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Developing A Global Real Time Assessment Tool For The Teaching Enhancement Of Engineering Graduate Teaching Assistants

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AC 2010-904: DEVELOPING A GLOBAL REAL-TIME ASSESSMENT TOOL FOR THE TEACHING ENHANCEMENT OF ENGINEERING GRADUATE TEACHING ASSISTANTS

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Developing a Global Real-time Assessment Tool for the Teaching Enhancement of Engineering Graduate Teaching Assistants

Abstract

In 1999, the VaNTH Observation System (VOS), a direct observation system that records instructor and student interactions in classrooms using the dimensions of the “How People Learn” (HPL) framework was developed to provide pedagogical feedback to bioengineering faculty at four research universities. Since its development, the VOS has been adapted for use in first year engineering laboratories taught by the graduate teaching assistants (GTAs) at a large Midwestern university. After piloting the VOS within this new environment in 2007, researchers noted some limitations. To overcome these limitations, a new pedagogical observation system, called the Global Real-time Assessment Tool for Teaching Enhancement (G-RATE), has been developed to provide GTAs with multidimensional feedback about their teaching. This paper describes the evolution of the G-RATE system, provides an overview of each section of the instrument, and discusses future steps for the development of this tool.

Introduction

Seymour et al.¹ note the importance of pedagogical feedback for graduate teaching assistants (GTAs) in a variety of disciplines. In a comparison of GTAs teaching in innovative and traditional course environments, the authors identified GTA responsibilities in traditional environments to include grading, working closely with undergraduate, and serving as secondary resources for students enrolled in the course. Within the innovative environments, however, GTAs were found to be troubleshooters, liaisons between faculty supervisors and students, and collaborators with faculty in the teaching of students enrolled in the course.

Because of the important roles that GTAs play in both traditional and innovative environments, feedback to GTAs about the extent to which they are fulfilling their teaching roles is needed. Although such feedback has been traditionally provided by GTAs’ coordinators or supervisors², by GTA self-reflections^{2,3}, by undergraduate students’ evaluations⁴, or by other surveys⁴, direct measures of GTA effectiveness are needed also. For this reason, this paper describes a new pedagogical system, the Global Real-time Assessment Tool for Teaching Enhancement (G-RATE), which has been developed to provide GTAs with multidimensional feedback about their teaching. This paper describes the evolution of the G-RATE system, provides an overview of each section of the instrument, and discusses future steps for the development of this tool.

Background

Prior to developing the G-RATE, researchers used the VaNTH Observation System (VOS)⁵ to collect real-time, in-class data about GTAs' pedagogical practices in first-year engineering laboratories at a Midwestern university over the course of two semesters. Such observations were needed to understand what data the VOS did and did not capture in laboratory environments, and how this data differed from that collected in classroom environments for which the VOS was designed. Of the four components of the VOS, the Classroom Interaction Observation (CIO) portion was used to collect data using *who*, *to whom*, *what*, *how*, and *media* categories (Figure 1), since data were recorded in four to six second intervals. Although the codes for each category are described in detail in Harris and Cox⁵, a pictorial representation of the five categories is displayed in Figure 1. A revised version of the CIO is located on a Personal Digital Assistant (PDA) that was used by trained classroom observers (i.e., three graduate assistants and one undergraduate researcher).

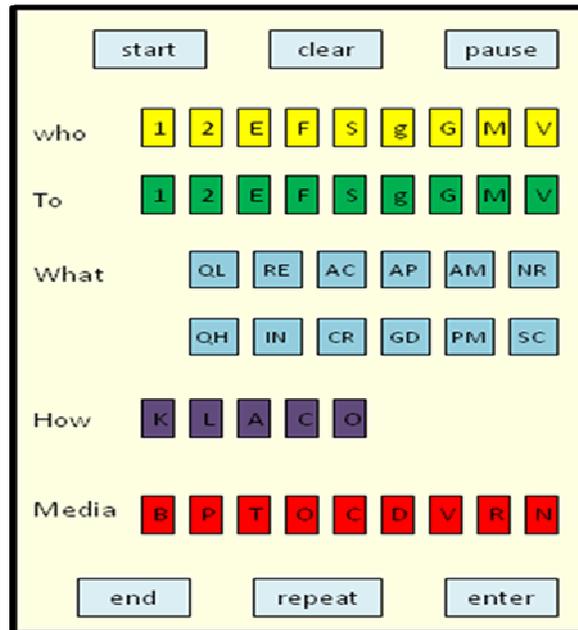


Figure 1. Revised data collection system for the VaNTH Observation System (VOS)

To collect data with the CIO portion of the VOS, observers sat in three-hour lab classes and observed a GTA supervising thirty undergraduate engineering students. The observer recorded observations of the instruction at regular intervals by selecting corresponding codes under each category, thereby resulting in the creation of hundreds of code strings per instructional session.

Despite this collection of code string data, the use of the VOS in laboratory settings was hampered primarily by two factors⁶. First, the VOS required considerable training to use. Careful training was required to achieve accuracy in four- to six- second coding intervals. Second, not all

categories were intuitive. While the *who*, *to whom*, and *media* categories were straightforward, the *what* and *how* categories required additional interpretation by the observer depending on the types of classroom interactions occurring in the classroom. Also, the *how* category, which contains the four HPL dimensions of knowledge-centered (K), learner-centered (L), assessment-centered (A), and community-centered (C), along with classroom organization (O), was difficult to assess because of the subjective nature of these items.

Based upon these observations using the VOS, researchers suggested that the following elements be incorporated into an improved tool.:

- The tool should be easy to use and not require extensive observer training.
- A complete description of the codes and what they depict should be integrated into the tool so that users do not have to memorize the codes and their definitions.
- The *who* and *to whom* categories should be customizable according to the particular environments (i.e., laboratory or classroom) where the tool is to be used.
- A help function should be provided to help users. Example questions and definitions would correspond to these options.

Development of the G-RATE

In response to the needs listed previously, the Global Real-time Assessment Tool for Teaching Enhancement (G-RATE) was developed. Figure 2 shows the start page of the G-RATE, from which a user selects his/her role, or function, in using the tool. The G-RATE consists of the *Observer*, *Student*, *Graduate Teaching Assistant*, *Researcher*, and *Administrator* functions. The descriptions of these functions are:

- *Administrator*: An administrator can modify the observation parameters of the G-RATE (e.g., modifying the code strings of the observation categories and selecting appropriate questions for GTAs and undergraduate students). This occurs at the **beginning** of the lab session.
- *Observer*: An observer can record the observational data that reflect GTAs' instructional practices in elements of the How People Learn (HPL) framework⁷ **during** lab sessions.
- *Student*: Students who are enrolled in the observed lab session can answer the formative and/or summative survey items which provide feedback to the instructional GTA. This occurs **during the last ten minutes** of the lab session.
- *GTA*: The GTAs can access to the reflective items that can be used for self-assessment of their teaching **after** the lab session.
- *Researcher*: A researcher can access to data which are collected from the other G-RATE functions without overriding modifications. The researcher accesses these profiles **after** all other data have been collected.

Training materials can be accessed by clicking on the buttons at the bottom of the interface. These tutorial sessions provide training in system operation as well as instruction about the HPL framework, the theoretical framework on which the G-RATE instrument is based.

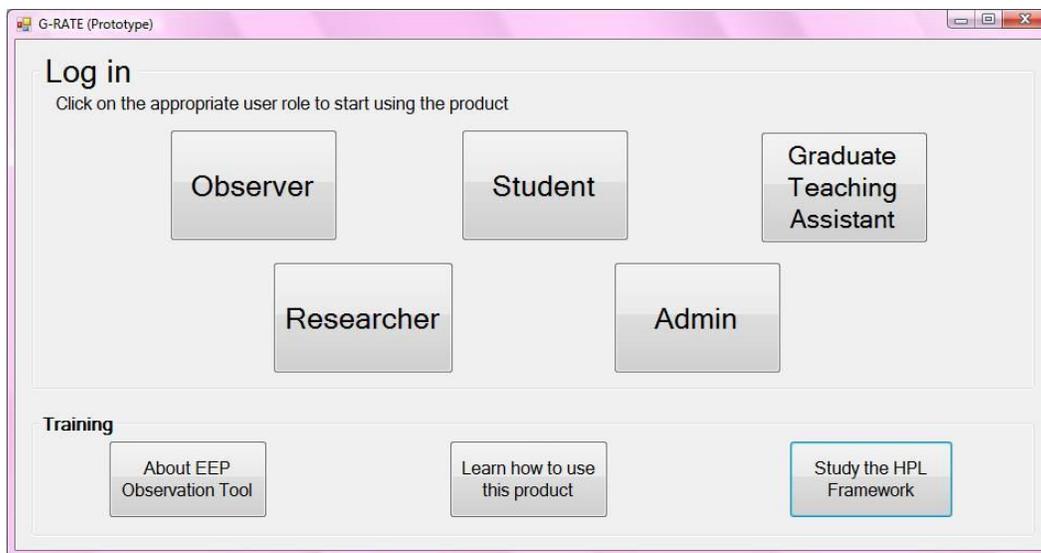


Figure 2. Start page of the G-RATE

System Requirements of G-RATE

The G-RATE was designed using the Microsoft Visual C# programming language. The G-RATE requires the Windows XP or Vista operating system and 3 MB free hard disk space as well as an eight inch or larger screen. Microsoft Excel and Microsoft Access are required for generating observation reports.

Current status

At present, only the development of the *observer*, *administrator*, and *training* functions has been completed. Figure 3 shows the page that is used for recording observational data using the *observer* function. The G-RATE uses descriptive codes rather than abbreviated codes that were used with the VOS interface (e.g., “higher order question” rather than “HQ”). To help observers learn the codes, tooltip and help functions have been provided. Clicking on the exclamation mark beside a code produces a popup tooltip that explains what code means and provides examples of how it is to be used. A user can also access the *help* function at any time during observation for general help on such as interface use or information on the How People Learn framework.

Another capability which has been added to the G-RATE tool is an automatic coding interval option. With this option, the data that the observer enters is automatically stored at preset time intervals. This helps observers to enter data at precise intervals.

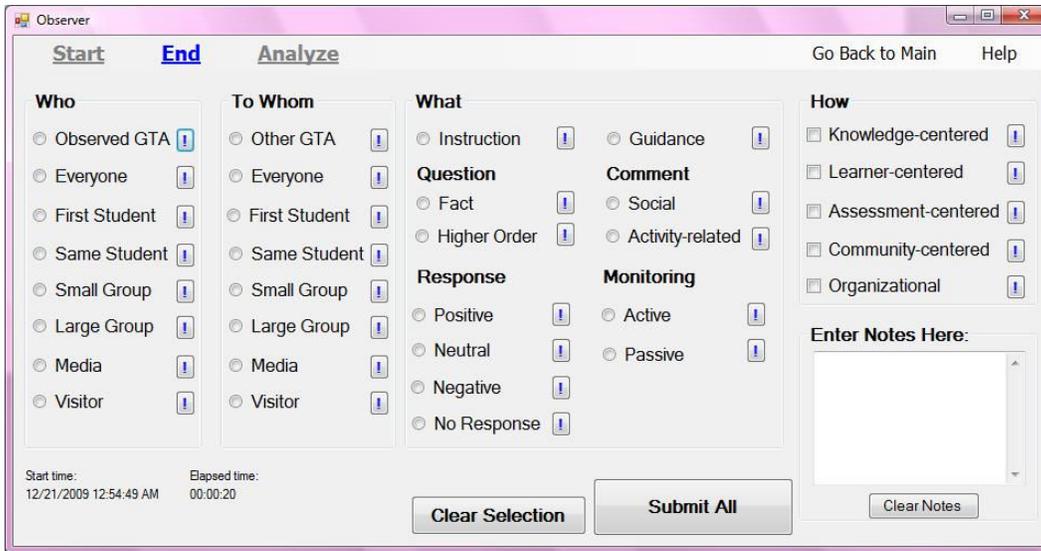


Figure 3. Observer function page of the G-RATE

The *administrator* function allows a user to customize some observational interface features (Figure 4). Under the *index* tab of the *administrator* function, the supervisor of the observations can modify the elements of the *who* and *to whom* categories to meet the conditions of the environment in which the tool is being used. In addition, on the *user page* tab, the supervisor can set a password so that only authorized users can access the database in which data is store.

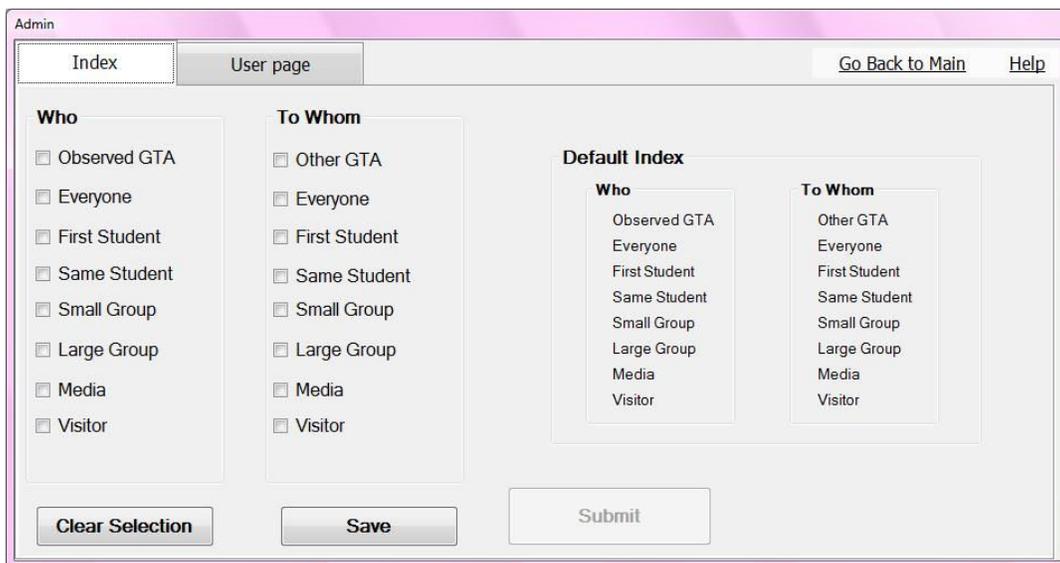


Figure 4. Administrator function page of the G-RATE

The *help* function provides training materials to help users familiarize themselves with the G-RATE and the How People Learn framework (Figure 5). The *help* window can be loaded at any time by pressing a *help* button that is located on every window in the interface.

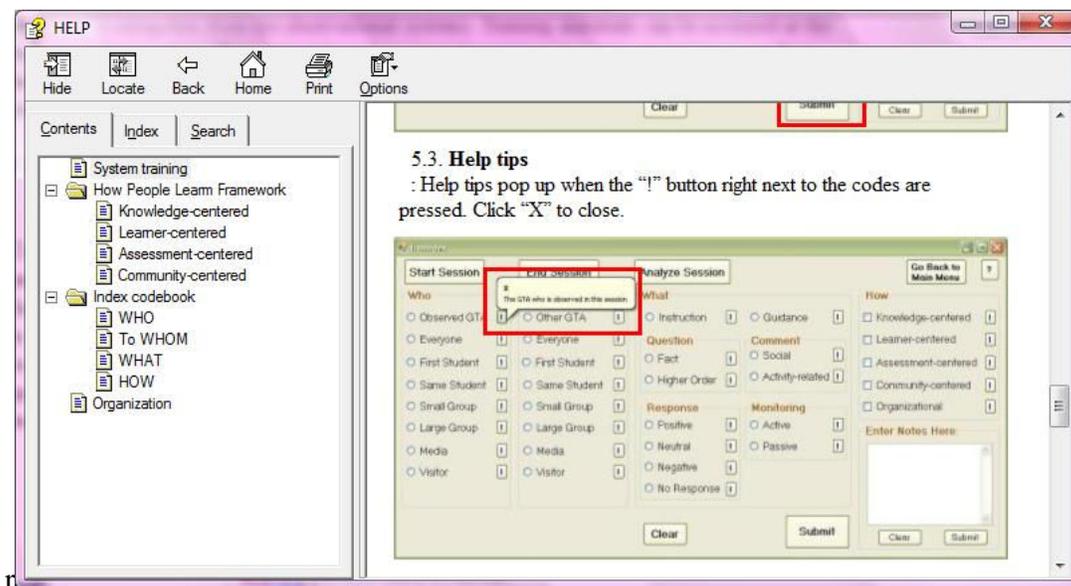


Figure 5. *Help* window of the G-RATE

Future Work

Although initial work has occurred on the G-RATE, several tasks remain. First, the remaining parts of the G-RATE (i.e., the *researcher*, *undergraduate*, and *GTA* functions) are yet to be fully developed. Second, in order to provide feedback from various groups to GTAs and to study their performance for certain periods, the databases of each function that are stored under each GTA will be combined as an interlocking database. Third, a simple feedback report template, which can easily be interpreted by someone who has no extensive knowledge of the HPL framework, will be developed. Once the report template is developed, observation reports will be generated by clicking on an ‘Analyze’ button on the *observer* function page. Finally, when the system is fully developed, the G-RATE will be tested and validated in a first-year engineering laboratory course.

Conclusions

The G-RATE is a tool that provides multidimensional direct observational feedback to GTAs on the instructional interactions that they are using teaching in a classroom. The G-RATE is an adaptation of the earlier VOS tool and provides flexible and easy-to-use interface which allows the tool to be used outside of traditional classroom environments. The G-RATE be also be used to collect data from a variety of stakeholders including undergraduate students, GTAs, researchers, and administrators in various observation environments.

Acknowledgements

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