

# Engaging Students in Learning through Cooperative Learning Strategies

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## Abstract

Engineering education faces significant challenges as it seeks to meet the demands on the engineering profession in the twenty first century. The paper focuses on classroom-based pedagogies of engagement, in general, and *cooperative learning strategies* in particular. The paper is a follow up to previous work by the author on viable strategies to improve the classroom environment of engineering colleges. At the start, the paper relates author's preliminary findings on *teaching-learning* practices in selected engineering colleges, sheds light on the *pros and cons* of the *lecture format*, and identifies meanings and substance of different *active learning* protocols focusing on *cooperative engagement strategies*. Next, it identifies common barriers to *reformation* in general, and to the use of modern pedagogical skills in particular. It is also argued that any meaningful change in classroom practices today (dominated by traditional lecture-based methods) must be mandated and supported by the university administration. What is necessary to create a change, is for the department or college, to have a comprehensive and integrated set of components: clearly articulated expectations, opportunities for faculty to learn about new pedagogies, and an equitable reward system.

## Introduction

“To teach is to engage students in learning.” This quote, from *Education for Judgment* by Christenson et al (1991), captures the meaning of the art and practice of pedagogies of engagement. The theme advocated here is that student involvement is an essential aspect of meaningful learning. Also, engaging students in learning is principally the responsibility of the instructor, who should become less an imparter of knowledge and more a designer and a facilitator of learning opportunities. In other words, the real challenge in college teaching is not trying to cover the material for the students, as many of us practice today; but rather uncovering the material with the students! This is a call for all faculty involved with teaching engineering courses, and those who develop, and implement engineering programs, to consider not only the content that make up an engineering degree, but also how students engage with these materials. It is primarily a call to search for proper tools that can be deployed to stimulate learning.

In moving forward, there are numerous tools available to select from, including the models predicated on *cooperation*; i.e., working together to accomplish shared goals. Within *cooperative*

*activities*, individuals seek outcomes that are beneficial to them and to all other group members (Smith et al 1981; Johnson et al 1991). *Cooperative learning* researchers and practitioners have shown that positive peer relations are essential to success in college. The positive interpersonal relationships promoted through *cooperative learning* are regarded as crucial to today's learning communities. They reduce uncertainties and increase the quality of social adjustment and integration into college life. Isolation and alienation, on the other hand, often lead to failure. Two major reasons for dropping out of college are: failure to establish a social network of classmates and failure to become academically involved in classes (Mckeachie et al 1986; Tinto 1994).

The purpose here is to renew the call for deployment of more effective instructional strategies in the classroom, stressing on *cooperative learning* practices as a viable alternative to the traditional (low-interaction lecture-based) environment that has gripped the engineering education in most institutions, for decades. The paper sheds light on: theoretical roots, current practices, and suggestions for redesigning classes-if need be- to help break the traditional lecture dominant pattern when *cooperative learning* protocols are deployed. The paper shows how *cooperative learning* can advance academic success, quality of relationships, and psychological adjustments and attitudes toward the college experience. A number of relevant questions do come to mind, including: What needs to be done to move the process forward? What are the key components of successful deployment of *active learning* in general and *cooperative learning* in particular? How to foster and expand the community of engineering faculty who decide to use *cooperative learning*? What plans /resources needed to institutionalize pedagogies of engagement including *cooperative learning*, at the department or college level? Achieving change needed does require a collective effort by all involved, namely: the institution, the faculty, and the students.

### **Teaching/Learning Practices Today: Findings through Interviews**

To get first-hand information on teaching practices in selected colleges, the author arranged to meet with faculty members and administrators from various engineering colleges, in an effort to learn, first hand, about current teaching and learning practices, and, instructors' views on ways to improve the classroom environment. A total of 24 faculty members were receptive and responded voluntarily – on a rather short notice - and expressed their views orally, supplemented with written statements. The main headings/questions raised by the author, during the interviews, were:

- Have you been exposed to *active teaching/ learning strategies*, and have you kept up with recent developments in the arena of *pedagogies of engagement*?
- Are you willing and able to deploy any of those strategies (*pedagogies of engagement*) if and when the need arises?
- If you were to select one such *strategy* which one would it be? And why?
- Preliminary information reveals that *strategies of engagement* are seldom used; and if at all, only by a few and on a limited basis? Why?
- Do you believe that *active learning strategies* should be deployed in your department and/or college? And if so, what are the barriers?
- Based on your experience, what would you suggest to add or change in your teaching strategies that would improve the classroom environment?

While answers to the above noted questions varied considerably from one member to the next; there were, nonetheless, some agreements amongst many, on certain issues that would be worthy

of consideration. The general consensus of views/opinions expressed by the majority of the faculty interviewed by the author asserts and/or amplifies the following points:

**First**, nearly all faculty members have been exposed to one form or another of *active learning* through work shops and seminars offered at their universities' Learning Centers. Some have acquired the knowledge on their own, i.e., through their own personal endeavors. **Second**, all have expressed their wish to learn more about *active learning strategies*; and most do not believe that they are sufficiently competent to deploy an *active learning strategy* as yet- in the courses they will be responsible for in the near future. **Third**, with regard to the strategy they would chose or deploy, the majority had no specific preference, and have argued that a specific method is best viewed as "a good choice" only when placed within a context that considers the overall experience and outcome, including: goals and objectives, the nature of the subject, and the capabilities and readiness of the students to embark on a new undertaking. **Fourth**, many have expressed their wish to improve their classroom strategies within the framework of traditional methods, arguing that there is a great deal of room for improvement within the traditional lecture approach. **Fifth**, some members have stressed the point that the success of any *active learning strategy* requires students' active participation- raising the question whether students are ready and willing to become active participants in the process? **Sixth**, most faculty members were mindful of the time and energy required to become a more effective instructor; and, at the same time, apprehensive and concerned that teaching is often undervalued in comparison to research.

The interviewed faculty members have been teaching undergraduate classes at their present institutions for a minimum of five years. Most of the classes taught by the aforementioned faculty are small size, seldom exceeding 35 students per class. The lecture format dominates the seen. There seem to be less interest (by most of the faculty interviewed) in the process by which the course content is delivered and more of a concern whether the rate of delivery would allow the instructor to finish the course on time. The views expressed, leads one to believe that it is highly unlikely that new more effective *teaching-learning strategies* would be deployed any time soon, unless drastic measures are undertaken. The author is more convinced now than ever, that deployment of *active learning strategies*, would happen only if the institution mandates it!

### **The Pros and Cons of the Lecture Format**

When asked why he lectures, one faculty responded: "*It is tradition. It was part of my training, and seems to dwell in me and seems like what I should be doing. I feel guilty when I am not lecturing*" (Creed 1986). This candid statement suggests one of the great dilemmas faced by all who teach at the post-secondary level. Lecturing is virtually synonymous with teaching. It was the dominant method by which we were taught - and it is the method by which most of us teach. When discussing potential change in current *teaching-learning strategies*, many faculty become defensive, and discussions may quickly degenerate into heated debates where sides are clearly drawn. Over-exuberant advocates of *active learning* have, unfortunately, not been able to persuade many of us who have grown accustomed to traditional teaching. Better approaches in persuading traditionalists appear necessary. The challenge is to choose a suitable method at the appropriate time. Understanding the *pros and cons* of the lecture method is a helpful start.

Lectures have a number of characteristics that makes them, for the right subject matter, desirable in the classroom (Bonwell and Eison 1991). It does, to a great extent, depend on the abilities and experience of the lecturer. An able and committed lecturer can accomplish the following:

1. Relate the material proficiently and effectively, in a manner that reflects lecturer's personal conviction and grasp of the subject matter;
2. Provide students with a thoughtful, scholarly role model to emulate;
3. Supplement the subject matter with current developments not yet published, or interject lecturer's own views derived from his/her own experience whenever applicable;
4. Organize material in ways to meet the particular needs of a given audience;
5. Efficiently deliver large amounts of information, when the need arises, without confusing his/her audience;
6. Underscore key points, simplify complexities, and illustrate with facts and figures, and arrive at conclusions.

The effectiveness of the lecture varies inversely with the difficulty of the material presented, and listeners retain factual material better when presented in short sentences rather than in long sentences. Speaking extemporaneously is more effective than reading from lecture notes, and it is desirable to change the pitch, intensity, and timbre of one's voice (Verner and Dickinson 1967). These characteristics presume that the lecturer is an enthusiastic and knowledgeable scholar. But, we realize that most campuses have a few that fit this description, and can be labeled as gifted practitioners who could keep most students interested during the formal 50- minute lecture. Even if it is assumed that most engineering lecturers possess these necessary characteristics, research has shown that *the exclusive use of the lecture in the classroom constrains students' learning.*

For those instructors who would like to go beyond the traditional methods of lecturing, a number of effective strategies, promoting *active learning*, are available to choose from. If a faculty member is hesitant about selecting one or more of these *active learning strategies*, because some questions exist about its comparative effectiveness with the lecture method, he or she should consider the following: *research has shown, beyond the shadow of doubt, that these strategies do deliver content as well as lectures while providing diverse presentations that enhances students' motivation and achievement, and helps in building up desirable personal traits.*

### **Promoting Student Engagement Using Cooperative Learning Structure**

As noted earlier, relying solely on the traditional lecture approach, no matter how competent the lecturer is, fails to *engage students in learning*, thus indirectly deprives students of learning experiences and opportunities that could only materialize utilizing *engagement strategies*.

Under the umbrella of *engagement strategies*, there are numerous models available to select from, including the models predicated on cooperation - working together to accomplish shared goals. Within *cooperative* strategies individuals seek outcomes that are beneficial to themselves and beneficial to all group members within the class (Smith et al 1981; Johnson et al 1991). The work by Johnson, Johnson, and Smith (1991) indicates that students exhibit a higher level of individual achievement, develop positive interpersonal relationships, and achieve greater levels of academic self-esteem, when participating in a successful *cooperative learning* environment.

*Cooperative learning* practitioners have shown that positive peer relations are essential to success in college. The positive interpersonal relationships promoted through *cooperative learning* are regarded by most as crucial to today's learning communities. They increase the quality of social adjustment to college life, reduce uncertainties about attending college, and increase integration into college life. Isolation and alienation, on the other hand, often lead to

failure. Two reasons for dropping out are: failure to establish a social network of classmates and failure to become academically involved in classes (Silberman 1996; Prince 2004).

*Cooperation* is more than being physically near other students. It is actually a state of mind. A willingness to open up to others, exchange information and views with others, and accept the fact that working together is more beneficial to all involved in the exercise. For a *cooperative learning* experience to be successful, it is imperative that the following be integrated into the class activity (Lowman 1980; McLeod 1996; Prince 2004):

- Positive Interdependence- Students should perceive that they need each other to complete the planned activity.
- Face to Face Interaction- Students should work together in planning, executing, and arriving at conclusions. They should share the work load, and share the credit. Thus promoting each others' learning.
- Accountability- Each student's role and performance is to be assessed, and the results are those of the group (and for the group). Keeping track of the contribution and knowledge gained by each member could be monitored, as well, by either testing each and every student in the group, or by randomly selecting a group member (or members) to be tested, and thus proxy for the group.
- Sharing known skills- Students who possess certain knowledge or skills (examples: computer skills, laboratory skills, data reduction skills, presentation skills) should be willing to pass it on, and/or share it with their group members.
- Collaborative Skills- Groups cannot function effectively if members do not have (be willing to learn) or use some needed social skills. These skills include leadership, decision making, trust building, and conflict management.
- Monitoring Progress- Groups need to discuss amongst themselves whether they are achieving their set goals; also, need to prioritize the scheduled activities, introduce changes if need be, solicit advice and assistance with the consent of the instructor, and maintain effective working relationships among the members.

Success in implementing *cooperative learning* is attributable, in large measure, to: proper planning, efforts, dedication, and foresight of the instructor. Experience definitely is a major factor. A proper start for instructors wanting to try *active learning* for the first time (including *cooperative learning*) is to step into it gradually, and to seek continuous feedback as to how the course is going and how the students feel about it. In addition, he/she can tap into documented sources, attend seminars/workshops on the subject matter, and discuss planned activities for his/her course with experienced colleagues who can offer constructive comments and advise.

### **Barriers to Change in the Classroom**

To address adequately why most faculty have not embraced recent calls for educational reform, it is necessary first to identify and understand some common barriers to instructional change that seems to apply in America and elsewhere, and have been reported on in the literature (Bonwell and Eison 1991). Most of these barriers are applicable to engineering colleges- and include:

- The powerful influence of educational tradition,
- The discomfort and anxiety that change creates,
- Faculty self-perceptions and self-definitions of roles,
- Lack of well-defined incentives; also, lack of proper guidance to embark on the change.

There are also specific obstacles associated with the use of a new format in teaching, i.e., for example, when using *pedagogies of engagement* approach:

- The potential problem/difficulty that may result from not covering adequately the assigned course content in the limited class time available;
- The increase in the amount of preparation time;
- The lack of needed resources to proceed with the new method, when applicable;
- The difficulty of using *active learning*, or any variation thereof, in large classes.

Perhaps the single greatest barrier of all is the fact that: faculty members' efforts in employing a new approach would involve risk- the **risk** that students would not participate. Additionally, faculty members may feel a loss of control, or be criticized for teaching in unorthodox ways.

Faculty universally "know" that their institution expects excellence in teaching, but relatively few campuses have critically examined and discussed explicitly how "excellence" is best achieved and assessed. Research has shown that faculty perceptions about the underpinnings associated with "superior teaching" clearly place "knowledge of the subject matter" well above all other considerations (Blackburn et al 1980). A provocative analysis of metaphors about teaching and learning in higher education describes the "Container- Dispenser model"(Pollio 1987). Knowledge is a substance, material, or source of power, instructors are containers (filled with content, material, and facts), and students are vessels (wanting to be filled up). It seems apparent that faculty whose view of teaching and learning could be represented by the "Container-Dispenser model" would be especially concerned about covering content.

**A. The feedback circle in the classroom:** Faculty and students share many expectations regarding the proper role that each plays in teaching and learning- those perceptions having been formed in traditional classroom settings. For example, many faculty members are very specific about how they learned to teach - "modeling" themselves based on their own experiences from their student days. Most can not point to a powerful role model in their past who consistently and skillfully used *pedagogies of engagement* in the classroom. For this reason, if no other, it is not surprising that faculty seldom use strategies promoting engagement practices.

Students' resistance is another element of the feedback circle. Some students will always resist the use of *pedagogies of engagement* because of their contrast to the more familiar passive listening role to which they have become accustomed. Listening to faculty talk is not only familiar to students; it is also a considerably easier one! Often, and as noted in the literature, students do communicate their displeasure with nontraditional instructional approaches, which in turn encourages the use of more traditional teaching methods (Bonwell and Eison 1991). Students' maturity, academic growth and intellectual development play a major part in their response to unfamiliar and novel teaching and learning strategies. The work by Perry (1968) suggests that "dualistic learners" want structured lectures in which faculty describe clearly and precisely what they need to know. Such students expect the instructor to maintain control over the class and to simply present the facts. They believe that a student's role is to pay attention, to take notes, and to memorize the material presented. "Dualists" typically find class discussions confusing and a "waste of time." Chances are that only in a later stage of intellectual development- the relativism period- students begin to assume responsibility for their own learning, view class participation as an exciting opportunity to exchange differing perspectives, and become willing to participate and critique each other. What would it take to entice students

to become active participants at an early stage? Undoubtedly, pre-college exposure to *pedagogies of engagement* – if at all possible – would lighten the burden on faculty and students in adopting and implementing *active learning pedagogies* in college.

**B. Feelings of discomfort, anxiety and indecisiveness:** Experiencing some degree of anxiety in response to one's initial attempts to try something new is probably a universal trait. So it is when faculty consider trying new and different ways of teaching. Faculty resistance to change in their classroom practices is the norm. Professors tend to be conservative, favoring old, tried-out methods and viewing innovations of any kind with considerable apprehension. Little evidence exists today to suggest that the picture has changed much in recent years. For many faculty, things are the way they are because that is the way they have always been; further, most find the majority of traditional teaching practices more comfortable than not (Bonwell and Eison 1991).

**C. The self-definition of roles:** Expectations about faculty members' roles and responsibilities are often categorized under three areas: *teaching*, *research*, and *service*. Though institutional settings, climates, and prevailing practices naturally tend to vary; currently, on many campuses considerable tension exists with regard to the relative importance that should be placed on each. "The language of the academy is revealing: professors speak of teaching *loads* and research *opportunities*, never the reverse" (Bonwell and Eison 1991). The greatest paradox of academic work today is that most of the faculty teach most of the time, but, unfortunately teaching is not the activity most rewarded by nor most valued by the system at large. These three categories do provide faculty members with the universally recognized cornerstones for personal self-definition; and the same three create inherently conflicting pressures for faculty members' attention, time, and energy. To the extent that campuses provide greater recognition and rewards for research and research grants over teaching, the likelihood of faculty members' seriously and significantly making efforts to improve instruction is reduced. Administrators – at department/college/ or institutional level - have always praised good teaching but rewarded research! Even professors themselves do the one (*teaching*) but acclaim the other (*research*).

**D. The lack of incentives to change:** Faculty members see few incentives to change, for several common reasons. *First and foremost*, is the pervasive belief that "we are all reasonably good teachers?" *Second*, there is a very limited financial incentive, if any, to devote time and effort acquiring alternatives to traditional approaches of classroom teaching. *Third*, the perception shared by most faculty that time and effort spent pursuing research and research money, is more rewarding, from an institution point of view, than time spent improving one's teaching skills. *Further*, the personal costs of trying new innovations are often high, and innovations are acts of faith requiring that one believes that they will ultimately bear fruit and be worth the personal investment, often without the hope of immediate return. Given that most faculty view themselves as above average, and that change can involve high personal costs, faculty members who attempt alternatives to traditional approaches are relatively few. Therefore, little reason exists to try new approaches, particularly when one's self-perception is: He/she is an above average teacher.

### Looking Forward?

A root question: What is an engineering education for? – should be on the table for an evolutionary debate, referring, in particular, to the future of engineering education. What engineering students need to learn, and *how* can they best learn it, as well as *how* can engineering schools best teach it? The "**H**ow" is at the crux. Changing the *status quo* is never

easy, but time has come for colleges to turn a “new leaf” and begin moving in the direction of *active learning strategies*, in general, and *cooperative learning* environment in particular.

The author is convinced that unless, and until, the institution requires it, i.e., makes it “mandatory”, academics will continue to pursue their present course. While paying lip service to “teaching excellence,” most institutions do not provide clear and visible support and/or rewards for innovative teaching. Therefore, institutions have implicitly endorsed the *status quo* of “traditional” classroom instruction. The author believes that in addition to mandating the “change”, an effort should be made to create a climate for improvement in classroom instruction by changing the social and cultural norms that have prevailed for decades. Such an effort should permeate throughout the academic arena, re-defining the role of teaching faculty, underscoring the fact that learning is a consequence of students’ engagement with the subject matter, and emphasizing that the simultaneous presence of interdependence and accountability are essential to learning. The specifics of such an effort ought to include the following:

- i) *Rid classroom teaching environment from prevailing passive approaches to learning, and plant the seeds for active learning protocols throughout the public education system.* Propagate the idea that: Student-teacher interactions are a “piori” to stimulate learning at all levels.
- ii) *Provide the manpower and support necessary to “in-house” education units and/or centers that define, promote, and encourage the art of appropriate teaching, including active learning protocols.* Scholarly research about teaching, should be encouraged, valued, and discussed.
- iii) *Provide instructors with clear and consistent communications about expectations regarding teaching.* Faculty become frustrated and confused when told that teaching plays a vital institutional role, but to find out that rewards are for research. Effective teaching should also be rewarded, and poor teaching needs to be remediated through training and development programs.
- iv) *Encourage instructors, when using alternative instructional strategies, to meet the needs of students’ learning styles.* Students’ learning styles are inherently different (Dunn 1990).
- v) *Target new instructors, in particular, and help them to make the transition from traditional methods to active learning strategies.* Young faculty must feel that it is all right to try a new strategy, even if the first trial is less than satisfactory.

Some institutions have lately attempted to meet some of the noted objectives by relying exclusively on teaching awards. This modest approach has not worked! More effective initiatives are needed to infuse a commitment to proper teaching and *active learning strategies* throughout the system. The real key to establishing a supportive environment for innovative teaching is to create a university-wide administrative structure that promotes, rewards, monitors, and publicizes excellence in the classroom. If and when such a structure is established, its prime mission would be to approach the different departments, and groups within the university hierarchy- seeking ideas, plans, scenarios, to translate the “mandated” change into reality. Common questions that are likely to come up include: How to get started? What steps should be taken to **move forward**? Who should initiate the process? What guarantees its success?

Invariably, different scenarios may be arrived at, and faculty members who have had some prior experience, and/or have the self-confidence in deploying *engagement practices* should be given the opportunity to lead in this effort. However, leaving change up to individual faculty members without a supportive culture that values effective teaching/learning pedagogies for classroom reformation and educational development, doesn’t work. Piecemeal efforts- an initiative here or a success story there - could result in pockets of improvements but will not change the *status quo*



as a whole. What is necessary, from author's perspective, to plant the seeds and sustain the "change", is for the university (i.e., the department, the college, the group) to arrive at a comprehensive and integrated set of components: clearly articulated expectations, a reward system aligned with these expectations, and opportunities for faculty to acquire new pedagogies.

### **Concluding Remarks**

To keep pace with fast changing global marketplace, engineering education has to undergo major "reformation" including revitalization of the classroom environment. There is concern among faculty, graduates and others—*supported by feedback from faculty interviewed recently by the author* - that current teaching practices (traditional teaching) have adversely affected outcome.

The paper reviews the *pros and cons* of the traditional lecture approach, sheds light on common forms of *active learning* most relevant for engineering faculty, identifies barriers to reformation, and argues that the introduction of classroom-based pedagogies of engagement can help break the traditional lecture—dominant pattern . One way to get the students actively involved is to adopt a *cooperative learning strategy*: dig below superficial levels, learn "to learn" and not just to pass the test, get to know their classmates, and build a sense of community with them. It is important that when seniors graduate they have acquired the skills needed to work cooperatively and are able to balance personal relations and be contributing members of their communities.

This is a call for engineering faculty and program developers, to consider not only the content and topics that make up an engineering degree but also how students engage with these materials. It is also a call for the faculty to learn the new ways of teaching, and strive to develop and achieve a high level of pedagogical knowledge and competence. In the dialogue between administrators and faculty, needed to bring about the change, faculty will rightfully identify barriers including the time and resources needed to embark on the change. Also, should request authorization to experiment with new ways of teaching without risking low teaching evaluations.

With regard to implementations, author's findings assert that classroom practices today have remained, by and large, very traditional. Therefore, unless the "change" is mandated by the institution, it is highly unlikely that the classroom environment would witness any noticeable shift toward *classroom engagement practices*, any time soon. If and when the "change" is mandated, the challenge then will be: How to infuse the new pedagogies without causing disruptions or trigger some undesirable consequences? Said another way, is there an optimum balance between maintaining traditional lecture-based practices and the deployment, in part, of an *active learning pedagogy*? If so, what does the balance depend on? (Level of course? Type of course? Students' background? Instructor's abilities and skills?). Implementation of said "change" may have to be carried out in phases over time. "Change" will only be brought about through the determination of the leadership (deans, department heads, etc.), required support and resources, and faculty willingness to change their current classroom practices.

The myth expressed by some faculty that "*I am willing but they won't let me*" is a common response from faculty members to calls for reform in education. To the contrary, and as eloquently expressed by Combs (1979): "*Teachers may not be able to change the educational system, but the variations possible, within an ordinary classroom, are almost limitless.*"

## Bibliography

1. Blackburn, R.T., Pellino, G., Boberg, A., and C. O'Connell, "Are Instructional Improvement Programs Off Target ?" *Current Issues in Higher Education*, no.1, 1980, pp. 32-48.
2. Bonwell, C.C., and J.A. Eison, "Active Learning: Creating Excitement in the Classroom," *ASHE-ERIC Higher Educ. Report no.1*, George Washington University, Wash., DC, 1991.
3. Christensen, C.R., Garvin, D.A., and Sweet, A., *Education for Judgment: The Artistry of Discussion Leadership*, Cambridge, Mass.: Harvard Business School, 1991.
4. Combs, A.W., *Myths in Education: Beliefs That Hinder Progress and Their Alternatives*, Boston, Mass, Allyn & Bacon, 1979.
5. Creed, T., "Why We Lecture," Symposium: *A Saint John's Faculty J.*, no.5, 1986: pp. 17-23.
6. Dunn, R., "Understanding the Dunn and Dunn Learning Styles Model and the Need for Individual Diagnosis & Prescription," *Reading, Writing & Learning Disabilities*, vol.6, 1990.
7. Johnson, D.W., Johnson, R.T., and Smith, K.A., *Cooperative Learning: Increasing College Faculty Instructional Productivity*, ASHE-ERIC Report on Higher Education, Washington, D.C.: The George Washington Univ., 1991.
8. Lowman, J., *Mastering the Technique of Teaching*, Jossey-Bass, San Francisco, Ca. 1984.
9. Mckeachie, W., Pintrich, P., Yi- Guang, L., and Smith, D., *Teaching and Learning in the College Classroom: A Review of the Research Literature*, Ann Arbor, Mich., 1986.
10. McLeod, A., "Discovery and Facilitating Deep Learning States," *National Teaching and Learning Forum*, Vol.5, no.6, 1996, pp.1-7
11. Perry, W.G., *Forms of Intellectual and Ethical Development in the College Years*, Holt, Rhinehart & Winston, New York, 1968.
12. Pollio, H.R., "Practical Poetry: Metaphoric Thinking in Science, Art, Literature, and Nearly Everywhere Else," *Teaching -Learning Issues*, no.60: Univ.of Tennessee, Learning Research Center, Knoxville, 1987.
13. Prince, M., "Does Active Learning Work? A Review of the Research," *ASEE Journal of Engineering Education*, vol. 93, no.3, 2004, pp.223-231.
14. Silberman, M., "Active Learning: 101 Strategies to Teach Any Subject," *Temple University*, Allyn and Bacon, Needham Heights, Massachusetts, 1996.
15. Smith, K.A., Johnson, D.W., and Johnson, R.T., "Structuring Learning Goals to Meet the Goals of Engineering Education," *Engineering Education*, vol.72, no.3, 1981, pp.221-226.
16. Tinto, V., *Leaving College: Rethinking the Causes and Cures of Student Attrition*, 2<sup>nd</sup> ed., Chicago, Ill.: Univ. of Chicago Press, 1994.
17. Verner, C. and G. Dickinson, "The Lecture: An Analysis and Review of Research," *Adult Education*, no. 17, 1967, pp.85-100.

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