REINVESTIGATING THE USE OF GSS TECHNOLOGY IN THE CLASSROOM AS A LEARNING TOOL

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ABSTRACT

Educators are constantly seeking new innovations and practices to improve and enhance the learning environment. Applying GSS to the academic sector can speed up communication between the information providers (teachers) and receivers (students), brainstorm all members for creative ideas, and help to improve the learning process in the classroom setting. This paper discusses the advantages and disadvantages of applying the GSS technology as a teaching tool in a classroom setting. This paper seeks to reinvestigate the use of GSS in the classroom by reporting the results of a replication of a previous study in which a GSS system was used to facilitate discussion of an academic topic. Both results of these studies provide evidence that GSS technology can be used to enhance the classroom experience for a better learning environment.

INTRODUCTION

Universities and faculty are continually seeking to introduce innovation in the classroom to help improve the educational experience and increasing the effectiveness of the learning process. The introduction of technology in the classroom allows teachers to change how they deliver information and interact with students [19] GSS technology can help alter classroom interaction and uniquely support student collaboration and empowerment [9] [14] [64]. For example, at a 1995 Panel Session at the Association of Information Systems Inaugural Americas Conference, Dr. Carol Pollard argued that classroom discussion of case studies is fraught with problems that can be mediated with GSS use. Similarly, at the same panel session, Dr. Robert Bostrom pointed out that learning group facilitation skills, and using GSS to create an effective collaboration environment, could better prepare students to work more effectively in teams.

Research has found that group support systems (GSS) can be used to address problematic group process issues for a variety of group settings. GSS features such as parallel communication, anonymity, process structure, and group memory help to reduce problems with the group process and promote group synergy [44]. Based on the success of using GSS to support collaborative activities such as idea generation and decision-making, there has been recent interest in using GSS in the classroom to implement and enhance group-oriented learning approaches [62]. This

paper seeks to reinvestigate the use and implementation of GSS technology in the classroom to promote more effective learning practices.

GROUP SUPPORT SYSTEMS AS A TEACHING TOOL

Why is a Group Support System a better teaching tool for academic settings? What are the implications of GSS technology in the traditional classroom? The performance of U.S. students in academics lags drastically behind other industrialized nations. Communication is a problem that pressingly needs to be addressed according to the research in gender and racial differences in relation to mathematics performance that emerged recently [18] [37] [65] [58] [29] [41]. Various professional organizations in science and mathematics have addressed the importance of adequate preparation of students to pursue career goals in the science-related disciplines. Hands-on approaches have been advocated, resulting in the discovery teaching and the Tech Prep Model, which utilizes the resources of the school's community in order to better prepare students for the world of work in particular, and in society, in general [17] [43]. The basic premise of the Tech Prep Model is to present the student with the opportunity to understand methodology and for the student to gain an ability to collect and organize data to make decisions. These skills are essential aspects of adulthood [43]. Although several improvements in teaching the science-related disciplines have taken place, the application of GSS technology in particular - can be used to improve team process and communication, as well as to enhance individual productivity.

Working collaboratively in small groups helps to increase understanding and to decrease anxiety [25]. Group Support Systems are uniquely designed to reduce anxiety due to its collaborative nature. Collaborative learning seeks to have students produce something new, so that discovery occurs. Students change from passive recipients of information to active agents in knowledge construction [59] [51]. GSS provides more student participation. Because GSS offers anonymity to students, they may participate more without fear of criticism or ridicule [34]. Additionally, GSS offers the student the opportunity to contribute their ideas without pausing to listen to others in a linear fashion. Students can speak in parallel, resulting in greater group participation [45].

The process of tailoring effective instruction for learners is a challenge to all educators. In that students use their own modes of cognitive processing to acquire, retain, and retrieve information, performance depends on how the learner manipulates the content of the subject matter [40]. Primarily, the educator's task is to determine the specific needs of the learner and then design instruction to accommodate the learner's needs [13]. GSS technology can also facilitate group synergy. Since learners bring different information skills to the group setting, this dynamic effect allows for greater idea generation and structured discussion. Learners are able to think creatively by exploring, questioning, and modifying ideas. This type of discovery approach to teaching may prove to be more effective than the traditional lecture approach.

It can be surmised that GSS could be a dynamic teaching tool in the classroom to support collaborative work. The combination of anonymity and parallel communication points toward greater participation of group members [8] [4]. Productivity and effectiveness is enhanced through the structuring of group member interactions. Because GSS tools provide a permanent record of the group's interactions through electronic capture, group synergy is further supported [10]. Thus, the creative processes are left intact due to the information-processing capacity of the GSS. The traditional classroom is thereby more student-centered with the teacher as facilitator of the discovery process.

EXPERIMENT AND RESULTS

A replication experiment was conducted to determine the effectiveness of GSS technology in the classroom. The first experiment was executed in August 2002 and included 15 subjects from an academic institution located in the western part of the United States [15]. All 15 students were asked to engage in a discussion regarding two academically-related articles. A repeated measures study was enacted in which students participated in a verbal and an electronic GSS discussion. All the subjects were graduate students: 10 were male and 5 were female. As such there was no attempt to make statistical differences for gender. Upon completion students were asked to complete a questionnaire describing their experience. Overall, subjects engaging in the GSS setting found the process to be more effective at generating ideas, more effective at using all members input, they experienced less meeting apprehension, and overall felt more satisfied with the meeting process.

The second experiment was conducted in February 2003 and included 17 subjects from an academic institution located in the southeastern part of the United States. All 17 subjects were asked to engage in a discussion related to another two academically-related articles. A comparable methodology was adopted whereby a repeated measures study was enacted in which students participated in a verbal and an electronic GSS discussion. As with the first experiment all the subjects were graduate students: 10 were male and 7 were female. Again there was no attempt to make statistical differences for gender. The second group of participants was asked to complete the same questionnaire utilized in the first study. Overall, subjects engaging in the GSS setting again found the process to be more effective at generating ideas, more effective at using all members input, they experienced less meeting apprehension, and overall felt more satisfied with the meeting process. Table 1 reports the T-test results of the comparison between the two groups, of the 10 measures tested, all were found to be significant. They are listed below:

Table 1: ANOVA test results in the Southeastern U.S.

	T	Sig. (2-tailed)
idea generation	10.67	<.001
using member input	10.47	<.001
communication	9.52	<.001
meeting process speed	10.96	<.001
apprehension	6.44	<.001
helpful	9.98	<.001
trust	10.26	<.001
future work with members	10.11	<.001
overall satisfaction	10.30	<.001
Satisfied with discussion	10.24	<.001
overall experience	11.51	<.001

1. **Generating ideas** – Subjects participating in the GSS experimental study found the system to be more receptive to idea generation and as such were able to consider more options than those in the verbal groups.
2. **Utilizing member input**- Because of the speed of computerized intervention the subjects were able to address more rapidly the comments and as such work as a group to determine the level of importance.
3. **Communication** – Due to the immediacy of computerized information, subjects found they could process the information returned by the computer quicker than in traditional verbal methods.

4. **Meeting apprehension** – The computing interface allows for the individual to submit comments without ownership, thus reducing the level of anonymity and increasing the total comment generation.
5. **Meeting cohesion** – Apparently the GSS seemed to assist the meeting process as for allowing people to communicate more effectively and efficiently.
6. **Level of trust** – This measure was supported and it is presumed that by increasing the level of anonymity members felt more comfortable with the communication process and more 'free' to submit potential aversive comments.
7. **Future work with group**- It is presumed that because there was not a large level of involvement with other members that each participant was still looking forward to working with the group. This is an area that requires future investigation.
8. **Overall Satisfaction** – Subjects who engaged in the electronic process found the meeting much more productive as which resulted in higher satisfaction ratings.
9. **Group Discussion**- Because the electronic GSS allowed for a larger amount of comments subjects felt this process created a better discussion.
10. **Overall Experience** – Combining the reduction of time in addition with the number of comments generated, subjects found this process to be much more enjoyable than the face-to-face experience.

LIMITATIONS AND FUTURE RESEARCH

While the findings in the replicated study reinforce the effectiveness of GSS implementation in the classroom, there is still much research necessary to be conducted. Some of the limitations of both studies included small sample sizes, inability to account for gender effects, and group size dynamics. In addition, these studies utilized related topics—ie. Academic-related articles in the fields of information systems and production/operations management. It is important to conduct future research to determine what if any topics are not suited for this application. Another research opportunity is to investigate the application of new web-based GSS technologies and the impact of asynchronous communication.

CONCLUSION

Generally, this paper presents research findings that support the use of technology-enabled learning environments to facilitate a teach paradigm shift from conventional teacher-centered to student-centered instruction. By replicating previous research, the current study advances the notion of the effectiveness of collaborative learning using GSS in the classroom. GSS is one technology that, when integrated into the learning environment, may support exchange of ideas via many-to-many parallel communication. This approach facilities the transfer of knowledge between teacher to student as well as concurrently among every other group participant [22]. The current study, once again, indicates GSS increases effectiveness of collaborative learning by increasing student participation and active involvement in knowledge construction by facilitating generation, exchange, and analysis of information during learning group interactions. GSS accomplishes increased effectiveness by supporting cooperation and teamwork among students while facilitating information sharing and group process support and process structuring [9]. Although the results of the previous research as well as those of the current study indicate that GSS is a useful tool in student comprehension and understanding of potential difficult material further research is necessary to define the specific advantages of GSS in the classroom.

References available upon request from carlr@sandiego.edu.