "Science lab" and "Science" were 2 of

Table 1
Frequencies of students reporting that each aspect was one of the "most fun" aspects of school across grade and gender.*

	Grade											
	3rd		4th		5th		6th		7th		Total	
Aspect	F	M	F	M	F	M	F	M	F	M	F	M
Recess	5	6	6	9	7	12	5	6	1	2	24	35
Phys. Ed	3	7	7	7	8	12	1	3	3	5	22	34
Art	5	4	9	7	9	6	5	4	2	2	30	23
Mathematics	4	4	6	8	7	9	3	2	0	0	20	23
Music	2	4	7	5	7	5	3	2	2	1	21	17
Lunch	1	4	5	6	3	8	3	3	0	3	12	24
Reading	1	4	6	4	6	6	2	2	2	1	17	17
Socializing with Friends	2	4	0	2	5	5	2	2	4	5	13	18
Science	1	2	3	3	6	7	2	2	0	3	12	17
Spelling	1	3	6	3	5	2	2	3	0	0	14	11
Gifted Program	4	5	3	2	6	3	2	0	0	0	15	10
High Technology/Computers	2	6	2	1	2	7	1	1	0	3	7	18
N:	5	9	11	10	15	14	6	6	4	5	41	44

*Note: Only the 12 most frequently reported aspects of school are listed.

the 10 most fun aspects of school, they were coded as Science and counted as only one response. Likewise, if a student responded with "Band" and "Chorus," those responses together were coded as Music.

From these responses, the 12 most fun aspects overall were selected to serve as elements in eliciting constructs for repertory grid analysis. We took into account all aspects generated by the children, including those aspects that weren't particularly academic (e.g., lunch, recess). We wanted to get at students' own ideas, not merely their perceptions of what we thought important. Frequencies of responses across grade and gender are presented in Table 1. Together, these top 12 aspects account for 56% of the total number of responses.

Construct Elicitation

Subjects. Subjects in Group 2 were 126 children in Grades 4 and 5 (64 males and 62 females) and 87 children in Grades 6 to 8 (41 males and 46 females) identified by their school districts as gifted. Eight subjects did not report grade level or gender. Data for these 8 subjects were included in the overall analyses only. The 221 subjects were involved in a 3-week summer program for gifted elementary and middle school students at a midwestern university. Criteria for inclusion in the program included achievement scores at or above the 95th percentile (for the child's district) or teacher ratings of 99+ percentile in ability. The program was organized such that subjects were placed in groups of approximately 10 to 12 children.

Procedure. Five groups of children from the fourth and fifth grades (19 females and 25 males) and three groups of children from the sixth through eighth grades (17 females and 17 males) were selected at random to generate constructs for the final grid. Construct elicitation followed the same general format outlined by Kelly (1955). The 12 "most fun" aspects of school listed in Table 1 were randomly assigned to triads with the requirement that each aspect appear equally across the 20 total triads.

Children were presented with each triad from the list at random and were asked to write what made the first two aspects of school more fun than the third. A total of 20 reasons an activity is fun (personal constructs) were elicited from each of the 79 subjects. Subjects were tested with their group but were not allowed to share information.

The 13 most common constructs overall were selected to serve as representative constructs for the total sample. In addition, 7 author-generated anchor constructs were added: Two for perceived control ("I have control when I am involved in it"; and "I get to choose what I will do in it"), 2 for interests ("It is one of my interests"; and "It is interesting"), and 3 for optimal arousal ("I am curious when I am involved in it"; "It is difficult but not too difficult"; and "I can imagine lots of different things when I do it"). A final construct, "It is fun," was added to the list, making a total of 21 constructs.

Subject Ratings

The 12 "most fun" aspects of school were randomly assigned to 12 columns on a standard grid. The 21 constructs were randomly assigned to rows on the grid. Thus, the constructs rating form consisted of a 252-cell matrix designed to allow children to rate constructs on how well each pertained to each fun activity.

The 221 subjects in Group 2 were tested in their small groups. For each of the 12 aspects of school, the children were asked to rate how much they agreed with each construct on a 10-point scale (10 = agree very strongly, 1 = disagree very strongly).

To obtain a measure of the stability of ratings over time, subjects were asked to rate a subset of the grid form one week later. Seventy fourth and fifth graders returned the reliability measure. The median correlation indicated an overall reliability of .76.

Results

Age and Gender Differences in the Motivational Value of Academic Areas

Pearson Chi-square statistics were computed between grade levels and between males and females for each of the 12 elements to determine whether differences in perceptions of fun exist for boys versus girls or for older versus younger children. The results showed that boys endorsed Physical Education (χ^2 (1 *df*) = 5.26, $p < .05$), Lunch (χ^2 (1 *df*) = 5.55, $p < .05$), and High Technology and Computers (χ^2 (1 *df*) = 5.81, $p < .05$) as the most fun things about school more frequently than did girls. The results further indicated that

Table 2
Pearson Correlations Between Mean Construct Ratings and Mean Rating for "It is fun"

Construct	r
It is one of my interests	.530
It is easy	.428
The teacher is good	.594
I am in control	.495
I get to be myself	.572
It is important	.666
There are lots of choices of things to do	.588
I am good at it	.590
I can imagine lots of different things when I do it	.563
There is no supervision when I do it	.077 (ns)
It is interesting	.700
It is a break in my routine	.276
It is exciting	.643
It is difficult but not too difficult	.153 (ns)
I get to choose what I will do in it	.423
I learn a lot	.511
I get to do what I want	.452
I like it	.722
I am curious when I am involved in it	.554
It is challenging	.197 ($p < .01$)

Note: All p values < .001 unless otherwise noted.

children in higher grades (6th and 7th grade) placed Socializing with Friends on their list more often than children in the lower grades (3rd through 5th grade) (χ^2 (1 *df*) = 7.786, $p < .01$).

A 2 x 2 (Grade by Gender) analysis of variance was performed on mean construct ratings within each of the 12 aspects of school. The results tended to confirm differences reported above—namely, boys more so than girls were inclined to rate High Technology and Computers as fun ($F(1{,}209) = 3.789$, $p = .05$), whereas girls rated Art, Spelling, and their Gifted and Talented Program higher in perceived fun than did boys ($F(1{,}209) = 4.898$, $p < .05$; $F(1{,}209) = 7.609$, $p < .01$; and $F(1{,}209) = 6.688$, $p < .01$, respectively). Younger children perceived mathematics as more fun than did older children ($F(1{,}209) = 4.662$, $p < .05$). There were no significant age by gender interactions.

Validity of Construct Ratings

To understand how constructs associated with academic fun were rated for school in general, scores for each construct were summed across all school activities and divided by 12, the number of activities. This yielded a measure of the average construct rating across all of these "fun" aspects of school.

As a validity check to determine whether construct ratings were indeed related to ratings of fun, Pearson correlations were computed across the 221 subjects between the mean rating for "It is fun" and the mean ratings for each of the other constructs. High ratings of perceived fun corresponded to higher mean construct ratings (Table 2). The only nonsignificant ($p > .01$) correlations between mean construct ratings and the mean rating for "It is fun" were for the constructs "There is no supervision when I do it" and "It is difficult but not too difficult."

These low correlations may be due to the fact that relatively few children indicated "There is no supervision when I do it" during the construct elicitation task and the fact that "It is difficult but not too difficult" was an author-generated construct and may not be important in children's own representations.

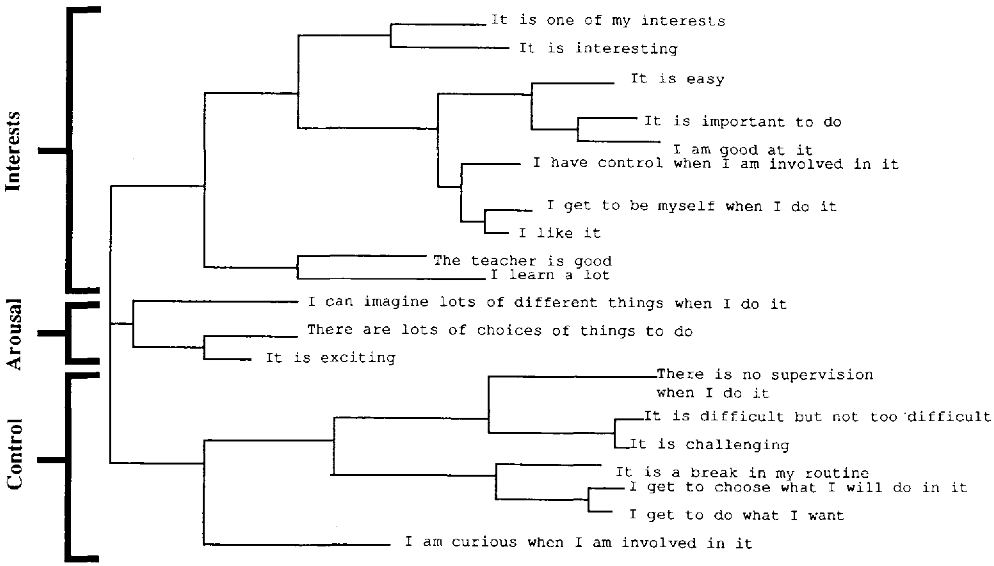
Clearly, elicited constructs are strongly related to children's perceptions of fun. The next section examines the ways in which gifted children organize these constructs in their representations of academic fun.

Construct Organization

Average construct matrices were derived by computing the mean ratings for each cell in the grid form. Average matrices were computed separately for each age level (younger = 4th and 5th graders, older = 6th through 8th graders), for gender, age level by gender, and overall.

An additive cluster analysis (e.g., Sattath & Tversky, 1977) was applied to the average matrices (see Lehrer, 1988, for a more complete description of the metric and of the software

Figure 2. Tree diagram illustrating gifted elementary and middle school children's representations of academic fun: Total sample (N = 221).



used in these analyses). It was expected that clusters of constructs would reflect the model of academic fun presented earlier. Constructs should tend to be organized into three general clusters corresponding to interests, perceived arousal, and perceived self-control.

An additive tree diagram illustrating cluster organization for the total sample is presented in Figure 2.

Similarity in ratings is indicated by the proximity of the constructs to each other. Further, the branching form of Figure 2 reflects a hierarchical organization of constructs. For example, the constructs "It is one of my interests" and "It is interesting" form a superordinate construct that encompasses both items. These in turn join at a higher level with the remaining members of the Interests construct. Thus, the tree diagram can be interpreted as progressing from the most subordinate (specific) constructs on the far right, to the most superordinate (general) constructs on the far left. Ultimately, all constructs will join at the highest level on the tree to reflect the concept "fun."

As expected, subjects tended to organize constructs into three exclusive clusters which correspond to the three hypothesized domains. However, the cluster corresponding to the Interests domain contains more constructs than were expected from the original hypothesis.

"Interests" may be an inadequate descriptor for this superordinate category. Children organized a variety of constructs within this domain, touching upon feelings of self-efficacy and learning potential as well as interest. For example, statements such as "I get to be myself when I do it" and "I am good at it" suggest that students evaluate activities in accordance with their self-concept in determining whether or not activities are perceived as fun. In addition, the construct "I have control when I am involved in it" would seem to indicate some experimental error or instability in the data. Otherwise, why was it not organized more like other seemingly similar statements such as "I get to choose what I will do in it"? However, because the former construct was consistently classified in the Interests domain across gender and age, it would seem that "I have control when I am involved in it" is indeed a part of determining gifted children's constructed interests.

In the Arousal domain are found only those constructs pertaining to fantasy, variety, and excitement. This would seem to confirm the importance of stimulation in gifted children's perceptions of activities as fun.

Results for subgroups showed highly similar construct organization regardless of gender, age, or age-by-gender grouping; thus, the tree diagram presented in Figure 2 is representative of the sample in general. The least similar conceptions appeared between older girls and older boys. Older girls tended to organize aspects of free choice ("I get to do what I want" and "I get to choose what I will do in it") with aspects of arousal. It is unclear at this time whether these constituted stable gender differences. It does, however, suggest that the relationship between arousal and control might be profitably investigated in future studies.

Discussion

The results support our hypothesis that gifted children's conceptions of fun in academics tend to be organized around their "interests" and their perceptions of arousal and control. In addition, similarity of construct organizations indicates that the criteria by which activities are classified as "fun" or "not fun" is highly similar regardless of age or gender. However, some interesting differences were apparent between children's conceptions of academic fun and the proposed model. Particularly intriguing is the role of self-efficacy statements such as "I have control when I am involved in it" and "I get to be myself when I do it" in evaluating activities as fun. How students construct their feelings of efficacy and the role these feelings play in determining motivation seem to be fruitful "next steps" in refining a theory of academic fun (see Bandura, 1989 for a discussion of the role of self-efficacy in regulating cognitive processes).

When designing instructional activities for gifted students, the present results suggest that three questions need to be addressed in order to tailor the activities to the students' motivational characteristics:

1. Does the activity engage an interest? (Has the student displayed self-efficacy in similar activities before? Has the student indicated that he or she likes the topic area?)
2. Is the activity sufficiently challenging? (stimulating?)
3. What control of the learning process can be given to the student?

An example from mathematics may help to illustrate.

In a recent discussion of the benefits of creating mathematics activities that are fun, a professor (who, by the way, is a fairly sophisticated mathematician) asked, "This is really neat stuff, but how does it translate into instruction?" The following problem served to illustrate the point, and the professor's affect while solving the problem provides an excellent example of a gifted individual having fun doing mathematics.

> If a string were tied around the earth at the equator (assuming the earth is a perfect sphere), and if 2 additional meters were then added to that string and it was suspended equidistant around the circumference of the earth, what kind of animal could crawl under the string?

This problem involves fairly elementary mathematical procedures and knowledge. However, the process of thinking involved in obtaining the solution is quite elegant. At first, our professor thought the solution was trivial. He responded, "An ant." When confronted with the actual answer—that a human being could crawl under the string—he exclaimed, "No Way!" and proceeded to attempt to prove the answer false. The incongruity of the solution elicited arousal in the form of skepticism and curiosity.

The nature of the large numerical values in this problem make the use of mental computation nearly impossible. Further, most calculators have difficulty computing an accurate answer without roundoff error. This proved to be an impasse for the professor. He started to realize that proving his point was more challenging than he first anticipated.

Mathematical modeling was suggested as a way to make the problem more accessible. If a pattern became evident through use of small circles, perhaps the solution could be extrapolated. Thus, greater control was given to the professor so that he could solve the problem without becoming frustrated and giving up. By using circles with known diameters and circumferences, the mathematical relationship that governs the solution became apparent. As the pattern unfolded, the professor became quite excited. He scribbled all over the chalkboard, amazed at the simplicity of his solution and especially at the elegance of the mathematical relationship. When he sat down, he said, "Well, that was fun!"

The reader will recall that the professor thought the problem was trivial at first. By giving him sufficient challenge and control in the activity, the search for a solution to the problem became meaningful—and fun. As the problem unfolded, the excitement of discovery virtually forced him to continue until he had the solution. A week later, he confessed that the counterintuitiveness of the problem still bothered him!

In terms of the proposed model (Figure 1), the professor originally checked with his interests construct and found no matching activity. Further evaluation led him to perceive the solution as trivial (not affording sufficient challenge), thus not meeting the arousal requirement. Consequently, he did not initially perceive the problem as fun.

When given the incongruous solution, however, his arousal was heightened. In addition, being able to model the solution provided sufficient control over solving the problem. Thus, both the arousal and control aspects of the activity were sufficient to motivate exploration. Through engagement in the problem-solving process, the excitement and accessibility of the solution enabled him to continue having fun. The problem then was placed in his interests construct.

The same problem, given to middle-school children, proves to be a wonderful exercise in fun mathematical problem solving. Given a variety of balls and lengths of string, children can measure the diameters and the circumferences of the balls, and then they can derive *pi* and use that relationship to solve the problem elegantly, even without a knowledge of algebra. Giving the students manipulatives allows them to engage in elegant mathematical thinking without having to feel anxious about remembering mathematical formulas or procedures. The challenge of the problem, the incongruity of the solution, and the perception that solving the problem is under their control makes the task fun.

One caveat is necessary regarding the design of motivational activities: It is important to make sure that the focus of students' intrinsic motivation is on aspects central to the purpose of the lesson. Many school activities (field trips, games, etc.) are considered fun by children because they involve novelty and a play atmosphere. If the novelty or the play is focused on skipping class and socializing, as well as popcorn, soda and gift shops, all of which are peripheral to learning, then children may develop a construct of fun that includes the peripheral aspects exclusively. If, however, the novelty or play engages the children in extending their knowledge, then they will be motivated to engage in similar academic activities in the future. "I learned a lot" is one of the factors that engaged the interests of students in our study.

If children begin to believe that academics are fun, they will become more intrinsically motivated to extend their knowledge and further actualize their academic potential. Fun should be viewed as one of the most important attributes of gifted education, for it motivates children to seek out intellectual challenge and to continue to do so throughout their lives. The personal enjoyment of children who accomplish something worthwhile and are proud of their achievements should be our primary goal as educators of the gifted. That makes it fun for all of us!

Authors' Note:

The authors would like to thank Bob Clasen and Margaret Powell for editing previous versions of this manuscript. We are also grateful to Gary Davis for his editing and "lightening up" of a semifinal draft. We would like to thank the reviewers of this paper for their thoughtful and incisive comments. The research reported in this manuscript was supported in part by the Wisconsin Center for Education Research, School of Education, University of Wisconsin, Madison. The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Wisconsin Center for Education Research.

References

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology, 25*(5), 729-755.

Bannister, D., & Fransella, F. (1971). *Inquiring man: The theory of personal constructs.* Baltimore, MD: Penguin Books.

Besonen, P. (1984). Turning on the talented. *The Creative Child and Adult Quarterly, 9*(3), 160-163.

Davis, G. A., & Rimm, S. B. (1989). *Education of the gifted and talented* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Farley, F. (1986, May). The big T in personality. *Psychology Today,* pp. 44-52.

Kelly, G. A. (1955). *Psychology of personal constructs: Vol. I. A theory of personality.* New York: W. W. Norton.

Lehrer, R. (1988). Characters in search of an author: The self as a narrative structure. In J. C. Mancuso & M. L. G. Shaw (Eds.), *Cognition and personal structure: Computer access and analysis* (pp. 195-228). New York: Praeger.

Lehrer, R., & Guckenberg, T. (1988, April). Children's perceptions of educational software. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Lepper, M. R. (1988). Motivational considerations in the study of instruction. *Cognition and Instruction, 5*(4), 289-309.

Sattath, S., & Tversky, A. (1977). Additive similarity trees. *Psychometrika, 42,* 319-345.

Whitmore, J. R. (1986). Understanding a lack of motivation to excel. *Gifted Child Quarterly, 30*(2), 66-69.