# Participatory Learning Approach: An Overview

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## MOTIVATION AND DESCRIPTION

The Participatory Learning Approach (PLA, pronounced "play") engages students as active participants in the full life cycle of homework, projects and examination. PLA's core idea is that students design the questions or projects, execute them, and then assess and grade their peers' solutions. Each stage can be performed by individuals or by teams. Students should be able to observe (read) everything their peers do so they can learn further from others' efforts.

PLA is designed to work for a wide range of students from junior high though graduate and professional schools, as well as for training and adult learning.

PLA has the following major objectives.

- To increase learning of course materials (primarily) and assessment skills (secondarily).
- To provide and evaluate a systematic, collaborative approach to homework assignments, projects and examinations, focusing on active participation and peer evaluation.
- To develop accompanying software that maximizes student learning, facilitates collaboration, and minimizes student and instructor overhead in conducting PLA.

To date we have pioneered and refined the PLA for five semesters with essay-question exams in a graduate-level information systems course, with both distance learning and traditional sections, and in an undergraduate programming class with short essay questions. Experimental results show that a large majority of students believed that their learning had increased through the PLA process, recommended its use in future courses, and actually reported enjoying the exam process.

PLA embodies the following systematic process. The following description assumes that students work individually on each stage. Alternatively, collaborative groups could perform the task at any stage, which would further enhance learning.

Software supporting PLA could streamline the process for both students and instructors, reducing reducing "cognitive" and administrative overload. Software to fully implement PLA is currently under development at the New Jersey Institute of Technology. In the meanwhile, classes could utilize learning management systems such as BlackBoard, WebBoard and WebCT to post entries in a threaded manner (so that description, solution and grades are grouped together for each problem). Instructors optionally may permit all entries to be posted anonymously, allocating an ID to each problem and telling students the ID of the problem they should work on.

The following description assumes the use of supportive software. Students should be able to read everything peers post on-line, which is an important learning component. Figure 1 illustrates the PLA process.

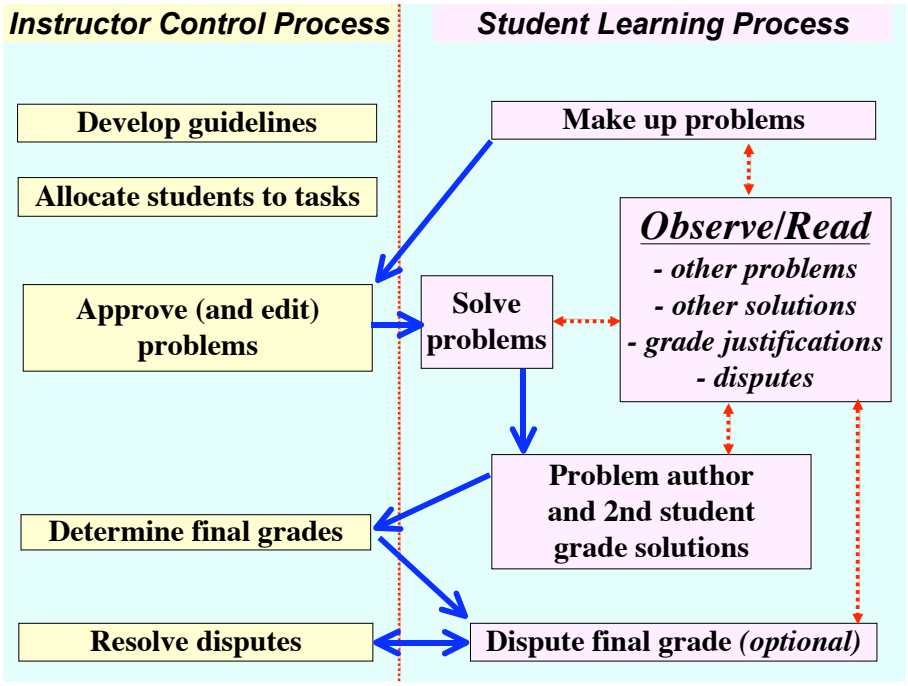


Figure 1: Instructor and student processes within PLA. Solid arrows show the process flow. Dashed arrows emphasize that students also learn by observing everything their peers do. The PLA support software will guide students and instructors, as well as assist with administration, such as allocating students to PLA tasks and emailing anyone late.

- Each student designs a problem, using guidelines provided by the instructor. Students post the problem description on-line.
- The instructor approves the problem description, editing it if necessary.
- Each problem is allocated to a different student who will solve it.
- Each student posts his or her solution on-line.
- Students grade the solution to the problem they authored, using guidelines provided by the instructor. Students may be required to grade along several different criteria. They must provide a written justification of at least two sentences for each evaluation criterion. *Justifications, a detailed written critique—positive or negative—are a vital aspect of learning how to assess.*
- Students are allocated a second solution to evaluate, providing each solution with a second opinion.
- Instructors assign a final grade to each solution, using the two student evaluations as input. If the two student grades are close enough (e.g., within 10 out of 100 points), to conserve time the instructor optionally may choose to accept the higher grade without re-evaluating the solution.
- Students optionally may dispute their grade, in which case they must re-grade their own solution using the same evaluation guidelines. *Disputes are an especially important feature. They help ensure the fairness of the PLA approach, especially when instructors do not have time to carefully review each answer and evaluation. If a student believes the*

*peer (or instructor) evaluations were incorrect a dispute will ensure that the instructor focuses adequate attention to this specific problem.*

- The instructor determines the final grade for the disputed solution.

## Opportunities for Learning

PLA incorporates several opportunities for learning, in designing problems, answering them, grading them, disputing results, and in observing/reading what everyone else does.

PLA forces students to view a subject from several new vantage points. Designing problems challenges students to analyze course materials in order to determine the most important aspects for critically assessing understanding of a subject by their peers. Evaluating solutions and arbitrating disputes challenge students to assess how fully a set of materials (the solution) fits their understanding of the field as well as the problem posed. Often solutions will be quite different from how the evaluator views the problem, forcing a rethinking of the material.

Finally, students learn from reading what their peers have written—problems, solutions, grading justifications and disputes. Students read their peers' work out of curiosity, for new ideas, and for comparison to their own work.

## Extending the Basic PLA Process

PLA can be extended in several ways from this basic model.

- Collaboration: Groups of students could work together to create problems, solve problems, evaluate, arbitrate disputes, and assign final grades.
- Multiple Problems: Students could design and solve more than one problem within a single assignment (homework, project, quiz or exam), and thus be involved in various roles for different problems under the same assignment.
- Sub-problems: Problems could be designed to contain several sub-problems. Each could be conducted in tandem or sequentially when the prior part was complete. Each sub-problem would be assessed separately. For sequential sub-problems, students would not start solving the next sub-problem until the prior one passed assessment.

  An example of two sequential sub-problems could be (i) the design of a large computer system, followed by (ii) its implementation and testing. The instructor may want the class to use PLA to assess the design before students move on to the implementation. Similarly, the instructor may break a semester project into an extended outline and its completion, and use PLA to evaluate the outline before students complete it.

  For complex problems, the individual or group designing the problem may wait with designing a subsequent sub-problem until its prior sub-problem has been completed.
- Multiple Evaluation Opinions: The PLA model supports any number of evaluations for each problem, instead of always two.
- Separating Evaluation from Grading: For larger projects and in cases where instructors may wish to limit potential bias, PLA will support separating the assessment of the solution from its grade. One evaluator would write up a detailed evaluation. A second evaluator would assign a grade based on the evaluation. The instructor should separate evaluation instructions from grading instructions.

- Evaluating Other PLA Activities: In addition to evaluating solutions, the PLA model supports evaluating (grading) other PLA activities, such as grading problem statements, dispute arbitration, and even other evaluations, and when separated from the other evaluations, grades. This could motivate students to take these other aspects more seriously and learn more deeply from them. Such additional evaluations could also be disputed and arbitrated.
- Activity Rejection: Evaluation could be used to reject any activity (problem statement, sub-problem solution, etc.) that is so poor that the process cannot continue effectively with it. In this case the activity could be redone and re-evaluated, or the evaluator or instructor would provide a substitute, and the PLA process would continue. For example, when evaluating a semester project outline (a solution to the first semester project sub-problem), the evaluators could determine it not strong enough and reject it. In this case the group that created the semester project outline would have to redo it, hopefully benefiting from the evaluation justification.

## 6. ISSUES

Many interesting issues arise when embedding peer assessment within learning activities. Pragmatic concerns also arise when coordinating a new teaching approach.

Students have concerns when working with the PLA. They often believe it is the instructor's job to evaluate students. They feel unqualified to evaluate their peers, and indeed they often have no practice within an academic setting. Furthermore, when everyone in the class is responsible for evaluating a few questions, quality can be quite inconsistent. For all these reasons, there sometimes is a *perception* that the PLA is inherently unfair. Therefore it is critically important to explain to students that they indeed are qualified to assess concepts and people, and that they will often do this in the workplace.

Equally important is assessment training and repeated experience. Assessment is a skill that must be learned. Training, experience and excellent guidelines should improve inconstancy in grading, and the ability to grade in groups should also help. One can also build assessment training into the PLA support software.

Instructors can incorporate inquiry-based methods within PLA to better guide students in developing problems, solutions and evaluations. For example, this could lead students in appropriate ways to find and analyze information when solving specific kinds of problems.

Instructors can involve students in planning assignments. Several possible activities could get students to start thinking about developing problem statements, including developing a common concept map of the domain, creative brainstorming, etc. Students also could be involved in designing the assessment criteria.

Students often are concerned about the lack of privacy when the process is not anonymous. Pressure to award positive evaluations to peers is offset by the desire for integrity when evaluations are entirely visible. Anonymity most likely is not practical in smaller classes when multiple sections cannot be combined for PLA activities.

Cheating is always an issue with on-line systems. Instructors should take advantage of anti-plagiarism services that are becoming available. Answers cannot generally be copied from classmates because each student (or collaborative group) makes up different problems. However, the danger always persists that students will find someone else to do their work.

A practical issue concerns the amount of time the PLA takes. When instructors make up questions and then grade, students generally do the assignment and receive results quickly. The PLA process can take up to 2-3 weeks for classes meeting once a week and where part-time students might only allocate one day a week to homework. Instructors may need to engineer their classes so multiple PLA processes at different stages are underway at the same time (grading, answering questions, formulating new problems—each from a different topic in the course). This actually builds in opportunities for reinforcement and synthesis as students work on materials from several topics at the same time.

A fascinating challenge for enhancing both quality and fairness will be to structure ways for students to dispute a grade if they feel it is too high. Doing so would be instructive for the disputing student, who would have to justify why his or her work was overrated, for the evaluator who potentially overrated, and the dispute arbitrator. One approach would be to award bonus points greater than the grade were the dispute successful. The graders could optionally lose points for grading poorly.

The right to dispute evaluations acts as a safety net for many fairness issues. Disputes can rectify most cases where students feel something has gone wrong, and instructors should take them seriously. The PLA model supports involving students in collaborative dispute arbitration, adding an additional level of learning to the process.

## SUMMARY

PLA embodies a student-centered learning approach that trains students to assess and builds the self-assurance to assess confidently. Such evaluation is a valuable, lifelong, everyday skill that incorporates critical thinking and analysis. In the classroom, the active participation and collaboration of the PLA process results in deeper learning as well as increased awareness of, and interest in, the issues surrounding topics covered in class. PLA's success comes from the increased control students have over the process, the flexibility in the process (that it takes place over a period of time), and that students learn in so many ways. PLA fosters more knowledge-able students, confident and skilled in collaboration and subject-, self- and peer-assessment.

## ACKNOWLEDGMENTS

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