Toward a More Student-Centered Education:
Analyzing the Value of Participatory Development Methods in College Teaching

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Abstract
Many college educators are shifting from teacher-centered to student-centered instruction, in an effort to enhance student acquisition of problem-solving and life-long learning skills. Some strategies used are inquiry-based activities, case studies, discussions, project evaluations, and peer learning. The success of the strategies depends on many factors including preparation, design, content, class dynamics, the students, the instructor, and the setting. Participatory development methods, tools, and techniques are increasingly used in international development work to assure local and grass-roots initiation, design, implementation, evaluation, and ownership of development programs. A tacit assumption is that a participatory process is more likely to yield a successful and sustainable program, for it starts with the people’s needs, mobilizes local resources, and strengthens local capacity. Thus, participatory processes have been designed to bring out the best of each individual, facilitate exchange of ideas and collaboration, and result in a much better product than any one team member could have produced alone. The purpose of this paper is to discuss the potential of new methods and participatory development methods in supporting the shift from a teacher-centered to a student-centered learning environment in higher education. In particular, three methods are analyzed in-depth: Mind maps, problem tree diagrams (causes, effects, and solutions), and pocket charts (score matrix). In most occasions, the three methods can be used as excellent tools to 1) enhance group processes and cooperative learning, 2) promote active learning, 3) nurture multidisciplinary analysis, 4) improve student motivation, initiative, and individual work prior to class meetings, 5) promote student development of higher order thinking skills, and 6) address the needs of particular students who would typically not participate in traditionally-designed group exercises. An application example is given at the end of the paper.

Keywords: Participatory methods, student-centered education, student participation, problem tree, mind mapping
Introduction

Many college educators are shifting from teacher-centered to student-centered instruction in an effort to increase higher-order thinking and help students to acquire problem-solving and lifelong learning skills. Some strategies used by instructors to enhance student-centered learning are inquiry-based activities and laboratories, problem-solving, case studies, small group discussions, project evaluations, role playing, and peer learning. The success of these strategies depends both on institutional factors; instructor-centered factors including preparation, design, content, and setting; and on student-centered factors such as individual student participation, and class and team dynamics.

Active student participation is key for student-centered instruction. “Students learn better [not only] when their learning is active . . . [but also when it] involves talking and interacting . . . and when they have more opportunities for feedback” (Smith, 1992, p. 337). In addition, active participation of students is also “particularly important if one of the objectives of the class is to affect changes in attitudes” (Onken & Eastwood, n.d., p. 2).

Finding ways to encourage student participation is one of the recurring challenges faced by instructors seeking a more student-centered education. There are many “student” factors that influence the willingness or ability of a student to participate in class, including:

1. Student personal characteristics: Age, gender (Fritschner, 2000), maturity, skepticism, ability to work individually and in groups, leadership, communication, and interpersonal skills and styles;
2. Student background: Cultural, past educational experiences, personal experience regarding participation in class;
3. Student academic preparation: Whether or not student has the background knowledge required to keep up in the class and complete class activities;
4. Student self-perception: Self-consciousness, confidence, anxiety level, risk taking, and apprehension to ridicule (Armstrong & Boud, 1983);
5. Student attitude toward the class: Level of interest in the subject matter, reasons for taking the class, willingness to complete work needed to come prepared for class;
6. Student attitude toward other students: Respect, trust, and competitiveness);
7. Attitude toward the instructor: Trust, credibility (Myers, 2004), and perceived immediacy, homophily, interpersonal attraction, and verbal aggression of the instructor (Rocca, 2000); and
8. Situational: Course level (Fritschner, 2000), type of class, content of class, size of class, seating arrangements, class dynamics, and lack of clear systems for tracking and rewarding participation (Smith, 1992).

Nurturing collaboration among students is another challenge of college educators but invaluable to foster interdisciplinarity, higher order thinking, and holistic knowledge (Mu & Gnyawali, 2003). As James Watson (1962 Nobel Prize winner) said, “nothing new that is really interesting comes without collaboration” (Watson, as cited by Johnson, Johnson, & Smith, 1998, p. 27). According to Johnson, Johnson, and Smith (1998), there is “little doubt that cooperative learning is appropriate to higher education: it works. While it is never easy to implement, when all the critical elements are in place, it is very powerful” (p. 27). Cooperative learning is not used very often by college instructors in part because of similar reasons to the ones outlined for student participation, and in part because of its complexity for both instructors and students.
Participatory methods have proven to be invaluable tools for development agents “through the step-by-step process of assisting a community to identify its problems, find and implement appropriate solutions and to monitor and evaluate performance and results” (Harvey & Appleton, n.d., p. 3). A key feature of a participatory process is that it facilitates the connection between diverse stakeholders with the purpose of collective reflection, co-creation of knowledge, and action-oriented efforts to solve their shared problems (Rölling, 2004, p. 10). A tacit assumption is that a participatory process is more likely to yield a successful and sustainable program, for it starts with the people’s shared needs: Program stakeholders that have been involved in a participatory needs assessment and program design, for example, are more likely to “own” the program and therefore have more interest in investing in program implementation, evaluation, and continuation.

The value of participatory methods is both as an invaluable tool to achieve successful and sustainable programs, and in synergistic benefits of the participatory process itself. The process connects people, mobilizes local resources, strengthens local capacity, and empowers participants through enhanced understanding, knowledge, connections, tools, and vision. Some participatory methods used frequently are community mapping (most used as a tool to identify problems and to establish a common vision of the community), gender analysis, question boxes, story with a gap (before and after), three-pile sorting (good, bad, and in-between), problem trees (to analyze causes and effects of specific problems), solution trees, pocket charts or matrix scoring (to analyze and evaluate situations and solutions to a problem), option ladders (Harvey & Appleton, n.d., p. 21-33), and mind maps.

Participatory methods engage people with different perspectives, needs, knowledge, and opinions, in an interdisciplinary and collaborative brainstorming process. These methods seek to bring out the best of each individual, facilitate exchange of ideas and collaborative learning, enhance individual and collective knowledge and creativity, empower all participants, and result in a much better product than any one could have produced alone. These methods seem to be perfect candidates for some of the solutions sought by college teachers shifting from teacher-centered education to student-centered learning.

Purpose of the Paper
The purpose of this paper is to discuss the potential of new and participatory development methods in supporting the shift from a teacher-centered to a student-centered learning environment in higher education. In particular, three participatory methods are analyzed in-depth: Mind maps, problem tree diagrams (causes, effects, and solutions), and pocket charts (score matrix).

Philosophical Themes
Learning to use participatory processes in the college classroom
Using participatory methods will require from instructors “dual competency: the ability to manage content and process” (Christensen, 1991, p. 16), and the ability to successfully link what, whom, and how they will teach.

Learning to use participatory methods is not easy, and the first step is to develop key skills and attitudes. According to Harvey and Appleton (n.d.), for example, to create an enabling environment, facilitators of participatory methods need not only to adopt new habits, but also to “unlearn a whole range of habits” (p. 4), such as facilitating vs. telling, listening vs. talking, guiding vs. directing, probing, and stimulating (Harvey & Appleton, p. 4-8). College instructors
need also to enable and be flexible with their students, create a non-threatening environment, and help the class “evolve from a collection of individuals into a learning community with shared values and common goals” (Christensen, 1991, p. 16), a community able to foster everyone’s learning, able to co-create knowledge, and able to work toward its common goals.

One of the most difficult tasks for college professors will be to relinquish control of the classroom. Handing over to the students the control of the educational endeavor is not an easy task: It requires learning, training, and even reformatting on the part of the instructor, and also a certain ability to ignore concerns of possible institutional (and peer) barriers and challenges.

Actively participating, collaborating, and embracing control of the class may also be a complicated chore for some students who may not easily adapt to, understand, value, or welcome the change from an individual and passive presence in class to a group-oriented and active role in the process. As discussed in the introduction, there are many reasons for student lack of participation or collaborative attitude, and the instructor’s role in addressing the issues accordingly may need to vary from case to case.

Cultural background was one of the factors outlined in the introduction: It affects level of participation and collaboration of students in class activities. For example, “Western educators often complain that their Asian students do not participate in class discussions” (Nisbett, Peng, Choi, & Norenzayan, 2001, p. 304), and the fact is that “neither their culture nor their prior educational experience has prepared them for the canonical rhetoric forms that are taken for granted in the West” (Nisbett et al. 2001, p. 304). According to Nisbett et al. (2001), East Asian and American students will handle “argument, debate, and rhetoric” (p. 304) differently, with East Asians “using avoidance as a means of dealing with conflict of views [and with Americans] attempting to use persuasion” (p. 304). Another difference among students from different cultures lays in systems of cognition, mainly holistic and analytical. According to Nisbett et al. (2001), East Asian students tend to be holistic (“attending to the entire field and assigning causality to it, making relatively little use of categories and formal logic” (p. 291) “whereas Westerners are more analytic, paying attention primarily to the object and the categories to which it belongs and using rules, including formal logic” (p. 291). Also, in secondary schools, some authors have reported that “emphasis on critical thinking was associated with a magnification of gender and minority gaps” (von Secker & Lissitz, 1999, p. 1122). In these cases, it is the role of the instructor to appropriately explain the process, the game, and the “rules of the game” to all involved. It is the challenge of both the instructor and the students to succeed in creating an inclusive class culture, where the community works together, all systems of thought are valid and useful, and everyone can learn and grow.

Personality and learning styles are other reasons that may hinder participation of students that are quiet or reflective. Useful practices to encourage these students to participate in class are small groups to help quiet students open up, and pre-class assignments to help reflective students prepare for participation. Again, it is the role of the instructor to embed these practices in the teaching and learning processes.

Another detail that may determine whether or not a student participates in class or actively engages in participatory and collaborative learning processes is how well the student is prepared (or perceives him/herself to be prepared) to be successful in the endeavor. In the same manner that the facilitator needs to provide appropriate information and tools for every stakeholder in participatory processes to be an equal participant, the instructor needs to provide students with enough information and tools to board the train while it is still not going too fast.
Many instructors assign readings (both individualized and to the whole class) and ask for reflective pieces from students and small groups prior to coming to class. Strategies for classroom cooperation. There are many strategies that instructors can use for effective cooperative learning in higher education. Figure 1 illustrates the elements presented by Johnson, Johnson, & Smith (1998) as critical to cooperation, and explains what they mean from a practical standpoint for classroom instructors.

**Figure 1.** Elements presented by Johnson, Johnson, and Smith (1998) as critical to cooperation, and explanation of what they mean from a practical standpoint for classroom instructors.

Similarly, Mu and Gnyawali (2003) indicated that to improve cooperative learning processes, instructors should emphasize, reiterate, and help students reflect about the importance of “synergistic knowledge development” (SKD) (p. 707) (how it can help students use higher order thinking skills and effectively solve problems), help students identify and use mechanisms for enhancing SKD, and monitor groups, facilitate interaction, address conflict (if necessary), and provide feedback (Mu & Gnyawali, 2003)

**Mind maps**

“Developed by Tony Buzan in 1970, mind mapping is a revolutionary system for capturing ideas and insights horizontally on a sheet of paper” (Mento, Martinelli, & Jones, 1999, p. 1). It is not a method used per se in participatory development, but shares many characteristics with common participatory development methods. A mind map is a graphic organizer that can use both words and images. It always has a central idea or theme and then branches into secondary categories, from which, in turn, lesser categories bifurcate. Mind maps can be fairly rudimentary, such as Figure 1 of this paper, or quite elaborated, such as the ones proposed by Budd (2004):

In a Mind Map, the hierarchies and associations flow out from a central image in a free-flowing, yet organized and coherent, manner. Major topics or categories associated with the central topic are captured in branches flowing from the central image. Lesser items within each category stem from the relevant branches…. The central point in the Mind Map must always be an image…. Moreover, the use of images in the entire Mind Map is
recommended. Similarly, differences in the size of the branches and the associated words are used to reinforce associations and to add emphasis. The other difference to highlight is the use of color.... In particular, Mind Maps use one color for each major category to aid in organization. (p. 36-37)

For examples of fairly elaborated Mind Maps, the author recommends Mento, Martinelli, and Jones (1999), and Budd (2004).

The following are some of the contributions that mind maps can make toward an improved education process:

1. Foster participation of all students and support teaching that is responsive to a diversity of learning styles (Budd, 2004; Mento, Martinelli, & Jones, 1999): To contribute to the construction of a mind map, a student does not necessarily need to verbalize and explain in-depth his/her ideas. Sometimes, a word can be enough. The ability to communicate an idea in such a simple manner will encourage shy, quiet, and reflective students to be participants in the process, especially if they can add their branches or stems at any time. Visual learners also notably benefit from the tool;

2. Nurture analytical depth and breadth: In constructing a mind map, many branches and types of branches are possible: In-depth analysis of an idea will result in multiple stems off a main branch, while breadth of the analysis will be apparent through the number of main branches flowing from the central image. Variety of ideas and contributions from students of several disciplines will prove to be valuable to expand and improve the mind map;

3. Facilitate interdisciplinary teaching and learning: “The nature of Mind Maps can facilitate richer and broader associations” (Budd, 2004, p. 41). Students will see the associations between concepts and ideas, which will help them relate their contributions or ideas to those of others;

4. Channel holistic and global thinking: ‘Visual presentation of ideas helps one think about a subject in a global, holistic sense and increases flexibility. On a Mind Map structures of the subject can be seen in a way that it is not possible with linear outlines” (Mento, Martinelli, & Jones, 1999, p. 391). This is particularly helpful in including in the learning process both holistic thinkers (Nisbett et al. 2001) and global learners (Felder, 2006);

5. Help students “gather, interpret, and communicate large quantities of complex information” (Mento, Martinelli, & Jones, 1999, p. 391);

6. Nurture individual and team work: While students may work individually to gather and interpret information relative to their disciplines, the mind map can only be complete through the participation of all members of the team (demonstrate positive interdependence) (Johnson, Johnson, & Smith, 1998);

7. Promote active learning: “Students are engaged in active learning as they wrestle with ideas, associations, and categories in creating a Mind Map – they are creating their own Mind Map, not simply looking at one created by the instructor” (Budd, 2004, p. 42).

**Problem tree diagrams (causes, effects, and solutions)**
“The problem tree is a visual problem-analysis tool that can be effectively used . . . to specify and investigate the causes and effects of a problem and to highlight the relationships between them” (Anyaegebunam, Mefalopulos, & Moetsabi, 2004, p. 23). In this visual representation, the
tree roots are a net of causes of the problem, and each cause can be analyzed as a problem in itself. The trunk is the main problem studied, and the branches and leaves are the consequences of the problem. The problem tree is then used as the basis for discussion to analyze and prioritize causes of a critical problem, and to work to formulate solutions.

In trying to construct a problem tree, individuals easily understand the value of building the tree in cooperation with others, and the power of positive interdependence of members of a team (Johnson, Johnson, & Smith, 1998). Further, cooperatively constructing a problem tree helps participants realize the wide variety of causes affecting the problem under study, causes that are revealed only thanks to the integration of ideas from people from many different disciplines, perspectives, and interests. In addition, working individually on the trees first and then working with the rest of team members can be very valuable for individual students because the exercise can help them identify areas of weakness (Garforth, 2001).

The graphic nature of the tool helps participants visualize relationships between ideas, and discuss whether a proposed solution will address causes or effects of the problem, as well as to evaluate the long term effect and sustainability of each proposed solution.

The contributions of problem trees to education are similar to those of mind maps. Particular traits of problem trees are that they:

1. Demonstrate the power of positive interdependence of members of a team (Johnson, Johnson, & Smith, 1998) and enhance communication among team members;
2. Contribute to further developing interdisciplinary skills and foster global and holistic perspectives and thinking;
3. Promote student development of higher order thinking skills because they help ask WHY? (Anyaeegbunam, Mefalopulos, & Moetsabi, 2004, p. 23);
4. Engage students and promote active learning (students are building their own trees, not studying the analysis made by the professor) (Budd, 2004);
5. Foster participation of all students and support teaching that is responsive to a diversity of learning styles (Budd, 2004; Mento, Martinelli, & Jones, 1999).

Pocket charts (score matrix)

With the problem trees, the prioritization of focal problems and key solutions was a very difficult task. “A good way to prioritising root-problems is to . . . rank and score them” (Anyaeegbunam, Mefalopulos, & Moetsabi, 2004, p. 26), which can be done with a score matrix (also called pocket chart or matrix scoring).

According to the International Fund for Agricultural Development [IFAD] (2002), the purpose of a score matrix is “to make a relative comparison between different options of a specific issue or solutions to a problem, and to make a detailed analysis of how much and why people prefer one option above the other” (p. D-44). This method is particularly useful for team members to understand how other team members assess, analyze, and evaluate the different proposed solutions.

To build a score matrix, the team needs to decide what is being compared (e.g., solutions to a problem). Then, the facilitator will write what is being compared as the title to each of the columns of a table. Next, the team “discusses the advantages and disadvantages of each item/solution/issue to generate the criteria that will be used to compare each of the options” (IFAD, 2002, p. D-44). Each of these criteria will then be written as the title of the rows of the
table. Once the table has been built, participants will discuss and justify preferred options, and will work as a team to reach consensus on the scoring of the table.

“Besides the resulting matrix, one of the greatest values of this method comes from the discussions that are provoked as participants come to a decision about the final score of each option. . . . In the discussion, the reasons for preferences and rejection of options emerge” (IFAD, 2002, p. D-45).

The main contribution of the score matrix to student-centered education is in the process itself, for it is an excellent tool for team-building exercises, as well as for promoting student reflection, use of higher order thinking skills, and active participation in the learning process.

**Conclusions, Educational Importance, and Implications**

Participatory development methods can be excellent tools to help enhance student-centered learning in college teaching if they are carefully planned and appropriately adapted to the specific teaching environment (including institution, content, students, and instructor characteristics).

The three methods presented in detail in this paper – mind maps, problem tree diagrams, and score matrix – are tools that can help college instructors to:

1. Enhance group processes, improve the depth and breath of student contributions to group work, increase student interactivity, and foster cooperative learning (Johnson, Johnson, & Smith, 1998);
2. Promote active learning, improve class activities by increasing number of students participating and quality of participations (Budd, 2004);
3. Guide the students through multidisciplinary analysis, interdisciplinary work, and expand global and holistic viewpoints of students (Budd, 2004; Mento, Martinelli, & Jones, 1999);
4. Promote student development of higher order thinking skills (Anyaegbunam, Mefalopulos, & Moetsabi, 2004, p. 23);
5. Expand individual student motivation, involvement with class content, initiative, and inquiry;
6. Encourage and enhance student individual work (research, readings, reflection) prior to class meetings; increase student preparedness;
7. Encourage student participation in large group activities; and
8. Be responsive to a diversity of learning styles (Budd, 2004; Mento, Martinelli, & Jones, 1999) and address the needs of particular students who would typically not participate in traditionally-designed group exercises (i.e., students from different cultures, quiet and shy students, reflective learners, and global – rather than sequential – learners (Felder, 2006)).

College teachers should consider using these tools to enhance their efforts to improve student-centered education, student participation, and student learning. To continue advancing and improving our methods, further research is needed to assess the effect (or lack thereof) that the use of participatory development methods in college teaching may have in improving student achievement.
Application
The following is an example of a class project, “Climate change and food insecurity,” that uses the three methods described in this paper: Mind maps, problem trees, and score matrix. This class project was first developed by the author as a group project for a class on “International agricultural development.” The project is now being refined to be included as an activity for the study/action packet materials of the 2007 World Food Day Teleconference (Navarro, 2007), with no limitations regarding reproduction and distribution.

Description of group project
The goal of this class project is to guide students through a learning process in which they will do the following:

- Build a case study of a community and investigate vulnerability to climate change (exposure, sensitivity, and resilience) (Dow, 2005);
- Analyze root causes of vulnerability to climate change;
- Evaluate adaptive strategies to climate change;
- Prepare a policy paper to help guide the planning and implementation of successful adaptive strategies in a specific community.

Building the case study
Climate change poses a serious challenge to social and economic development. Developing countries are particularly vulnerable because their economies are generally more dependent on climate-sensitive natural resources, and because they are less able to cope with the impacts of climate change. (Organization for Economic Co-Operation and Development, 2006, p. 1)

The students will develop a class-wide case study of a community vulnerable to climate change (hereafter referred to as Community C). To start the brainstorming process to decide what characteristics of the community need to be studied and defined (e.g., location and accessibility, human development and food security conditions, exposure to and risks associated to natural hazards, etc.), students will be asked to first make individual suggestions on note-cards, then discuss their contributions in small groups, and finally report to the class to generate further discussion. All contributions will be captured in a mind map (Mento, Martinelli, & Jones, 1999) drafted by a student facilitator during class time, and supplemented by others as new suggestions arise. Students will then complete in small groups the research outlined in the mind map and will meet again as a group to agree upon a common narrative to describe Community C.

Useful references to complete this activity: Mind mapping in executive education: Applications and outcomes (Mento, Martinelli, & Jones, 1999); Natural disaster hotspots: Case studies (Arnold, Chen, Deichmann, Dilley, Lerner-Lam, Pullen, & Trohanis, 2006); Natural disaster hotspots: A global risk analysis. Synthesis report (Dilley, Chen, Deichmann, Lerner-Lam & Arnold, 2005); World disasters reports (International Federation of Red Cross and Red Crescent Societies [IFRCRCS], 2006); EM-DAT: The international disaster database (Center for Research on the Epidemiology of Disasters [CRED], 2006); Human development reports (UNDP, 2006)
Analyzing root causes of vulnerability
There is a reciprocal relationship between vulnerability to natural disasters and poverty, food insecurity, and deprivation (Kartha, Bhandari, van Schaik, Cornland, & Kjellén, 2006). IFRCRCS (2006) illustrates this relationship well when analyzing the effects of the rains that followed Hurricane Stan in Guatemala:

- Indigenous people living in extreme poverty were hardest hit. This tragedy exposed the risky conditions in which millions of Guatemalans live today and the complexity of factors that make people vulnerable to disaster, including: political instability, violent crime, discrimination, social exclusion, environmental degradation and migration of workers to the United States. (p. 1)

To further unravel the association between vulnerability to natural disasters and poverty, the students will work alone and create a problem tree revealing the causes of the vulnerability of Community C to natural disasters (illustrated as the “roots” of the problem tree), and the short and long term effects of natural disasters on the community (illustrated as the branches of the problem tree).

Useful references to complete this activity:

Creating strategies for communities to adapt to natural hazards
“The best way to avoid future food crises . . . is to help governments invest in sustainable agriculture and rural livelihoods. Otherwise the cycle of recurrent hunger and short-term response will continue” (IFRCRCS, 2006).

After completing the individual problem trees analyzing causes and effects of vulnerability of Community C to natural disasters, the students will get into groups of 4-6 students to compare and discuss their problem trees. Together, they will prepare a list of strategies that could help enhance adaptive capacity of Community C. The students will then evaluate the strategies by composing a class-wide pocket chart (score matrix), that will be used as a central document to prepare a common policy paper to help guide the planning and implementation of successful adaptive strategies for their chosen case-study.

Useful references to complete this activity:
- Score matrix (IFAD, 2002), and the report Poverty and climate change: Reducing the vulnerability of the poor through adaptation (Poverty-Environment Partnership, 2003) that analyzes several case studies and indicates that sustainable livelihoods, equitable growth, and governance, were all necessary foci to enhance adaptive capacity of communities (IFAD, 2002).

References


