

# USING *MESSAGEGRID* TO PROMOTE STUDENT COLLABORATION

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## ABSTRACT

It is now commonplace to see laptop computers in the classroom. Some colleges and universities have *mandated* that incoming freshmen have a laptop computer when they arrive on campus. What is not obvious is that, with the right software package, these computers can serve as powerful tools for collaboration among students both inside and outside the classroom. This paper describes one such package called *MessageGrid*. With *MessageGrid* the instructor can construct grids that allow students to contribute to a large analytical piece, compare their results and learn from their peers, interact asynchronously with their teammates on a team project, or prepare extensive supplementary materials and make them conveniently available to their instructor and classmates. A capability to poll students can provide the instructor with class opinion on any topic, assess student understanding quickly during class time, in general provide feedback to the instructor on his or her effectiveness in conveying the lecture content. We briefly describe *MessageGrid* and ways that instructors and professors from very different disciplines have used it in their courses. We conclude with lessons learned and plans for future development.

## KEYWORDS

Collaborative Learning, Learning Paradigms, Software Tools for Learning

## 1. INTRODUCTION

Classrooms in which every student has a laptop computer connected to the Internet are becoming commonplace [1-6]. More and more instructors are experimenting with novel pedagogical techniques to convey course material more efficiently and more effectively. An immediate problem, however, is the surprising scarcity of software that supports the efforts of the instructor in a laptop-filled classroom. There are currently very few packages that enable the instructor to construct classroom exercises which allow students and interact with the instructor and other students. The purpose of this paper is to give a brief description of *MessageGrid*, a software package being developed at Clemson University, and to give examples of the way this package is currently being used by instructors from a diverse set of disciplines at this university.

*MessageGrid* is described in detail in Section 2. Examples of how *MessageGrid* is used by different instructors are described in Section 3. Conclusions are presented in Section 4. Finally, plans for future work are detailed in Section 5.

## 2. OVERVIEW OF MESSAGEGRID

This section gives an overview of the capabilities afforded an instructor by *MessageGrid*. This will help the reader understand the different ways *MessageGrid* can be used described in Section 3.

The primary objective of *MessageGrid* is to *facilitate recitation and classroom interaction in a laptop-enhanced classroom*. It enables an instructor to design classroom experiences, tailored to support the lesson

for the day, and to engage the students by having them respond to questions, assignments, projects, etc., by posting their responses on the grid. Figure 1 shows an example of a newly-created, empty grid which is used in a music appreciation class. Music elements are listed on the left and a symphony's four movements form the columns across the top. A team is assigned to analyze a music element of a specific section and to post its analysis on the grid. When all teams have submitted, the class has a complete picture of how each music element is developed in the piece.

To respond, a student clicks on a *post* link and submits a response which may be in the form of text, html, images or a hyperlink to *any* object that can be displayed by a browser. Students can provide an image accompanying their text and displayed next to it. Students can provide a link to a document, a *ppt* presentation, a *pdf* file, a spreadsheet, an image, an audio file, a video file, indeed any object that can be displayed by a browser. Finally, students can provide a link to a web page, either a page designed by the student or any other publicly available page.

The instructor can control how visible to make student responses. Responses may be *public* or visible by all students, or *private* so that a student can see only his or her own responses.

Responses may be *anonymous*, i.e., all responses are visible but without accreditation. Finally, the instructor can allow the entire class to access a grid or can limit access to a few select students. The latter capability is particularly useful when using grids with team projects.

*MessageGrid* can poll students quickly and easily. An instructor can develop one or more multiple-choice questions associated with a grid. A question may have between two and ten answer options and students are allowed to respond once to a question. Once a student has answered a question, he or she may see a frequency count and a histogram of how many students selected each answer option. Students only see summary results; the instructor can know which students selected each answer option, thus providing information as to which students need help with a particular topic. We call these questions *clickers* because the capability they provide to an instructor resembles that of hardware clickers [7] used by some to poll student opinion and understanding in class. Clickers provide an instructor with a powerful assessment tool to use during lecture in real-time.

The instructor has control over several of grid functions: creating grids, deleting grids, making copies of grids, emptying grids, and deleting or editing student submissions. The instructor has the option of allowing students to include html tags in their submissions providing them with greater control over the appearance of their submissions.

Both instructor and students can post replies to grid submissions. A message posted on a grid can receive zero or more replies, each of which can in turn receive zero or more replies. The reply threads form a tree-like structure which can optionally be displayed in outline form. Currently under construction is a function that will allow the instructor to see the *sequence* in which replies are posted as well as the content of the replies themselves.

### 3. SOME EXAMPLES OF USE

Several Clemson University faculty members have been using an early version of *MessageGrid* during the fall 2004 and spring 2005 semesters. The almost *instant* appeal of *MessageGrid* among instructors from very different academic disciplines continues to be a pleasant surprise. The instructors come from the departments of languages, general engineering, nursing, psychology, English, sociology, distance education, statistics, mathematics, accountancy, education, chemistry, performing arts and computer science. This section briefly describes several different ways that *MessageGrid* has been used. The variety of use attests to the versatility of *MessageGrid* in different pedagogical contexts.

Figure 1. An empty grid used in a music appreciation class. Students study a musical piece and are assigned to analyze the music element (row) of one of the sections of music (column). After posting, comments across a row show student opinion on the development of a music element throughout the piece. A column displays student opinions of the music elements in a single section.

Movement	1	2	3	4
Tone color	(post)	(post)	(post)	(post)
Dynamics	(post)	(post)	(post)	(post)
Harmony	(post)	(post)	(post)	(post)
Melody	(post)	(post)	(post)	(post)
Texture	(post)	(post)	(post)	(post)
Rhythm	(post)	(post)	(post)	(post)
Form	(post)	(post)	(post)	(post)

A professor in the school of performing arts teaches a course in music appreciation. He asks his students to bring to class a pair of headphones and the music CD which accompanies their textbook. He creates a grid such as that shown in Figure 1 and assigns a team of students to a grid cell. He instructs the students to listen to the music and to discuss the music characteristic of one movement of the piece. For example, one team may be asked to analyze the harmony in movement 1. Another team may be assigned the rhythm in movement 3. And so on. As teams *post* their analyses, the grid projected on the screen from the instructor's computer is slowly populated with student submissions. Midway through the class period, the instructor freezes the grid (no more submissions allowed). He then leads a discussion of the *collective* analysis of the musical piece, sometimes analyzing a row of a grid, e.g., the harmony through all four movements, or a column, e.g., all of the characteristics of one movement. He is able to correct submissions slightly in error and enter his own analyses in grid cells to which no teams were assigned. At the end of the period, the students can download the partially filled grid to their laptop computers for future review.

A psychology professor uses a grid to introduce students to the process of reflection. He labels two columns "Artifact" and "Meaning" and rows with student names. In the first column, students briefly list and describe a technical paper, presentation, or any work that the student completed in any previous course. In the second, the students reflect on what the paper reveals about their abilities or talents. The exercise is designed to introduce the process of digital reflective portfolio construction to help students conduct self-analysis leading to self-awareness. Reading other students' reflections provides a student with a greater variety of self-analyses from which to refine his or her own.

A computer science professor uses a grid to conduct his web-application development class on days when he is out of town attending a conference. He first asks students to post links to their web-application assignments on a grid. During the class period, the professor from his conference site clicks through and critiques each of the student submissions. He communicates his evaluation orally to the students and receives questions from them using a headset and commercially available voice-over-IP software. The students can see the professor's desktop both projected on the classroom screen and on their laptop computers as he clicks through assignment submissions using a desktop-sharing package called Macromedia Breeze Live. Even without the live oral communication and desktop sharing, he uses *MessageGrid* for real-time interaction with his students. The professor *posts* his written evaluation of each of the assignments on the grid before class starts and responds to questions from the students posted on the grid by entering answers also on the grid. This communication through *MessageGrid* can be done synchronously or asynchronously. Moreover, an evaluation may be private (the student sees only his or her evaluation) or public (everyone sees everyone else's evaluation) at the discretion of the professor.

To facilitate class discussion in an upper level Spanish class for health professionals, a languages professor uses a grid with student names for row labels and seven topics for column labels. Her students have a week to research all seven topics, provide at least one link to a resource such as a news article or a position paper accessible on the web related to the topic, and to enter a personal opinion in Spanish on the resource.

A nursing professor asks each of her students to give a 10-minute presentation once during the semester with two students presenting in a class meeting. She uses a grid with dates of class meetings for rows and two columns labeled "Student 1" and "Student 2". Each student assigns himself or herself to a class meeting by posting his or her name to one of the grid cells. Students prepare abstracts and PowerPoint presentations and post these under their names several days before their presentation date. This gives the professor a chance to review and critique the student materials before each presentation date. She makes the student abstracts and PowerPoint presentations and her critiques visible to the whole class because she believes that all students benefit from the constructive remarks that she provides.

A statistics professor is considering creating a grid where students submit links to Excel spreadsheets containing results students obtained running an assigned experiment. In class, he plans to select several student sample data sets, cut-and-paste their data into a master spreadsheet, and run pre-designed macros on the combined data illustrating the objectives of the exercise.

A chemistry professor uses *MessageGrid* to determine what he will teach in subsequent lectures. In a large (over 150 students) introductory chemistry class, he first uses clickers to assess student understanding on a recently covered set of topics and then asks pre-assigned student teams to discuss the answers. He then asks the students to answer a second set of clicker questions on the same topics followed by discussion of the answers. Finally, he asks student teams to *post* detailed questions on the grid on any of the topics discussed. As a result, (1) the clicker questions and student team discussions help struggling students identify and learn

course material not completely understood, and (2) the grid submissions inform the professor which topics remain problematic even after the team discussions. This valuable feedback allows him to adjust subsequent lectures accordingly.

#### 4. CONCLUSION AND FUTURE WORK

Our primary *pedagogical* objective is to document the different ways that instructors use *MessageGrid* in their courses. This short paper is the beginning of this process. We plan to draw from the experiences of the group of professors currently participating in this study and others who may join later and to list as many examples as we can of new pedagogical approaches and techniques using *MessageGrid*. Each will be accompanied by student and faculty evaluation of the technique.

The anecdotal results we have accumulated so far are encouraging. *MessageGrid* appears to be particularly useful in very large classes where traditionally the instructor had no hope of interacting with the vast majority of students. The presence of the laptop computer and *MessageGrid* combine to allow the instructor to reach every student and, importantly, to recognize early in the semester which students are struggling. This provides the possibility at least of early intervention and saving the student from eventual failure.

Development of *MessageGrid* continues. Work has already started on improvements suggested by users. This process will continue through the 2005-2006 academic year. We also plan to design a process to formally assess the effectiveness of the use of *MessageGrid* in the classroom. The process will initially compare the performance of students in classes that have traditionally used common final examinations. The goal is to identify those activities using *MessageGrid* that improve teaching and learning as evidenced by improved performance on common examinations. We will report on the design and implementation of these assessment processes in a future paper.

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