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Teaching with GSS: Techniques for Enabling Student Participation

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Abstract

Learning requires cognitive effort and two way communication. In the classroom setting, it is difficult to give every student a significant amount of time to participate. Group support systems (GSS) have been shown to make meetings more effective (Nunamaker, Dennis, Valacich, Vogel and George 1991). If the classroom is viewed as a "meeting" where the students are called upon to contribute, GSS can bring the same benefits to the classroom. This paper first describes our goals for improving classroom learning and then describes our experiences and techniques to help others apply them to their classroom situation. The techniques described are domain independent. They apply to any subject area and almost every level of education.

Learning Goals

Early behaviorist researchers defined learning as a change in behavior. For example, Thorndike was concerned with "the fundamental facts of learning whereby a situation which first evokes response A later evokes response B, different from A" (Thorndike 1932, page 1). Our goal follows from this and is to influence students to respond more appropriately to certain problem situations than they would have before their education. We call this goal "authentic productivity."

Research on how to change behavior requires feedback (Thorndike 1932). In addition to feedback, other researchers have concentrated on the need for active participation of the learner (Bobrow and Bower 1969; Slamecka and Graf 1978). From these studies we have been developing a holistic model of what is needed for effective classroom learning.

Learning requires information, model building, model testing, and feedback (Brandt and Briggs 1995). These activities require cognitive effort on the part of the student and that effort is motivated by the relevance to the student. This model is shown in figure 1.

Giving students the opportunity to build and test their mental models in the classroom, where immediate peer and instructor feedback is available, improves learning. GSS tools enable exercises that allow every student to participate in every activity and receive timely feedback. Our goals can be summarized as follows.

Through the features of GSS, anonymity and parallel communication, students feel less apprehension and participate more equally. This participation leads to increased frequency and duration of mental model building and testing. The idea sharing features of the tools lead to timely feedback from both the instructor and peers. Through the use of more student input, relevance is increased.

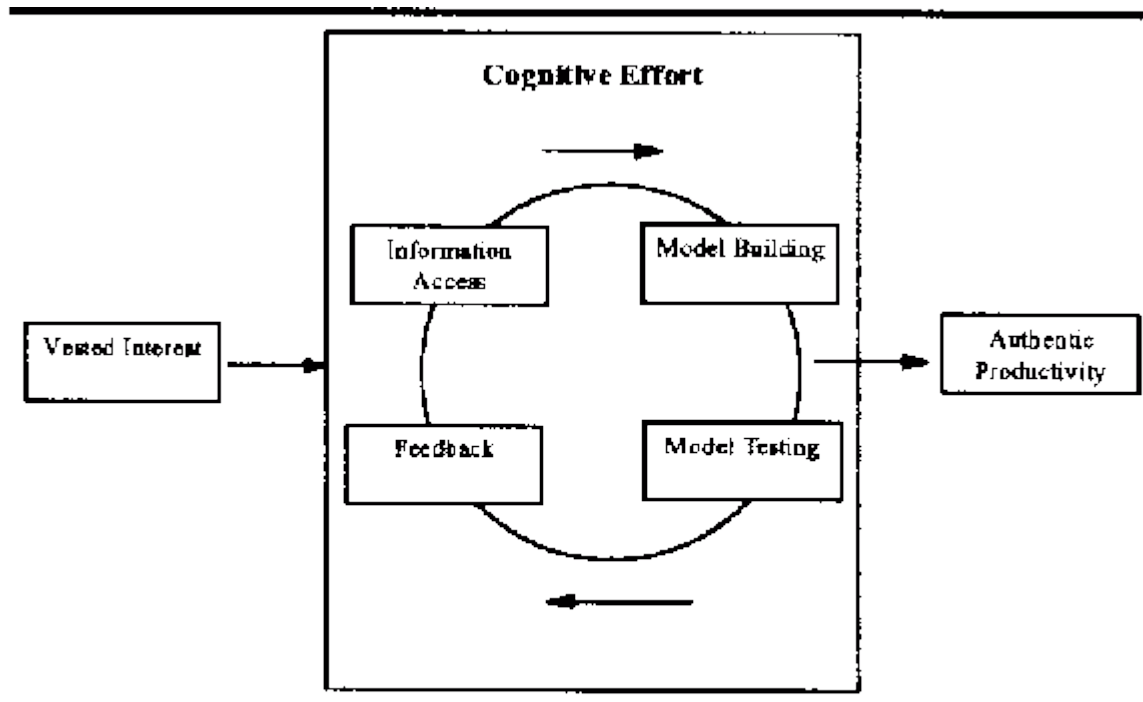


Figure 1: Learning Theory Model

GSS

GSS are generally networked computer workstations that support software with a variety of tools that allow the group to generate, consolidate, and vote on ideas. The tools allow every participant to "speak" at the same time and contribute anonymously. These features can help promote better student learning.

Techniques

The following are some of the techniques that use emerging collaboration technologies to enhance student participation in the classroom. We used GroupSystems (registered)

electronic meetings software developed at the University of Arizona for each of these activities.

Point Counter Point

The point-counter-point (PCP) technique allows students both to express an opinion and also challenges them to understand another point of view. In this technique we pose a problem to the students which has different solutions depending on the point of view or philosophy taken.

In one class where the instructional goal was to teach the differences between theory 'X' and theory 'Y' management styles, we asked the students to comment on using the theories to organize the move of a nursing unit to another location. A brief description of the situation was presented and the students were asked to respond in three ways. First, an electronic notebook page was displayed on each students workstation for them to enter their response to the question "Which management theory is most appropriate to managing the unit move and why." Second, the notebook page was randomly exchanged with another student's and the students were asked to argue the opposite point of view as the one on the screen. Finally, the notebook pages were again randomly exchanged between students and they were asked to synthesize the two points of view on their screen. Below is an example of the comments on one of the electronic sheets.

I think we should use theory x because, although people may like to work, they definitely like to be rewarded for the time they put in. Being rewarded with money is something that keeps people interested and motivated.

But, Theory Y allows employees more input and that in itself can be a reward. People don't feel rewarded only by money.

Theory X and Y can be combined by rewarding the employee monetarily and also they will be rewarded through the job itself.

After the student exchange, the instructor displayed each of the notebook pages on a public screen and reviewed them with the class. The review provided timely feedback on the work. In this twenty minute exercise, every student contribute 3 item to the discussion and many participated verbally while the instructor reviewed the conversations.

Small Group Compositions

Small group compositions (SGC) allow small groups of students to work together and develop ideas and then share those ideas with the class. This technique allows the students to develop more complete ideas. It also develops group cohesion which leads groups to defend verbally their arguments. We have used this technique assigning different topics to each group as well as assigning the same topic to more than one group. Assigning the same topic to more than one group provides a sense of competition and a level of social comparison that generally seems effective.

In a nursing management class, we divided the class into four person groups to write various nursing procedures and policies for a hypothetical nursing unit we were designing. In 15 minutes, each group wrote a 2 paragraph procedure. Two groups were given the same procedure to write and they engaged in vigorously in verbal debate once the procedures were shared with the class as a whole.

Pros and Cons

The pros and cons (P&C) technique divides the classroom in half and allows the students to brainstorm the either the positive or the negative aspects of an issue. We then allow the students to view the ideas generated by the other group which leads to verbal interaction as the students question each other. In this technique, we start a separate discussion in the group outliner tool for each half of the class. The students brainstorm, viewing only the comments in their assigned group. After a few minutes, we allow each group to view the other's discussion. Again, the students engage in verbal exchange, challenging the assumptions of the other team.

Voting

Voting is a quick technique that can be used to take the pulse of the class, highlight differences of opinion or interpretation, and surface assumptions. In voting the instructor can place a number of ballot items on the students screens and allow the students to vote using one of a number of methods such as rank order, yes/no, agree/disagree, or 1-10 scales. Unlike the other techniques, this technique does not allow for extended responses from the students (unless it is used in conjunction with another technique). It only allows a response to the ballot item. After voting, the tool allows the results to be summarized on a public screen. This summary show the distribution of votes. Often the summary shows major differences of opinion and students quickly engage in lively debate. This tool can be considered as a catalyst to richer interaction.

Multiple Technique Modules

Multiple technique modules (MTM) are modules which combine a number of the techniques described. The GSS tools allow the instructor to quickly move data from one tool another allowing for extended modules that combine techniques. For example, MTM allows vote-discussion-vote sequences that can show the effect how class opinion changes after topic discussion or the introduction of new information. In other cases MTM allows for idea generation followed by a vote which allows students to vote on ballot items which they created. We have observed that MTM techniques are often more engaging than separate techniques. Students seem to become more involved as they build on ideas they created.

One generic MTM technique that we have used with some Harvard Business School case studies is the identify issues, consolidate issues, resolve issues, and integrate resolution sequence. This sequence will fill a two and half hour class period and the level of

engagement can be held high as the students ideas drive the process. Unlike traditional case study teaching methods, every student can comment at every step of the process.

Instructor Learning

In working with faculty unfamiliar with this technology, we have seen the following impediments to instructor use of GSS teaching techniques. The following is a brief list of the impediments and the ways we overcame them.

- Difficulty running the class and the tools

Initially, we used trained facilitators to run the tools and train faculty

- Information overload from the volume of responses generated by students

Instructors developed systematic ways of reading incoming data. Initially, we used techniques that limited student divergence. We also demonstrated how more experienced GSS users use the data.

- Cognitive load of transition from "information delivery" to "mentor and guide"

Instructors saw the benefits of the student interaction, they began to design classes with less lecture and more interaction.

In general, instructor learning takes time and seems to require a continuing relationship between the GSS instructor and the classroom instructor. A GSS teaching expert will probably need to work with instructors unfamiliar with GSS for one or two semesters with the GSS teaching expert taking a decreasing role over that time.

After two semesters of using GSS teaching methods, instructors want to continue. Without support for this period of transition, instructors will not readily change.

Conclusion

The techniques demonstrated in this paper appear to be robust, but we expect that these are only some basic building blocks and new and better techniques will emerge. The techniques seem robust because of the favorable results seen at the university in the diverse subjects of MIS, Nursing, Management, and Communication. We have also seen favorable results in grade schools and high schools.

The techniques described here have been used, primarily, in face to face classroom settings. However, many of them could be used for distributed classes. Also, a combination of distributed and face to face exercises would likely be effective.

The general implication for teaching is that IT can change what is the most effective use of classroom time. In past eras, without electronic dissemination of information and even without text books, it was appropriate to use classroom time primarily for the delivery of information component of learning. Today, it is more useful to have students actively

engaged in building and testing their mental models while receiving immediate feedback from their peers and instructor.

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