THE INTERNATIONAL JOURNAL OF CREATIVITY & PROBLEM SOLVING
2010, 20(2), 7-21

# Lectures May Be More Effective Than You Think: The Learning Pyramid Unmasked

John Baer
*Rider University, USA*

Four studies assessed college student preferences for lectures, assigned readings, and small group activities and discussions. Although students reported that they enjoyed small group activities and discussions more than lectures, they believed that they learned more from lectures. There was also a consistent aptitude-treatment interaction, with higher GPA students valuing lectures more and valuing group activities and discussions less than lower GPA students. These results directly contradict the predictions of the so-called Learning Pyramid, and because there is a complete lack of empirical evidence supporting the claims of the Learning Pyramid, its validity must be called into question.

Several years ago I spent a sabbatical semester at Yale, where I noticed a great deal of effort was being spent trying to get students to attend the small group "section" meetings that were part of most lecture courses. The typical format for courses other than seminars or laboratory science courses was two lectures and one section meeting each week. The sections were small, generally less than 20 students. The primary goal of the more than two dozen section meetings that I observed was to have a wide-open discussion, prompted by open-ended questions offered by the instructor. There was also usually a chance for students to ask questions, either of the instructor or the group.

Most students attended lectures regularly, even though attendance was not taken at lectures, but attendance at sections was notoriously low, despite the fact that the graduate students who led most of these sections were also the people most responsible for grading in many of these courses. Attendance at sections was required in many courses, and various inducements were provided to encourage attendance -- a variety of carrots and sticks that would make it profitable for students who cared about their grades to attend (and not very many people who are careless about grades make it through Yale admissions).

There were theories why interest in sections was so low, generally centering on the lack of teaching skill, enthusiasm, or lower academic qualifications of the graduate students who led the sections. There were certainly some graduate students who didn't care about teaching, but there were also many who cared very much about it (and had even formed their own self-study groups to improve their teaching). But it just seemed that Yale students were interested in what Yale professors had to say, not

Correspondence concerning this article should be addressed to John Baer, Memorial 102, Rider University, 2083 Lawrenceville Rd. Lawrenceville, NJ 08648 USA. E-mail: baer@rider.edu

what either Yale graduate student teaching assistants or their Yale classmates had to say.

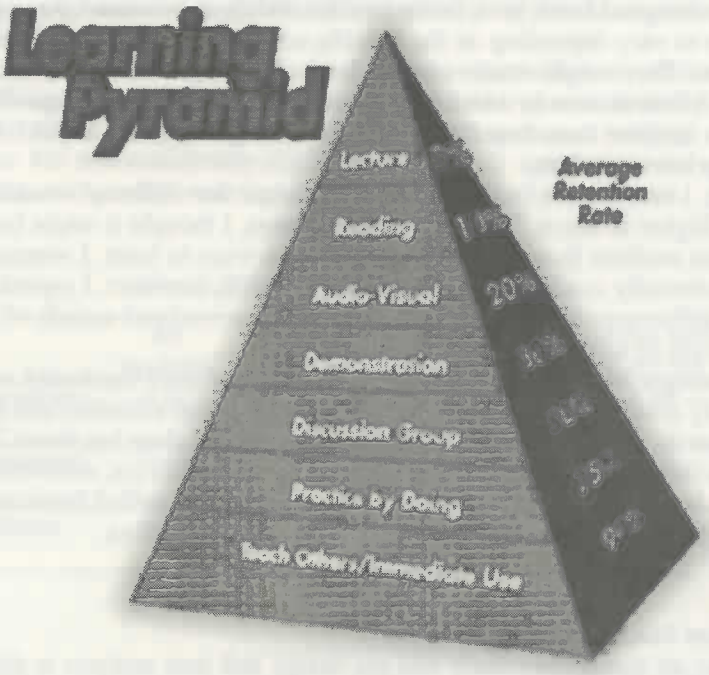
It certainly makes sense that, other things being equal, students at Yale (or any college) would prefer highly qualified professors over graduate student instructors. But other things *weren't* equal. The professors were delivering lectures, but the graduate students were leading small group discussions. Could it be that these students simply preferred lectures to discussions, or perhaps believed that they learned more from lectures?

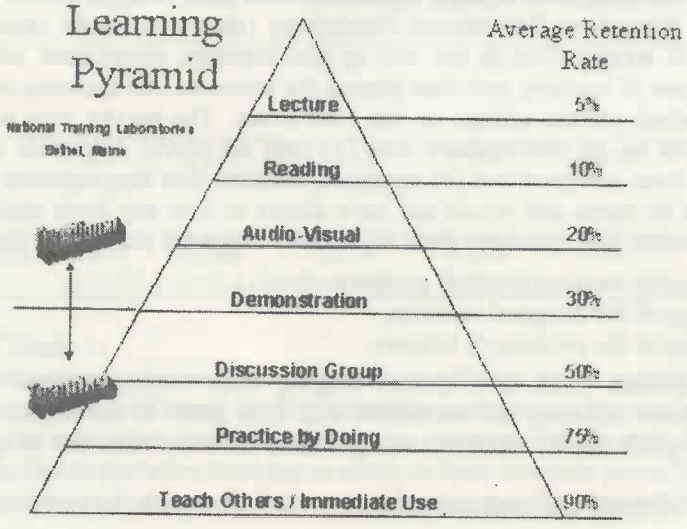
Aptitude-treatment interaction (ATI) research (Cronbach & Snow, 1977; Snow, 1989; Snow, Federico, & Montague, 1980) suggests that some instructional strategies may be more effective with one kind of student than another. Snow (1989) wrote that the best supported ATI effect involves treatments that differ in the level of structure and level of ability. Highly structured techniques (with a high level of external control -- what are sometimes called teacher-centered techniques, such as lectures) seem to help students with low ability but hinder those with high abilities compared to low-structure strategies (in which students have more control of what happens in the classroom -- what are sometimes class student-centered strategies[1]). Based on this research, one would predict that highly able Yale students would be the ones best able to benefit from less structured activities like discussions, but these students seemed to be voting -- with their feet -- in favor of highly structured lectures. And although there might be many reasons why Yale students preferred lectures to discussions, including the quality of the instructors, it is hard to believe that Yale students would skip discussion sections if they believed they would help them learn. And yet most regularly attended lectures that they were free to skip (because no attendance was taken) but tried to skip discussion sections that they were expected to attend and where their absence would be noted and possibly recorded.

At the college where I teach, there is a concerted effort to decrease the amount of lecture and increase the amount of class discussion. (This rather over-simplifies the efforts of the administration to encourage what is frequently called student-centered instruction, which involves more than just class discussion, but there is no doubt that these two goals -- decreasing lecture time and increasing discussion time -- are primary components of this movement.) On the door of the chairperson of my department there was, until he retired, an illustration of what is known as the "Learning Pyramid," which claims that students retain 5% of what they hear in lectures, 10% of what they read, 20% of what is presented through audiovisuals, 30% of demonstrations, 50% of discussion groups, 75% from "practice by doing," and 90% from teaching others. This is a rather familiar graphic in education circles; if one does a

[1] Among the many ways "student-centeredness" is used, perhaps the most common has to do with who determines what is to be learned and how best to learn it. For example, Kain (2003) explained that "In teacher-centered approaches, judgments about appropriate areas and methods of inquiry, legitimacy of information, and what constitutes knowledge rest with the teacher" (p. 104), as opposed to student-centered instruction, in which authority in these areas is either given over to students or shared somewhat equally between professors and students. There is far too much dispute about both what teacher- and student-centered approaches imply for instruction and the relative success of these approaches to discuss here, but see, e.g., Kaminski, Sloutsky, & Heckler, 2008; Kirschner, Sweller, & Clark, 2006; Mayer, 2004; Woolfolk, 2007.

Google search of "Learning Pyramid, many slightly varying depictions of this graphic will appear among the 25,000 or so hits generated. Sometimes a source is cited, which is most often the National Training Laboratory in Bethel, Maine (more on this in the General Discussion section below). Here are two common depictions of the Learning Pyramid(from http://www.acu.edu/cte/activelearning/whyuseal2.htm; http://lowery.tamu.edu/Teaming/Morgan1/sld023.htm):



I had sometimes wondered how one could operationalize "average retention rate" as it is used in the Learning Pyramid. Would this refer to learning a percentage of the content of the lecture or discussion (or whatever else has occurred to promote learning)? In that case, the most effective method would be the one that presented the least content, because if there were little that students could learn it might be rather easy to get them to learn it. Or would a percentage of the content, skills, etc. that the course was designed teach be a better benchmark? It also seemed these percentages would have to vary depending on the specific content and background knowledge of the students. They might retain content learned through discussion or practice or teaching if it was an area in which they already had some skill and knowledge, but it was hard to imagine them benefiting from discussing something about which no one in the group knew anything.

Although I was unable to make sense of claims that different teaching methods resulted in higher or lower "average retention" rates, I thought it might be interesting to learn what students thought were more effective ways to learn. I wanted to remove as many potentially confounding variables as possible, however. I especially wanted to remove differences in the qualifications (both perceived and actual) of the instructors who might be lecturing or leading discussions.

At the colleges where the four studies reported below were conducted, most classes are relatively small, allowing either lecture or small group activities and discussions, and there are no graduate student instructors. The typical class has about 25 students. These class sizes make possible either lectures or discussion (or, most often, both) in almost all classes. So I used students as my subjects, and polled them on what they thought about lectures and small group activities and discussions.

## STUDY 1

**Subjects and Method of Study 1:**

Study 1 was an exploratory study and the design and data analysis is different than that of the following three studies, which benefited from insights gained form Study 1.

Students from three Educational Psychology (class size in all cases was approximately 20) were polled at the end of the semester about their preferences for different types of learning activities during the semester. All students were attending a medium-sized private college on the East Coast. The survey data were collected from students by an intermediary who (a) kept all survey responses until after all grades had been assigned and (b) promised students that the instructor would never see the data by name and would not have access to it in any form until after grades had been posted. The questions from that survey that were part of this study were:

I enjoyed working in small groups in class.
I enjoyed the assigned readings.
I enjoyed the professor's lectures.

Student responses (with five options ranging from "strongly agree" to "strongly disagree") were tabulated and correlated with final grade in the course, grade on the final exam, grade on the midterm, and grade on the only other test (a quiz) given in the course.

It should be noted that students need a 2.5 GPA to register for this course.

**Results of Study 1:**
Comparisons of mean ratings showed that students reported liking the activities that occurred in class (group work and lectures) more than course readings. Students receiving higher grades (using either an upper third v. lowest third comparison or an upper half v. lower half comparison) liked lectures significantly more than those receiving lower grades. There was no statistically significant difference between high and low achieving students' reported enjoyment of group work or course readings. These results are presented in Table 1.

Correlational analyses told a similar story. There were modest correlations between grades and liking lectures, and most of these correlations were statistically significant, as shown in Table 2. All correlations between enjoying course readings and grades were positive but not statistically significant, while all correlations between liking group activities and grades were negative but not statistically significant.

**Table 1**
*Group Means, Study 1 (total N = 53)*

| | all students | upper third—lower third, by grade | upper half—lower half, by grade |
|---|---|---|---|
| Enjoyed working in groups | 4.66 | 4.59 — 4.76 | 4.69 — 4.63 |
| Enjoyed assigned readings | 3.40 | 3.65 — 3.47 | 3.50 — 3.30 |
| Enjoyed lectures | 4.42 | 4.65 — 4.18 $p$=0.011 | 4.65 — 4.19 $p$=0.002 |

**Table 2**
*Correlations, Study 1*

| | Course Grade | Final Exam | Midterm Exam | Quiz | All tests | All tests + grade |
|---|---|---|---|---|---|---|
| Enjoyed working in groups | -.049 | -0.070 | -0.247 $p$=0.075 | -0.129 | -0.159 | -0.118 |
| Enjoyed assigned readings | 0.235 $p$=.09 | 0.150 | 0.262 $p$=0.058 | 0.060 | 0.186 | 0.208 |
| Enjoyed lectures | 0.395 $p$=.003 | 0.326 $p$=0.117 | 0.274 $p$=.047 | 0.232 $p$=0.094 | 0.335 $p$=0.014 | 0.362 $p$=0.008 |

**Discussion of Study 1:**
The data do not explain why students achieving at different levels exhibit somewhat different preferences for different kinds of learning experiences, but one reason may be similar to the one often used to explain the common finding that highly able students do not like cooperative learning as much as their less able peers: that conversations about a topic with peers who know considerably less than oneself may be less

interesting or enjoyable (Baer, 2003). It is also possible that higher achieving students were better able to understand the lectures without group support.

This study was problematic, however, in that the focus was students' experience in a single class. Perhaps it was the style of lecturing or the kinds of small group activities in these classes that produced the observed results. This study also looked only at what students reported enjoying, ignoring student assessments of which class activities they may have found more or less helpful in their learning. For these reasons, a second study was conducted to see if similar results would be found if students were led to evaluate their classes more generally and if asked about both enjoyment and learning.

## STUDY 2

**Subjects and Method of Study 2:**

Students from eight Educational Psychology classes (N = 166) at a medium-sized private college were surveyed on the first day of class regarding learning preferences. All subjects were either sophomores or juniors. The survey instructions were to respond based on their past experiences in all their college classes, and because nothing had happened yet in the Educational Psychology class where they were surveyed, the students could not be evaluating anything about that class, as in Study 1. The purpose of the study was not explained. Students may have believed that their responses would influence what would happen in their Educational Psychology class, although this was not promised or even suggested.

GPAs were collected from the registrar. Because 34 of the students were transfer students, GPA data was available for only 132 subjects. Because students needed a 2.5 GPA to register for this course at this college, the GPA distribution is somewhat truncated. The effect of this truncation, in which the bottommost segment (lowest achieving students) is not included, might be to somewhat mitigate any effects of differences in levels of achievement. This will be considered in the discussion of the results.

The questions from the survey were:

1. *I generally enjoy working in small groups in a class.*
2. *I believe that working in small groups in a class helps me learn.*
3. *I generally enjoy the assigned readings in a class.*
4. *I believe that the assigned readings in a class help me learn.*
5. *I generally enjoy professors' explanations & lectures.*
6. *I believe that listening to professors' explanations & lectures helps me learn.*

Subjects could choose responses to each question from a five-point Likert scale:

| | | | | |
|---|---|---|---|---|
| *Strongly agree* | *agree somewhat* | *neither agree nor disagree* | *disagree somewhat* | *strongly disagree* |

Because in Study 1 there was something of a ceiling effect, with students ranking all activities high, the following forced-preference question was added:

*Please rank order the following in terms of how well you believed each helps you learn the required course material in your classes. Put 1 next*

*to the one that helps you learn most, 2 next to the one that helps you learn second most, and 3 next to the one from which you learn least (in terms of learning required course content).*

_____ *Small group activities and discussions*
_____ *Assigned readings*
_____ *Professors' lectures and explanations*

**Results of Study 2:**

Comparisons of mean ratings showed that students reporting liking the activities that occurred in class (group work and lectures) more than course readings, as in Study 1. The ratings for how much they enjoyed working in groups, assigned readings, and lectures were all somewhat lower than in Study 1, perhaps due to the difference between rating their experiences in a single course (Study 1) v. rating their experiences in classes more generally, but the pattern was nonetheless similar. There was also a much more limited aptitude-treatment interaction between how well they liked each type of learning and the measure of achievement, in this case GPA.

**Table 3**

*Group Means of Nominal Ratings, Study 2, Enjoyment (total N = 132)*

| | mean (all students) | correlation with GPA |
|---|---|---|
| Enjoyed working in groups | 4.26 | -0.08 |
| Enjoyed assigned readings | 3.28 | 0.03 |
| Enjoyed lectures | 3.94 | 0.05 |

Looking at what students believed about their *learning,* as opposed to their enjoyment, produced a rather different picture. Students believed they *learned* the most from lectures and the least from assigned readings, with group work falling between these two. Pairwise comparisons of how *well* students believed they learned from each mode of instruction (discussion, lecture, and reading) were all statistically significant ($p < .001$ for lecture v. group and lecture v. reading, $p = .04$ for reading v. group work).

**Table 4**

*Group Means of Nominal Ratings, Study 2, Learning (total N = 132)*

| | mean (all students) | correlation with GPA |
|---|---|---|
| Learned from working in groups | 4.10 | -0.01 |
| Learned from assigned readings | 3.92 | 0.15 |
| Learned from lectures | 4.43 | 0.10 |

Although there were small positive correlations between GPA and how much students believed they learned by reading and lectures, none of the correlations with GPA were statistically significant at the .05 level. Two factors made it unlikely that such statistically significant correlations would be found: (1) the restriction in range of GPA, due to the fact that students needed a 2.5 GPA to register for this course and (2) the restriction in range due to the generally high ratings given by almost all students (a ceiling effect). It was in anticipation of these limitations that a forced

comparison was included, in which students had to rank order how well they believed they learned from each of the three methods. This procedure would not removed the restriction in range due to GPA, but could at least remove the influence of ceiling effects on ratings.

Overall, students reported that professors' lectures and explanations helped them learn the most, followed by small group activities and discussions. Assigned readings were rated least helpful. All three pairwise comparisons were statistically significant ($p < .05$).

**Table 5**

*Group Means of Rank Order Ratings, Study 2, Learning (total N = 132)*

| | mean (all students) | correlation with GPA |
|---|---|---|
| Group activities/discussions | 2.18 | -0.24 ($p = .006$) |
| Assigned readings | 1.41 | 0.15 ($p = .096$) |
| Professors' lectures/explanations | 2.41 | 0.16 ($p = .061$) |

Correlations of these forced comparison ratings with GPA produced one robust effect and two less certain ones. Higher GPA was clearly associated with a belief that group activities and discussions were less beneficial learning tools. There were positive correlations between GPA and beliefs that lectures and assigned readings were helpful learning methods, although neither correlation quite reached a .05 level of statistical significance.

**Discussion of Study 2:**

As in Study 1, the data show that students like group activities and discussions more than lectures. But liking and learning are different things, and the data suggest that these sophomore and junior students believe that they *learn* more from lectures than small group activities and discussions (and that they learn even less from assigned readings, which the students also liked least, as in Study 1). In addition, there is some evidence suggesting an aptitude-treatment interaction, with higher achieving students claiming that they learn less from group activities and discussions than lower achieving students and that they may learn more from lectures and readings than their lower achieving classmates.

These students were sophomores and juniors, and even though they had been in mostly small classes in which discussion was possible, their responses might reflect their limited exposure to more seminar-like, upper-level classes. The next study tried to remove this limitation by surveying seniors.

## STUDY 3

**Subjects and Method of Study 3:**

The 66 subjects in this study were all second-semester seniors who were just beginning their final semester at a medium-sized private college. As in Study 2, they were surveyed about their learning preferences on the first day of class so that their responses were more likely to reflect the totality of their class experiences rather than

what was happening in the particular class in which the survey took place. The students were surveyed in small seminar classes. The students represented a variety of arts and sciences majors. The methodology was identical to that used in Study 2.

**Results of Study 3:**

Comparisons of mean ratings showed that students reporting liking the activities that occurred in class (group work and lectures) more than course readings, as in Studies 1 and 2.

**Table 6**

*Group Means of Nominal Ratings, Study 3, Enjoyment (total N = 66)*

| | mean (all students) | Correlation with GPA |
|---|---|---|
| Enjoyed working in groups | 4.08 | 0.12 |
| Enjoyed assigned readings | 3.50 | 0.08 |
| Enjoyed lectures | 3.98 | 0.07 |

As in Study 2, students believed they *learned* the most from lectures and the least from assigned readings, with group work falling between these two.

**Table 7**

*Group Means of Nominal Ratings, Study 3, Learning (total N = 66)*

| | mean (all students) | correlation with GPA |
|---|---|---|
| Learned from working in groups | 4.08 | -0.12 |
| Learned from assigned readings | 3.92 | 0.35 ($p<.005$) |
| Learned from lectures | 4.30 | 0.17 |

In the most telling analyses, in which ceiling effects were removed by requiring a forced rank ordering, the results paralleled those of Study 2 but showed an even stronger correlation between GPAs and type of instruction. The belief of higher achieving students that lectures promoted learning better than group activities and discussion was even more pronounced.

**Table 8**

*Group Means of Rank Order Ratings, Study 3, Learning (total N = 66)*

| | mean (all students) | correlation with GPA |
|---|---|---|
| Group activities/discussions | 2.18 | -0.40 ($p = .0008$) |
| Assigned readings | 1.44 | 0.19 ($p = .136$) |
| Professors' lectures/explanations | 2.38 | 0.40 ($p = .0008$) |

**Discussion of Study 3:**

Because the results so closely mirrored those of Study 2, it seems safe to reject the hypothesis that the observed results were due to the fact that students had not yet experienced upper-level courses where seminar-like discussions might be more common. In fact, it appears that, if anything, greater experience with seminar-type classes

may more lead to an even *greater* divergence of opinion between lower and higher achieving students, with the higher achieving seniors finding group activities and discussions even less valuable (and lectures more valuable) than did their sophomore and junior counterparts in Study 2.

## STUDY 4

**Subjects and Method of Study 4:**

Study 4 was a partial replication of Study 2. The subjects were sophomores at a two-year community college. The primary goal of Study 4 was to test the generalizability of the findings of Study 2 with a different population of students attending a different kind of college. The same survey was used as in Studies 2 and 3. The ages of students were not obtained, but because this community college has a far greater percentage of returning students overall, it is likely that the mean age of the students in this group was older. In terms of number of credit hours completed, however, this was the youngest sample (subjects were all either first- or second-semester sophomores).

**Results and Discussion of Study 4:**

The results were similar to those of Studies 2 and 3, with a few minor exceptions, as reported in Tables 9-11. Students in Study 4 preferred lectures to working in groups (Studies 2 and 3 had the opposite finding) As in Studies 2 and 3, students in Study 4 believed they learned most from professors' lectures and explanations. The correlations with GPA were similar, but less striking. They seemed to be of two minds regarding the comparative value of working in groups and assigned readings, ranking readings higher in nominal ratings but lower in forced-choice rankings.

**Table 9**

*Group Means of Nominal Ratings Study 4, Enjoyment (total N = 90)*

| | mean (all students) | Correlation with GPA |
|---|---|---|
| Enjoyed working in groups | 3.76 | 0.06 |
| Enjoyed assigned readings | 3.24 | 0.12 |
| Enjoyed lectures | 4.08 | 0.15 |

**Table 10**

*Group Means of Nominal Ratings Study 4, Learning (total N = 90)*

| | mean (all students) | correlation with GPA |
|---|---|---|
| Learned from working in groups | 3.59 | -0.03 |
| Learned from assigned readings | 3.80 | -0.02 |
| Learned from lectures | 4.52 | 0.00 |

**Table 11**

*Group Means of Rank Order Ratings Study 4, Learning (total N = 90)*

| | mean (all students) | correlation with GPA |
|---|---|---|
| Group activities/discussions | 1.88 | -0.14 |
| Assigned readings | 1.55 | -0.01 |
| Professors' lectures/explanations | 2.56 | 0.21 |

## GENERAL DISCUSSION

Overall, the results of these four studies point to two general conclusions:

1. Students believe they learn more from lectures than from small group activities and discussions, and that they learn even less from assigned readings.
2. These learning preferences are most pronounced among more able students, indicating aptitude-treatment interactions in which higher achieving college students find less value in small group activities and discussions and more value in lectures and assigned readings than do their lower achieving classmates.

Students do not seem to share the widely held belief that lectures are too teacher-centered or insufficiently constructivist to be effective ways to learn. Although only three general teaching methods were included in this study, these are primary methods employed in college classrooms and the terms used are ones that students have little trouble understanding. It may be that some specific types of group activities or discussions would get higher marks from students than other kinds of small group activities, just as some kinds of assigned readings might be more valued than others, but as general approaches to learning, students overall found them less effective than the often vilified lecture. It appears that students at both a mid-level private college and a community college, like students at Yale, think lectures are good ways to learn.

The students may, of course, simply be wrong. These studies do not show which method actually produces better learning outcomes (and, as noted in the introductory discussion of the Learning Pyramid, such a test would be difficult to design). Perhaps students mistakenly believe that lectures are more effective than small group activities and discussions.

If students *preferred* lectures to group activities and discussions, this might bias them in favor of lectures as more effective teaching techniques, but this was not the case in any of the four studies. Overall, students claimed to enjoy discussions more. If anything, this would seem likely to bias them in favor of the effectiveness of group activities and discussions. The results, however, were just the opposite: the students found group activities and discussions *less* effective than lectures as ways to learn.

But don't we already *know* that lectures are less effective than discussion -- ten times less effective, according to the Learning Pyramid? Based on what we know from the Learning Pyramid, the students must not only be wrong, they must be wildly deluded in their belief that a technique shown to have almost no value as a means of learning (lectures) could possibly be superior to a technique that is known to be one of the best ways to learn (discussion groups). Discussion groups are by far the most effective of the seven methods catalogued in the Learning Pyramid that are readily available to most college professors because the only methods that the Learning Pyramid says are more effective -- teaching others, immediately putting the new knowledge to use, and practice by doing (whatever that might mean) -- are not really possible in many contexts[2].

---

[2] Once some learning has taken place, students might begin to "teach" other beginning learners in the sense of sharing ideas about their new understandings -- perhaps in cooperative learning groups, which would fit into the category of group activities/discussions surveyed in the studies reported above. But to whom would a student who is just beginning to learn, say, about the philosophy of Schopenhauer

So if the Learning Pyramid is right, the students must simply be wrong, and the problem of interpretation facing us is why students are so misguided in their beliefs. Were it not for the well-established Learning Pyramid, we might have to conclude that lectures are, on average, better learning methods than small group activities and discussions.

As it turns out, we might have to give the students' beliefs a second look, because the Learning Pyramid is a fraud -- despite the many thousands of Google-reported web pages that use the term, many of them websites devoted to improving instruction by showing what an ineffective method of instruction lecturing is and exhorting readers to use more effective techniques like group discussion and teaching others. The Learning Pyramid is based on *no* research that anyone can identify -- absolutely none -- and it has no connection with the National Training Laboratory in Bethel, Maine, which is the common citation. A search for its origins suggests that it was probably based on Dale's Cone, which was not based on any empirical research at all -- just someone's hunch (Eskow, 2005) (from http://www.acu.edu/cte/activelearning/whyuseal2.htm).


genuinely *teach* this philosophy? It is hard to imagine subjecting other (even less knowledgeable?) students to the tutelage of "teachers" who know almost nothing about a topic. And how might this student practice his or her beginning knowledge of Schopenhauer's philosophy "by doing"? How could one put it to "immediate use"?

With the Learning Pyramid based on no empirical research at all -- just someone's hunch, which was supported not by research but by a fake citation -- we need to take students' views about lectures seriously. The fact that one cannot prove them wrong does not prove them right, but it should at least humble those who believe lectures are less effective than group discussion. They may be right, but there is no evidence to support their claim -- and there is evidence to support the counter-claim that lectures are more effective. That evidence -- from the studies reported above -- is hardly reason to abandon small group discussions and activities. Even if such small group work is, in general, less effective than lectures, it still might be quite effective in some settings, with some students, and with some teaching goals. There is also probably value in providing a mixture of teaching methods, some better suited to differing student preferences, different content, and different learning goals.

That brings us to the second conclusion of this research, that more able students tended to find lectures and assigned readings more valuable, and group activities and discussions less valuable, than their less able peers. Why might this be so? Some possibilities include:

1. More able students might be better able to understand both lectures and assigned readings better.
2. More able students might learn less from small group discussions with less able students because the level of discussion is limited by the knowledge and abilities of the group.
3. Less able students might be able to understand course content better through small group discussions with more able students than through lectures or assigned readings, which they might find harder to comprehend.

The fact that more successful students (in terms of GPA) are the ones who most strongly believe that lectures are more effective learning tools should give us pause for at least two reasons. First, they are perhaps better judges of what techniques facilitate learning. Overall students endorse lectures over group discussion, and this endorsement is particularly strong among the very students who are learning most effectively. This gives us additional reason to believe that students' judgments in these matters may be accurate.

Secondly, college professors need to beware falling into a trap that some elementary and secondary teachers succumb to -- focusing instruction at the level of students who are struggling. Professors, like all teachers, need to do their best to teach *all* students. Eschewing lectures might make a professor more popular (because students, even those who find lectures more useful learning methods, like group discussion better) and might better suit the preferences of the lowest achieving students, but a lecture-free strategy could result in much less learning by the more able students in a class. This paper is not a call to end small group activities and discussions -- these can certainly be quite valuable. It should give pause to those who complain that lectures are inefficient ways to help students learn, however. College students don't agree, and we would be foolish to ignore what they say.

This study used student grades as its measure of student learning, but of course grades are only one such measure. It is likely that other important outcomes, such as interest generated among students for independent study in the field or for taking more courses in a subject area, may be missed by looking only at grades. As noted in

the previous paragraph, nothing in this paper is meant to suggest that such activities should not be part of college classes or that they do not promote learning and other worthwhile outcomes. A mixture of lectures, discussions, and other kind of learning activities is perhaps optimal for many college courses. These results do not dispute such a claim. They do dispute claims that lectures are ineffective ways to teach, however.

An editorial appeared a few years back in the Yale Daily News about "the superiority of lectures over seminars" (Engler, 2006) as ways to learn. The writer argues that "lectures are good because, if for no other reason, they allow your professor to do most of the speaking. Professors got to where they are because they . . . know more about the subject than you do." Other arguments made in this editorial included the posturing of students in seminars and the frequent lack of focus of seminar-style discussions. The editorial did note that "not all seminars are created equal," however. The ones that start with open-ended questions, according to this editorial, tend to lack focus and become monotonous. (It also suggested that professors who structure their classes this way have "gotten lazy.") But when the seminar begins "with the professor setting the stage through a 15-minute mini-lecture," followed by discussion, this editorial argued that seminars can be much more productive and valuable.

The suggestion that professors should set the stage by providing a context and focus for class discussions and that even in seminar classes they should mix mini-lectures with other teaching techniques seems like reasonable advice. Much ink has been spilled in the past few decades about the limitations of lectures (and, like any other teaching technique, when done badly, dull and poorly organized lectures can be stultifying wastes of time). And there are certainly advantages to other teaching methods. But we shouldn't follow the advice of the so-called "Learning Pyramid" -- which we should remember has no real authority or empirical basis -- or dismiss lightly a potentially valuable teaching technique. Lectures have had and should continue to have an important role to play in teaching. They have been around for a long time not only because of inertia. Learners find them effective ways to learn, and we mustn't let any theoretical blinders or false "Learning Pyramids" prevent us from using them effectively.

## REFERENCES

Baer, J. (2003). Grouping and achievement in cooperative learning. *College Teaching, 51.* 169-174.

Cronbach, L. & Snow, R. (1977). *Aptitudes and Instructional Methods: A Handbook for Research on Interactions.* New York: Irvington.

Engler, S. (2006, April 21). Heed disparities in class formats. [Editorial]. *Yale Daily News* (retrieved April 21, 2006 from http://www.yaledailynews.com/article.asp?AID=32823).

Eskow, S. (2005). Origin of the Learning Pyramid. homepages.gold.ac.uk/polovina/learnpyramid/disputed.htm (retrieved December 12, 2005).

Kain, Donna J. (2003). Teacher-centered versus student-centered: Balancing constraint and theory in the composition classroom. *Pedagogy, 3(1)*, 104-108.

Kaminski, J. A., Sloutsky, V. M., & Heckler, A. F. (2008). Learning theory: The advantage of abstract examples in learning math. *Science, 25,* 454-455.

Kirschner. P. A., Sweller, J., & Clark, R. E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist, 41(2)*, 75–86

Mayer, R. (2004). Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction. *American Psychologist, 59,* 14–19.

Snow, R. (1989). Aptitude-Treatment Interaction as a framework for research on individual differences in learning. In P. Ackerman, R.J. Sternberg, & R. Glaser (ed.), *Learning and Individual Differences*. New York: W.H. Freeman.

Snow, R., Federico, P., & Montague, W. (1980). *Aptitude, Learning, and Instruction, Vols. 1 & 2.* Hillsdale, NJ: Erlbaum

Woolfolk, A. (2007). *Educational psychology (10th Ed.)*. Boston: Allyn and Bacon.

Key words: Lectures, Discussion groups, Learning pyramid, Student preferences