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**iSTART: Interactive Strategy Training for Active Reading and Thinking
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I. INTRODUCTION

Many students have difficulty understanding what they read, particularly the challenging textbooks they encounter in their academic courses (Bowen, 1999; Snow, 2002). Such texts can be better understood by teaching students how to use active reading strategies that enhance comprehension. In this project, we focus on teaching high school and college students just such reading strategies through an automated strategy trainer called iSTART (Interactive Strategy Trainer for Active Reading and Thinking, McNamara, Levinstein & Boonthum, 2004).

To date, numerous experiments assessing the efficacy of iSTART have been conducted with over 1,000 middle school, high school, and college students. The convergence of findings suggests that iSTART is effective in helping students use strategies to learn from texts, and enhances comprehension, particularly among low-knowledge readers (Magliano, Todaro, Millis, Wiemer-Hastings, Kim, & McNamara, in press; O'Reilly Sinclair, & McNamara, 2004a, 2004b). The goal of the current project is to expand iSTART so that it can be more effectively and efficiently be used in high school classrooms.

iSTART: Automated Strategy Training

iSTART is a web-based computer program that uses automated agents to provide reading strategy training. iSTART currently incorporates theoretically motivated Self-Explanation Reading Training (SERT; McNamara, 2004; McNamara & Scott, 1999), which teaches students to self-explain science texts by using active reading strategies that facilitate and enhance comprehension, such as paraphrasing, elaborative inferences and bridging inferences (Gernsbacher & Hargreaves, 1988; Pressley, Wood, Woloshyn, Martin, King, & Menke, 1992; Rosenshine & Meister, 1994).

iSTART has three modules: *Introduction* (students watch the teacher-agent explain the reading strategies to two student-agents); *Demonstration* (students are quizzed on various aspects of the SERT strategies); and *Practice* (students practice generating typed self-explanations while the program provides feedback on performance). The practice section incorporates feedback that is adaptive to the level of student performance.

Empirical studies with high school and college students suggest that iSTART improves both reading comprehension and the quality of self-explanation during the process of reading (e.g., McNamara, O'Reilly, Best, & Ozuru, in press; O'Reilly et al, 2004a, 2004b). The current IES

grant aims to scale-up iSTART so that it can be more widely accessible to users of different abilities.

iSTART: The System We Envision

iSTART targets the kind of active reading strategies that research has shown to be characteristic of skilled, successful readers (e.g., Bereiter & Bird, 1985). These reading strategies are particularly important for understanding textbooks because they often include unfamiliar, challenging material. However, teachers are often inadequately prepared to provide reading strategy training to the students in their classrooms (see, Snow, 2002). While they may be well versed in their particular domain, it is frequently the case that they have little training with regard to reading instruction, or how to incorporate reading strategy training into their classrooms (Baker, 1996; Snow, 2002). This impediment is augmented by the wide range of students' needs (Cornoldi & Oakhill, 1996) – students each have particular reading deficiencies and learn reading strategies at different rates. Teachers clearly do not have time to give individualized reading strategy training to each of their students.

iSTART offers a solution to this educational problem by providing automated reading strategy training that is adaptable to students' needs and rate of progress while taking into consideration the teacher's course demands. However, to fulfill such an active role in classrooms, the current version of iSTART must be augmented in two principle ways: (1) by improving the ability of the system to adaptively respond to students' and teachers' needs and, (2) by creating a teacher interface that allows teachers to integrate iSTART into their classrooms.

Incorporating a computerized tutor into a classroom is not as simple as merely giving the system to the teacher and expecting that it will be used consistently or successfully. There are many constraints that must be met in order for the system to be integrated into classroom in an effective manner. First, the teacher must understand the need for reading strategy training, and be receptive to intelligent tutoring systems. Second, the program must be easy for the teacher to use, and the system should also include a component that handles the teachers' questions about the program and data on the students' progress. Thus, a subcomponent called the teacher interface must be developed to facilitate teachers' use of iSTART in the classroom. Third, the number of course topics and range of text difficulty covered during the practice sessions need to be increased to make the system applicable to a wide variety of educational topics and students with varying levels of ability.

We have completed year two of the three-year funding period. The summary below briefly describes our second year of progress toward our four objectives. Following this are more detailed summaries of the project goals and sub-goals and our progress toward accomplishing our goals. Overall, we have made excellent progress in achieving the goals of our grant proposal.

Summary of Progress

Objective 1: Text Domains. Our first goal is to increase the number of texts used in the self-explanation practice. Also, by incorporating history and narrative texts into the existing practice texts from the domain of science, students with varying ability levels will be able to use iSTART across three curriculum domains. We are continuing to gather a large corpus of texts, aligned with the national education standards, from different genres to add to the training corpora.

The iSTART system has been expanded to be able to evaluate self-explanations in the additional domains of history and literature. This involves revision of the original self-explanation algorithms. We are currently creating LSA spaces for the domains of history and

literature. Relatedly, we are improving the self-explanation evaluation model by including a fuzzy-logic inference engine (Bellissens & McNamara, 2006).

We conducted an experiment in which high school and college students were trained to self-explain with iSTART using the standard science texts. However, in addition to being assessed on the quality of their self-explanations on science texts, students were also required to generate self-explanations for *history* and *literature* texts. The data from this study will help us to evaluate the effects of iSTART training on students' ability to self-explain texts across different subject domains. In addition, it will provide valuable data for the self-explanation evaluation algorithm, allowing better calibration which will result in more precise and accurate feedback to the trainee. We are currently analyzing this data and preparing several papers for publication (e.g., O'Reilly, Taylor, Duran, & McNamara, 2006).

Objective 2: Adaptability to the User. Our second goal is to match nature and difficulty level of the strategy training to the ability level of the reader; that is, training will be tailored to each student's background knowledge and reading ability. This will be measured prior to training through a collection of assessment instruments (e.g., prior domain knowledge, reading ability, learning goals, etc.), such that the optimal effect of training can be realized for students with varying ability levels.

We will also vary the difficulty level of the texts that students self-explain and the level of scaffolding provided to them during the practice phase. We have already begun acquiring texts at varying levels of difficulty (e.g., middle school and high school) based on national educational standards. In addition, we are currently analyzing collected data on the relationship between text difficulty (in the domains of science, history, and literature) and self-explanation quality (see Objective 1.4). We are in the process of planning a study that will begin in the fall of 2006.

Objective 3: Responsiveness to Strategy Deficits. Our third goal is to expand the training modules so that we can match the reading strategy training to the level of the reader. For example, during initial training, a low-ability reader should master lower-level strategies, such as paraphrasing, whereas a high-ability reader should focus on learning higher-level strategies, such as constructing inferences through bridging inferences or elaboration. As such, we will therefore refine the reading strategy instruction so that readers are taught strategies at the appropriate level.

We have created pretest assessments of students' prior domain knowledge in science, history, and literature. In addition, we developed new individual difference measures for: learning goals, epistemological level, interest in subject domains (i.e., science, history, and literature), and specific texts (Taylor & McNamara, 2006; Taylor, Sinclair, & McNamara, 2006).

Prototypes of five new strategy modules were created: *Preparing to Read* teaches basic concepts about reading, *Previewing* teaches the students to look at the main parts of the text and get an idea of what text is about *before* actually reading the text; *Paraphrasing* provides more practice on paraphrasing, particularly for less skilled readers; *Question Asking* teaches students to ask deeper level questions; and *What's the Main Point* teaches students to concisely convey the main points of the text. In addition to these new modules, we have also created a more adaptive version of the question manager underlying our Demonstration module. The modifications to this module make it possible to use a range of texts with different difficulty levels (see Sub-goal 2.1) and also adjust the difficulty level of the questioning according to the student performance.

Objective 4: Teacher Interface. Our goal is to create an interface that enables teachers to use iSTART effectively. The interface serves three purposes: (1) it provides necessary information and training for teachers to use iSTART, (2) it allows some degree of freedom for teachers to adjust the training program by selecting texts of their choice, and (3) it gauges students' progress in the training program.

We have developed prototypes for components of the teacher interface. As a part of the *Training Organizing Module*, we developed a new registration and enrollment management feature that allows teachers to sign-up and transfer students. Also, the new scheduling and policy features will allow teachers to set up iSTART and integrate it with their other class lessons. As a part of the Teacher Instruction Module, we have created a version of the iSTART trainer that provides a "hands-on" tour of the modules. We are in the process of preparing a set of prototype web pages that provide information to help the teachers understand the theoretical aspects underlying reading strategies. Lastly, a teachers' needs assessment was performed in which the Center for Research in Educational Policy (CREP) administered surveys to teachers from five high schools. The data have been collected and are currently being analyzed.

II. PROJECT GOALS AND PROGRESS

Objective 1: Text Domains

The goal is to increase the number of texts used in the self-explanation practice so that iSTART can be used across curriculum domains by students. Increasing text domains used in the practice session contributes to increasing the systems' ability to adapt to students with varying ability levels. The current version of iSTART provides self-explanation practice through two science texts that focus on the development of thunderstorms and the origin of coal. While this has been sufficient to conduct our initial evaluations of the system, it is not sufficient to take iSTART to a larger scale for the following reasons. First, increasing the number of texts is essential in order for struggling students to receive a greater amount of practice than is currently possible. Although practice with two texts provides substantial benefits, our research has shown that this is not enough practice for the students most in need of training. Second, our experiences with students and teachers over the past few years have made it evident that the reading strategy training offered by iSTART should be available in additional domains. For instance, in our previous research teachers have reported to us that even though the students were trained to use self-explanation in their science classes, the students would frequently also use the new strategies for their courses in history and literature.

Expanding the number of topics covered by iSTART is beneficial for both applied and theoretical reasons. First, teachers will be more receptive to using iSTART in their classrooms if topic-relevant material (or better yet, selections from their course textbook) is available for the students to read using the iSTART system. In other words, iSTART will be better used by teachers if it allows coverage of required content while their students are learning the reading strategies. In theoretical terms, increasing the number of topics covered will also contribute to our understanding of reading processes. It will both afford us the opportunity to examine how different strategies are used and also contribute to comprehension across different domains.

Our research plans to meet Objective 1 are represented as sub-goals in Table 1. The table indicates progress made with each sub-goal and the time frame in which we expect to complete the work.

Table 1: Sub-goals for Objective 1

Sub-goal	Description of activity	Progress	Time frame
1.1	Create a library of digitalized texts	In Progress	Years 1 and 2
1.2	Create a self-explanation evaluation system that can be easily adapted to a wide range of texts	In Progress	Years 1 and 2
1.3	Evaluations of the feedback system using Self-explanation protocols of narrative text collected in 2004 (Study 1)	Completed	Years 1 and 2
1.4	Experimental study involving collection of self-explanations for science, history and narrative texts	In Progress	Years 1 and 2

Sub-goal 1.1: This sub-goal involves building text libraries for iSTART practice by increasing the number of texts available in the self-explanation practice so that iSTART can be used more extensively both within curriculum domains (e.g., different topic within science) and across curriculum domains (e.g., science, history, and literature). In order to facilitate the widespread use of iSTART, the selection of the text passages was aligned with the associated national education standards. We are continuing to collect these materials and evaluate them in terms of their difficulty levels (see Sub-goal 2.1 for more information).

Sub-goal 1.2: This sub-goal involves the refinement of a self-explanation evaluation system. This system gives rapid evaluations and responses to student self-explanations. It can also easily be adapted to a wide range of texts. The self-explanation evaluation algorithms must be easily applied to a wide variety of texts. Our first version of an algorithm to achieve this goal is described in McNamara, Boonthum, Levinstein, and Millis (2006). We have created an evaluation system that can be automatically applied to virtually any text and is highly predictive of self-explanation quality. This revised system was used in the experiments conducted during the 2004-2005 school year. Informal examinations of the accuracy of the system's evaluations of self-explanations over a variety of texts indicate that the system performs quite well. After we completed the human coding of the protocols, which was necessary for a systematic evaluation of the system, and in the continuity of the current model, we decided to improve the model by including a fuzzy inference engine (Bellissens & McNamara, 2006). The fuzzy inference engine is able to abstract rules from human ratings to determine the quality of the self-explanation that the students produce. We are enthusiastic about the preliminary results we obtained because the protocols we used involved a wide variety of texts and participants. Nonetheless, we expect to improve the future evaluation performance with the application of this algorithm for several reasons. First, it is possible to easily tune the fuzzy model. Second, we want to improve the system to be able to take into account the match between texts and readers.

We are also working to create new semantic spaces for the LSA algorithms that are part of the system. LSA can be viewed as a statistical model of semantic memory. Theoretically, LSA uses induction processes to transform specific co-occurrences between words and contexts in a large corpus of text into abstract relations, called similarities, between words of the corpus. As one can use LSA to evaluate similarities between words, between words and passages, or

between two passages, LSA has demonstrated its usefulness in estimating the quality of a text production in comparison to the text segment it refers to (Graesser, Wiemer-Hastings, Wiemer-Hastings, Harter, Person, & the TRG, 2000; Landauer, Laham, & Foltz, 2003; McNamara, Boothum, Levistein, & Millis, in press; Magliano, Weimer-Hastings, Millis, Muñoz, & McNamara, 2002; Wolfe & Goldman, 2003).

The semantic spaces (or large corpora of text used in LSA) contribute to evaluations by providing a semantic comparison of the self-explanation to the target text. Thus far, we have created an LSA space for narrative texts, and are in the process of developing the history space. Unfortunately, preliminary evaluations of the narrative space have indicated that it does not perform well (i.e., it does not produce results equivalent to or as good as other spaces). As such, we are improving this space by expanding it and combining it with other, smaller narrative spaces. We have also gathered texts to create a history space, which will be compiled and formatted in the fall of 2006. We have compared the results of using an LSA-mixed corpus against the Science space (used in iSTART) and the TASA corpus. The LSA-mixed corpus seems to work as well as TASA, and in some cases is superior. This result bodes well because our hope is to be able to use one large, combined space for all texts. However, text genre seems to have an impact on the effectiveness of an LSA corpus. We will work to solve this problem because we prefer to use a single semantic space and a single algorithm irrespective of the genre.

Sub-goal 1.3: This sub-goal involves the collection of and human coding of protocols across a wide variety of texts to support the revision and evaluation of the system's algorithms. Last year, we completed a preliminary study in which high school students self-explained four types of texts (science, literary analysis, narrative, and wellness) after receiving iSTART training with science texts. This year, the protocols from this study were rated by human raters in terms of strategy use and quality. These ratings have been compared to the judgments made by the current system (McNamara et al., 2006; McNamara et al., 2004; Millis et al., 2004) and the fuzzy system (Bellissens & McNamara, 2006). The match between trained raters' judgments and the current system's judgments (in terms of d-primes and Cohen's Kappa) indicates the appropriateness of the judgments made by the system, although the match was better with the fuzzy system. We have completed the ratings of the protocols collected in the transfer experiment described in goal 1.4. We will use these protocols to determine the relationship between the structure of the texts and the self-explanation produced by the participants. In turn, this will allow us to improve the training and quality of the fuzzy model.

Goal 1.4: This sub-goal involves the testing of the transfer of self-explanation training on science texts to texts from three domains: science, history, and literature. This experiment also allowed us to collect additional self-explanation protocols from history and narrative domains.

We investigated the effectiveness of iSTART in facilitating the production of quality self-explanation of non-expository text. The experiment was a within-subjects design with genre (science, literature, history) and time of test (pre, post) as within-subjects variables. The six texts (2 x 3 genres) were selected and equated on the number of words, Flesch-Kincaid Grade level, and argument overlap. During the pretest, students typed SEs for eight target sentences within each of three counterbalanced texts (science, literature, history) presented in a random order. During the iSTART training, students progressed through the three main sections of the program: *Introduction*, *Demonstration*, and *Practice*. During the posttest, students typed SEs for eight sentences for each of the remaining three texts (science, literature, history). The quality of

students' SEs was evaluated by the iSTART algorithm (McNamara, Boonthum, Levinstein, & Millis, in press) which rates the quality of SEs on a 0-3 point scale, with 3 being the best score.

The complete experiment involves 272 students (77 high school, 195 college). These data have been collected and are currently being analyzed. Our initial pilot data (69 college students) have been analyzed and will be presented at this year's Society of Text and Discourse conference (O'Reilly, Taylor, Duran, & McNamara 2006). The participants were 66 undergraduate students who self-explained text from three genres: science, history, and literature. There were significant increases in SE quality across all three genres. Thus, we see evidence that the effects of iSTART training with science texts transfers to genres other than science.

Objective 2: Adaptability to the User

The goal is to make the iSTART system more adaptable to a wider range of students. A major step toward this goal is increasing the range of difficulty of the training texts. The current training texts are targeted at high school students. However, for some readers, these texts may not be challenging enough to stimulate processing at the zone of proximal development (Brown, Ellery, & Campione, 1998; Hung, 2001; Luckin, 2001; Murray & Arroyo, 2002, 2004; Vygotsky, 1978). Our past studies with high school students indicate that students vary greatly in terms of their reading skills, including their ability to self-explain texts using reading strategies (Best, Ozuru, & McNamara, 2004; McNamara et al., in press). Whereas some advanced students can use elaboration based on general world knowledge and personal experiences, many students often struggle with producing paraphrases when a target sentence is long, complex, and or contains unfamiliar words. Objective 2 is aimed at providing practice that adapts to students' current ability level. Our research plans and progress for meeting Objective 2 are represented as sub-goals in Table 2.

Table 2: Sub-goals for Objective 2

Sub-goal	Description of activity	Progress	Time frame
2.1	Increase range of text difficulty	Commenced	Years 1 and 2
2.2	Matching the text to the reader (Study 3)	Commenced	Years 2 and 3

Sub-goal 2.1: This sub-goal involves increasing the range of text difficulty. The texts contained in the text library described earlier will be analyzed and indexed in terms of various relevant text features that affect their difficulty level. We have begun acquiring texts at varying levels of difficulty (e.g., middle school and high school), based on national education standards. We are currently in the process of determining which of the many Coh-Metrix indices of text characteristics (Graesser McNamara, Louwerse & Cai, 2004; McNamara, Louwerse, & Graesser, 2002) are indicative of various types of difficulty (e.g., word-level, sentence level, discourse level).

Sub-goal 2.2 (Study 3): This sub-goal involves the matching of the level of text difficulty to the ability level of the reader. In Year 3 we will address the question of matching text to reader through a study in which the difficulty of the practice text is manipulated to be at three different levels - low, moderate, and high. This study will include 240 high school and college students that vary in terms of their reading ability and domain knowledge. Following training at one of

these three text difficulty levels, the participants' self-explanation ability will be examined using a text of moderate difficulty. We expect to observe an interactive effect such that low-ability readers will show greater improvement during training using the high-cohesion text, and high-ability readers will show greater improvement using the low-cohesion text (see e.g., McNamara, Kintsch, Songer, & Kintsch, 1996). In addition, according to the theory of the zone of proximal development, we predict that the greatest level of improvement will occur when participants read a text that they find to be moderately difficult given their ability level.

We are currently analyzing newly collected data to determine the relationship between text difficulty (in the domains of science, history, and literature) and self-explanation quality (see subgoal 1.4). At present, we are conducting a pilot study and are also designing a study to begin in the fall of 2006.

Objective 3: Responsiveness to Strategy Deficits

The goal is improve the adaptiveness of the system through an improved student model and the inclusion of additional strategy modules. This will be obtained through several means. First, there will be a refined battery of individual difference measures. This will help inform the second subgoal of developing an improved student model. Third, additional strategy modules focusing on the less skilled reader will be developed. During this process, the system components will be assessed in terms of their usability. Lastly, the expanded iSTART systems' educational efficacy will be evaluated. The progress made in each of these three areas is reported below.

Table 3: Sub-goals for Objective 3

Sub-goal	Description of activity	Progress	Time frame
3.1	Refine battery of individual difference measures	In Progress	Years 1 -3
3.2	Creation and revision of student model of strategy needs	Commenced	Years 2 - 3
3.3	Expansion of strategies included in the system	In Progress	Years 2 -3
3.4	Assess system usability (Study 4)	In Progress	Years 1 - 3
3.5	Assess efficacy of expanded iSTART (Study 5)	Not commenced	Year 4

Sub-goal 3.1: This sub-goal involves the development of improved individual difference measures. In previous research we have assessed students' competencies and aptitudes using a large battery of pretests prior to training using iSTART. The pretest measures included general reading skill (e.g., Gates-MacGinitie reading test), metacognitive reading strategy knowledge (Schmitt, 1990), metacognitive skills (e.g., Mokhtari & Reichard, 2002), general science knowledge, and specific science vocabulary knowledge. Over the past few years, we have collected data on thousands of participants that used our existing battery of pretest assessments. This large data set enabled us to evaluate our measures' ability to predict students' reading comprehension and learning gains. Our efforts have focused on evaluating the validity of our pretest measures in terms of predicting students' performance on science passage comprehension and self-explanation quality for science texts that were read both before and after training using the iSTART system.

While it is feasible to conduct two-hour pretest sessions in the laboratory, it is not so feasible to expect that teachers would be able to do so as well. Therefore our goal is to maximize the predictive power of the pretest assessments while reducing the time necessary to administer these tests. Thus far, we have evaluated each pretest measure and constituent questions in terms of whether they predict students' comprehension performance and self-explanation quality on a variety of science texts. Items (or entire measures) that showed little or no predictive validity were eliminated.

We have made significant progress in refining the battery of individual difference measures. This included the development of a more differentiated pretest that better assesses students' pre-existing knowledge on science, history and literature domain, as well as the addition of new measures of learning strategy, epistemology, and motivational factors.

The development of the prior knowledge questions occurred in the following four phases. *Phase 1:* We analyzed the data from previous studies to select the most predictive items. The selection process consisted of two stages. First, we eliminated questions whose difficulty level (i.e., proportion correct) was either above 60% or below 30%. Second, we correlated each question with several different individual difference measures (e.g., reading skill, metacognitive knowledge) and also with student's performance on several comprehension tests. Questions with low correlations to these measures were eliminated. *Phase 2:* Additional questions were taken from a test bank at Oswego City School District, Regents Exam Prep Center. This resource is an online facility that helps high school students prepare for the New York state standards subject domain tests. Questions were selected based upon moderate difficulty and topics that were not covered by our existing measures. *Phase 3:* Questions were generated by two of the post doctoral fellows to fulfill our needs that were not met by existing assessments. These were developed by sampling topics covered in high school textbooks and brief study guides. We developed near-miss, thematic, and unrelated question distracters based on the guidelines of Graesser and Wisher (2001). *Phase 4:* A total of 55 multiple choice prior knowledge questions (18 science, 18 history, and 19 literature) were piloted with 15 undergraduate students to examine the item performance. Thirty questions (10 each for each domain) were selected based on the item performance such that no items selected had either a ceiling ($> .9$) or floor effect ($< .25 =$ chance level performance). These 30 items were used in the transfer experiment conducted in the fall of 2005, and the spring of 2006. Overall item characteristics indicated that the items in each domain have reasonable variation in item difficulty without exhibiting ceiling or floor effect.

A second strategy for improving the individual difference measures was to include additional measures that have previously been found to influence learning. The new instruments were designed to measure students' learning goals, epistemological beliefs, and topic interest.

Interest. There is evidence indicating that students' engagement and learning from reading texts is influenced by their interest in the topic under study (e.g., Alexander, 1986, 1992), their learning goals (e.g., Taylor, 2005), and their epistemological beliefs (e.g., Daneman & Hannon, 2000). Preliminary analyses indicate that students' interest in the domain of science is significantly correlated with their ability to self-explain science texts prior to training, even after removing the effect of science prior knowledge and reading ability, thus indicating a unique contribution of domain interest to students' ability to self-explain science texts (Taylor & McNamara, 2006). In addition, strategy training via the iSTART system resulted in a significant improvement in self-reported understanding of the science texts and self-explanation quality. At pretest, the measures of students' understanding were significantly correlated with their measure of interest in specific texts. However, after training, these measures were no longer significantly

correlated. Hence, overall, iSTART training appears to improve readers' understanding while making it less dependent upon the learner being interested in the specific text (Taylor, Sinclair, & McNamara 2006). Similar analyses on the history and literature domains are under way.

Learning Goals. There are two primary learning goals used by students – maximizing learning or minimizing effort. Students seeking to maximize their learning are often required to exert greater effort and engage in what Bereiter and Scardamalia (1989) refer to as *intentional learning*. In contrast, some students do not seek to maximize their learning, but instead merely seek to minimize the amount of mental effort expended, taking an *effort minimization* approach. A nine-question measure of students' learning goals was introduced. Analyses of this new measure are in progress.

Epistemology. Another new measure that was introduced assessed the students' epistemology or their understanding of the nature of knowledge and knowing. Adapted from the work by Kuhn (Kuhn, Cheney, & Weinstock, 2000; Kuhn & Weinstock, 2002), this assessment helped to determine participant's epistemological level of understanding, holding that beliefs fall into one of three categories: (1) Always either true or false, (2) Relativist and merely a matter of opinion, or (3) Judgments requiring the backing of evidence. Analyses of this new measure are also underway.

Sub-goal 3.2: This sub-goal involves the creation and use of an improved student model of strategy needs. The model will be based on data gathered from the pretest battery and from the student interactions in the course of training. We envision a dynamic student model that makes use of pre-assessment data to initiate training and then is continuously updated as a function of training performance data, such as response times and question answering accuracy (e.g., strategy quiz performance). For example, in the introduction, the student is given a brief quiz after each strategy is introduced. In the demonstration section, we learn which strategies the student is able to, or prefers to identify. In the practice section, we learn how well the student is able to explain the texts and to identify strategies that are used. As this information is added to the student model, it will be possible to predict which avenues of iSTART training are most valuable as the student progresses.

We intend to make use of theoretical guidelines as well as empirical data to direct training. Both theory and data will guide options such as what level of scaffolding to provide, what strategies to emphasize, the number of examples to provide, and the amount of practice to offer. Constructing and revising a model of the student throughout training will allow us to map the characteristics of the student to an appropriate program of training. To this end, we will use data collected from previous experiments to examine the link between reader aptitudes (pretest assessments mentioned above) and the success with which students' learn and use strategies incorporated in iSTART (e.g., paraphrasing and bridging). Specifically, we aim to identify how students' level of reading skill and prior topic knowledge is associated with students' performance on the iSTART module tasks (quizzes incorporated in the Introduction module) and the use of strategies (self-explanation quality rating generated in the practice module). The overarching idea is to determine which reading strategies are appropriate for students of differing ability levels. For example, students with poor reading skills may demonstrate a poor knowledge of higher-level strategies (e.g., elaboration and bridging) and thus benefit more from learning the lower-level strategies (e.g., paraphrasing). Conversely, students with high reading skills may demonstrate a better grasp of the higher-level strategies and thus benefit from focusing solely on higher-level reading strategy training.

Sub-goal 3.3: This sub-goal involves the expansion of available strategy modules. One approach to improving the system's adaptiveness is to increase the range of strategy instruction by adding instructional modules covering both lower-level and higher-level reading strategies. These additional modules will augment the system's ability to adapt to the needs of students.

Our research has indicated that some students need more training on how to generate adequate paraphrases before they should attempt to learn higher-level strategies. Although paraphrasing does not lead to deep comprehension, it is a fundamental prerequisite to self-explanation. Thus, we realized that additional support would be needed for the lower ability students. We therefore focused our efforts in the past year on developing two additional modules ('Preparing to Read' and 'Paraphrasing') that teach more fundamental aspects of reading.

Preparing to Read Module. The goal of this module is to help student understand the nature of reading and why training provided by iSTART will help them to become more efficient and successful readers. This module is targeted at less skilled readers who need some additional guidance, beyond that provided by the standard iSTART Introduction section. Although the Introduction may be sufficient for relatively skilled readers who already intuitively know about the processes and effort involved in reading, less-skilled readers may have difficulty grounding the information in their own experience. Therefore, in developing the Preparing to Read module, we tried to anchor the reading strategy and self-explanation information more thoroughly on readers' personal experiences.

Previewing Module. The goal of this module is to teach the student to get an idea of what the text is going to talk about. Hence this is done before they actually start reading the text and also enables them to set a goal of why they are reading. This generally involves a short, focused examination of the text and notice things like titles and subtitles, introductory and concluding or summary paragraphs, review questions, emphasized words and phrases, charts and diagrams. This promotes better comprehension when the text is actually read. This year we have developed prototypes that can be used to introduce, demonstrate and practice Previewing. This helped us discover and solve the technical challenges involved in making Previewing possible in a computer program. Challenges include presenting large texts, control page navigation, recognize which previewing element the student identified and how to know which type it belonged to, etc. The Previewing Introduction illustrates previewing with snippets of text taken from a science chapter. This, like the iSTART introduction, uses three Avatars which play roles in describing previewing. For Previewing practice, we have developed three prototypes. 1) *One page at a time* – Students examine all the types of previewing objects on one page before being allowed to proceed to the next. 2) *One category at a time* – Students examine one type of previewing object at a time, which is perhaps more like what the students would actually do. They are directed to look for titles and subtitles first and then other components, going through all the pages each time. 3) *Free Form* – Students may focus on any previewing components in any order. This will mimic a more natural previewing process.

Paraphrasing Module. The goal of this module is to help students to be able to produce quality paraphrases. As mentioned earlier, many high school students have difficulty producing paraphrases. This is problematic because this may mean that they have difficulty understanding the meaning of individual sentences. If readers have considerable difficulty understanding the meaning of individual sentences, they are unlikely to benefit much from training on higher-level reading strategies such as elaboration and bridging inferences. Being able to form a mental model of the meaning of individual sentences is a necessity for higher level text comprehension.

For this reason, we are developing a new paraphrase module to provide more intensive training on paraphrasing for individual sentences of varying levels of difficulty.

The Paraphrasing module consists of two phases: (1) An introduction that provides a definition of paraphrasing and an explanation for how paraphrasing can help one better understand texts, (2) A practice phase, in which the students are requested to paraphrase some example sentences. First, a student-agent will produce an example paraphrase based on a low difficulty sentence. After the student studies how the example paraphrase compares to the target sentence, the target sentence and the example paraphrase will disappear from the screen. The student is then requested to produce their own paraphrase based on their understanding of the target sentence. In evaluating the quality of the paraphrase, we are planning to use the same evaluation algorithm as in the current iSTART system.

Question Asking Module. The goal of this module is to help students be able to general deep-level questions. Here, we make the distinction between a shallow question, which focuses mostly on verification and other short-answer aspects, and a deep-level question, which tends to focus on assertions, judgments, and other questions which require longer answers (Craig et al., 2000). Such a tool is necessary because (1) previous research on questions asked by students suggests that students ask very few questions (whether shallow or deep-level) during a typical classroom session (Graesser & Person, 1994) and (2) several studies (e.g., King, 1992, 1994) suggest that training in self-questioning may increase students' comprehension of a text.

The Question Asking Module will begin with animated agents discussing the significance of asking questions when reading a text, and then briefly explain how to ask deeper questions (such as those that link ideas within a text or link textual ideas with ideas already present in long-term memory). The module will then enter a "practice" session, where the student will ask questions based on selected target sentences within a science text. The participants' questions will be interspersed with questions asked by another agent. Both the participant and the "asking-agent" will receive feedback from an "instructor-agent." This will allow us to integrate detailed examples of questions and feedback for the asking-agent, while the participant practices and receives more general feedback. Such a "turn taking" style of practice should help scaffold the new strategy for the user. This module is currently under development and will be completed for use in an experiment in the fall of 2006.

What's the Main Point Module. The goal of this module is to help student to find the main ideas in text paragraphs by focusing on their central ideas, themes, and supporting details. The purpose of the module is similar to training systems that teach summarization. However, here, the focus will be on finding the main points and distinguishing those from details, rather than writing complete summaries of texts. This module is currently under development. We are currently envisioning this module to have an introduction part like the iSTART introduction and a practice module where the students can practice finding the main points. Prototypes of both the introduction and practice parts have been developed and we expect to commence development of this module in the fall of 2006.

New Question Manager in Demonstration. Our goal is to reduce the difficulty of the demonstration module and make it more flexible and responsive to the student's level of performance. This first required a task analysis of what the students needed to do in order to answer questions in the module. Considering factors such as working memory requirements and relevant skills, we have attempted to reduce the complexity of each task by improving the following components.

- Questioning methods: (1) give a set of strategies for selection in a multiple-choice box, (2) tell the student one of the strategies that was used, or (3) tell the student the strategy and remind him/her of the strategy's definition.
- Tool tips: When a multiple-choice dialog box is used, "tool tips" that contain reminders of the strategies' definitions are available to the student. The reminders are activated by clicking on a button next to the strategy choice.
- Focus: The original version required the student to inspect (and parse) the whole self-explanation. We added the capability to direct the student's attention to a portion of the self-explanation.
- Pre-parsing: The parts in the self-explanation where different strategies are used can be highlighted in alternating colors.
- Follow-up response: When the student makes an error, we have the option of telling the student which strategy was used.

Sub-goal 3.4: This sub-goal involves assessing the system's usability. Our approach to usability analyses will be three pronged, using a combination of information gathered via think-aloud protocols, eye tracking, and task-completion rates. While the usability studies are primarily planned for years 2 and 3, we have previously conducted a pilot investigation that tapped into students' eye-tracking movements when using the program. The main findings were that when an agent talks, the participants pay attention to the agent, but they do not look at the agent when the agent is quiet. In addition, participants pay attention to the appropriate agent when the speaking agent refers to that other agent.

A second usability study was performed which explored the possibility of providing more user-based control over the iSTART interface by allowing the background color for pages to be alterable. Such a change would provide the user with a more appealing interface from which to interact with the iSTART system. This change must answer two important questions (1) is there a need for background color change, and (2) will background color change effect performance. To answer these two questions, two experiments were designed. The first experiment assessed the need for color change and was completed during the spring of 2006. The second experiment will determine the effect of background color on iSTART and is planned for the fall of 2006.

Experiment 1 was a preference study for iSTART background colors. In order to provide a manageable set of alternative color schemes, the number of colors examined were constrained to primary (red, yellow, or blue), secondary (green, orange, or violet), tertiary (combinations of one primary and a secondary color of which they were a component color), black, white, or the original color of iSTART. A single snapshot of each module was used for comparison with background colors. Preferences for each of the 15 different background colors were obtained for each iSTART module. Two colors, orange and blue, were preferred across all three modules more than the current iSTART background color. These findings provide the basis for continuation of the study to address whether alterations to background colors will affect performance. Experiment 2 will contain altered iSTART modules allowing learners the option of changing their background color at the beginning of each module. Performance between users using the current background color for iSTART and other colors will be compared.

Objective 4: Teacher Interface

The goal is to provide an effective and user-friendly user interface for teachers using iSTART in their classrooms. So far iSTART has only been implemented in classrooms under

experimenter control. Scaling up the program means that the classroom teacher would need to have control over how the program is to be used. Our research plans and progress to meet Objective 4 are represented as sub-goals in Table 4.

Table 4: Sub-goals for Objective 4

Sub-goal	Description of activity	Progress	Time frame
4.1	Development of teacher interface	Commenced	Years 1 – 3
4.2	Teachers’ needs assessment (Study 6)	Completed	Years 1 – 3
4.3	Assessment of teacher interface (Study 7)	Not commenced	Year 3
4.4	Assessment of teacher interface in classroom (Study 8)	Not commenced	Year 4

Sub-goal 4.1: This sub-goal involves the design of the iSTART user interface to be used by teachers in their classrooms.

Teacher Instruction Module. In order to maximize the effectiveness of iSTART, we believe that teachers need to have an understanding of relevant underlying psychological theory. We will therefore provide teachers with the basic information about the reading strategies and why they are effective. This information will cover topics such as theories of text comprehension, the effect of prior knowledge on reading, and the importance of reading strategies. We have prepared the required material for this and are in the process of developing a prototype as a set of WebPages. This approach will let us provide this material in a brief and simple manner. More details can be assessed by following the links in the WebPages. This module also aims at providing teachers a “hands-on” tour of the iSTART modules. As a part of this, we have developed demonstration version of iSTART. A menu has been added to iSTART to allow the teacher to explore all modules without being required to complete each one. This will enable the teachers to get a better idea of the tasks that their students will experience.

Training Organizer and Manager Module. The goal of this module is to provide technical and practical support to the teachers so that they can use iSTART effectively. The option of being able to customize the training for different levels of student ability is important for improving the effectiveness and adoption rate of the iSTART system. The teachers will be able to designate different training sequences or modules for different groups of students in the same class or different classes. The *registration and enrollment management* features should allow the teacher to sign-up to iSTART, add a class, register students to their selected class, transfer a student, add a new student in middle of class. Detailed PowerPoint prototypes have been designed as the first step. The *scheduling and policy* features should allow the teachers to set up the curriculum by configuring different modules of iSTART. Modules can be mandatory, optional and can also have prerequisite modules. The program will have default sequences for students based on their assessed ability; however, this module will allow the teacher to modify those sequences. The teacher will also be able to choose training and practice texts. We will provide a library of texts that will encompass a wide selection of topics and domains from which to choose. The curriculum policy concerns whether the students take the modules at their own pace, one after the other, or take them on a schedule; whether missed modules can be made up and, if so, whether the current module is taken first or last. We have a prototype developed in power point for this part as well. These prototypes will allow us to simulate what teacher will

experience and provide feedback that will enable us to make the interface more useful and user friendly.

Performance Analyzing Tool Module. The purpose of this module is to provide teachers with a means to monitor students' performance and progress during training. In addition to reporting the students' pre-training assessment scores, this tool will provide regular reports on the assessments that occur during the iSTART training. These reports will help teachers to gauge the students' performance. This tool will also help teachers create customized iSTART training sequence that will be better suited to individual students. In this Module, the main challenge involves determining the right amount of data to be included in the reports generated for the teachers. Although these reports present summary information, the teacher will also have access to more specific information such as the modules completed, time spent, number of attempts, and performance on each attempt. An interface to access the student's progress on iSTART trainer and pretest has been developed. For a selected class and selected module, the teacher can view the student information by module or by student. Two versions of reports can be generated: (1) a table in HTML format presented on the screen, and (2) an XLS Excel file to be downloaded. These excel files may be useful for the researcher to later examine the data more closely. The reports that can be made available to the teachers are: i) scores on each of the pretests by test, ii) scores on each of the quizzes of the introduction, iii) student level after each of the sentences of the demonstration section, and iv) explanations produced by student on each sentence of practice and extended practice. What we intend to include is partially based on teacher interviews.

Sub-goal 4.2 (Study 6): This sub-goal involves assessing the needs of teachers for using iSTART in the classroom. The iSTART system is to be developed in such a way that it enables teachers and students to be able to use the tool with ease and efficiency. As a first step toward assessing teachers' preferences when using the interface, we had previously conducted a pilot study in which teachers that had used iSTART system before provided us with their opinions about the teacher interface and iSTART in general. This information has served to guide our refinement of the iSTART system.

In order to effectively develop iSTART and the teacher interface, it is necessary to evaluate both the general computer technology skills of teachers and the current availability and usability of computer technology in the average public high school. The goal of the current study was to evaluate what high school teachers know about computer technology, the availability of computers, electronic media, and internet technology for teachers, and the extent to which teachers actually utilize the various available technologies.

Principals at five area high schools in the Memphis City School system were selected and recruited by the Center for Research in Educational Policy (CREP) at the University of Memphis. For faculty participation in the iSTART Needs Assessment survey, schools were given a \$500 stipend. A total of 127 teachers participated. For the Memphis City Schools the student race/ethnicity percentages for the 2005-2006 school year were as follows: 87% African American, 9% Caucasian, and 4% Other.

A CREP researcher attended after-school faculty meetings at the schools to administer the surveys during March and April, 2006. Surveys were completed during these meetings and were then collected by the researcher. The surveys were anonymous and the data from the surveys will be reported in aggregate to preserve the anonymity of respondents.

Three instruments comprised the survey: The Technology Skills Assessment (TSA), Teacher Technology Questionnaire (TTQ), and the iSTART Teacher Questionnaire. The first two are

CREP-designed instruments, and the last instrument was designed by iSTART researchers, with input from CREP.

The TSA was developed to assess teachers' perceived technological abilities and knowledge. Teachers rated themselves on a three point scale ('not at all', 'somewhat', 'very easily') with respect to "How easily" they could perform certain tasks. The six task categories included Computer Basics (e.g., 'How easily can you use keyboard commands to cut, copy or delete text?'), Computer Software (e.g., 'How easily can you open and use software programs that are installed on your computer?'), Multimedia Basics (e.g., 'How easily can you import digital video from a camera to a computer?'), Internet Basics (e.g., 'How easily can you use the internet to find help when you have a computer problem?'), Advanced Skills (e.g., 'How easily can you publish information in a variety of media (e.g., printed, monitor display, web-based, video)?'), and Using Technology for Learning (e.g., 'How easily can you use multimedia software to enhance learning experience?'). A sixth section posed questions on the teachers' understanding of site licenses and copyright issues. There were a total of 56 questions in the TSA assessment.

The TTQ focuses on teacher experiences with regard to technology usage, professional development, accessibility of technology resources, and confidence in using technology. Teachers rated statements on a five point scale ('strongly disagree' to 'strongly agree'). Examples of TTQ statements are 'My students have adequate access to up-to-date technology resources' and 'Materials (e.g., software, printer supplies) for classroom use of computers are readily available.' There were a total of 20 technology statements and eight demographics questions (e.g., 'Do you own a home computer?').

The iSTART Teacher Questionnaire focused on teaching strategies, teaching methods, and evaluation techniques (see Appendix A). Additionally, teaching demographics were collected. The results of this study will be used to assess the ability of current teachers to utilize available computer technology in the classroom. This information will help in developing an iSTART program that enables teachers and students to use the tool with maximum ease and efficiency. The data from the surveys is currently being tabulated with data analysis beginning in June of 2006.

Sub-goal 4.3 (Study 7): This sub-goal involves assessing the teacher interface. In year 3 the usability of the system will first be tested with undergraduate students using methods such as eye tracking and think-aloud protocols. We will use a structured series of formative evaluations including one-to-one and small group sessions. The full study will include 30 teachers of varying backgrounds and ability levels. The teachers will be given a mock set of students, and be asked to accomplish a particular set of goals. Performance, as assessed using outcome measures (behavioral observations, eye tracking, and think-aloud protocols) will inform further development.

Subgoal 4.4 (Study 8): This sub-goal involves the in classroom assessment of the teacher interface, and expanded iSTART system. In year 3 the system will be tested on a small scale with 6 teachers, in approximately 30 classrooms, within a single high school. The teachers will be provided with the necessary training and asked to integrate the system into their classroom. During the first half of the academic year (i.e., the fall semester), data will be collected to assess student and teacher performance prior to the introduction of iSTART. The assessments will include measures of student performance, but it will focus on factors such as teacher classroom practices, the number of reading assignments, reading strategy knowledge, reading strategy

instruction, technology experience, and attitude toward technology use in the classroom. This data will be collected via archival data, surveys, focus groups, and classroom observations and will be used to help refine the iSTART system. In January of the target year, teachers will be fully trained in the use of the iSTART system. Observational and survey data, mirroring that collected in the fall semester, will continue throughout the spring semester. In addition, teachers' and students' use of iSTART will be automatically collected via the web. Using the standard design approach, if problems are detected or if teachers make particular requests, revisions to iSTART will be made during that semester. At the end of the year, survey data will be collected by our outside evaluation team (i.e., CREP) to assess the impact of iSTART on the school and the classroom.

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Appendix A

TEACHER SURVEY

1. Which of the following applies to you?
 - a. I have a professional teaching license.
 - b. I have a provisional (temporary) teaching license.
 - c. I do not have a teaching license.
 - d. Other _____

2. How many hours of Continuing Education have you had this academic year? _____
3. How many teaching conferences have you attended during this academic year? _____
4. How many years experience do you have teaching high school courses? _____
5. How many years experience do you have teaching courses at grade levels below high school? _____
6. How many different topics have you taught (for instance, science is one topic, history is one topic, etc.)? _____
7. How many years of teaching experience do you have in total? _____
8. Have you received training in reading instruction this academic year? ___yes ___no
If yes, what type of training did you receive?

9. Please list below any Professional Journals you have read within the past year:

10. Approximately how many hours of homework per week do you assign your students? _____

11. Approximately how many pages of reading per week (outside of class) do you assign your students? _____

12. Which of the following best applies to you?
 - a. My most important goal is to cover as much content during the year as possible.
 - b. My most important goal is to provide students with the means to learn on their own.
 - c. My most important goal is to teach students to apply the information that they learn to other situations.
 - d. My most important goal is to ensure that my students have learned all of the material covered on state tests.

13. Please list the specific name/title for each course you are teaching this school year.

Teaching Strategies

Instructions: Please rate how often you use or encourage use of the following reading strategies in your classes by selecting the appropriate choice describing frequency of use over the last 12 months. (Select 0 for unfamiliar strategies.)

0 Unfamiliar Strategy Use	1 Never Use	2 Have Tried Once	3 Use Sometimes	4 Use Often	5 Very Frequent
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I have used the following reading strategies when teaching during the last 12 months:

a. PAR Lesson Framework.....	0	1	2	3	4	5
b. Textbook Treasure Hunts.....	0	1	2	3	4	5
c. Possible Sentences.....	0	1	2	3	4	5
d. Two Column Notetaking.....	0	1	2	3	4	5
e. Guided Reading Procedure.....	0	1	2	3	4	5
f. Remembering.....	0	1	2	3	4	5
g. Reading Response Charts.....	0	1	2	3	4	5
h. Interactive Notation System for Effective Reading And Thinking (INSERT).....	0	1	2	3	4	5
i. Anticipation Guides.....	0	1	2	3	4	5
j. Structured Overviews.....	0	1	2	3	4	5
k. Reading Roadmaps.....	0	1	2	3	4	5
l. Pattern Guides.....	0	1	2	3	4	5
m. 3-Level Study Guides.....	0	1	2	3	4	5
n. Reciprocal Teaching.....	0	1	2	3	4	5
o. Cubing.....	0	1	2	3	4	5
p. Semantic Feature Analysis.....	0	1	2	3	4	5
q. Speed Reading.....	0	1	2	3	4	5
r. Directed Reading Thinking Activity (DRTA).....	0	1	2	3	4	5
s. Concept Guides.....	0	1	2	3	4	5
t. Post-Graphic Organizers.....	0	1	2	3	4	5
u. Comprehension questions.....	0	1	2	3	4	5
v. Reading questions.....	0	1	2	3	4	5
w. Paired reading.....	0	1	2	3	4	5
x. Subtitle questions.....	0	1	2	3	4	5
y. Read/outline.....	0	1	2	3	4	5

Teaching Methods

Instructions: Select the number that best describes your teaching methods.

	1	2	3	4	5	
	Never	Seldom	Sometimes	Often	Very Frequently	
					Very	
				Never	Sometimes	Frequently
1. I like learning and using new teaching methods.....	1	2	3	4	5	
2. I teach with an overall yearly plan in mind.....	1	2	3	4	5	
3. I teach to my students' interests, creating weekly plans.....	1	2	3	4	5	
4. After my class plans are made, I change them if necessary.....	1	2	3	4	5	
5. I use the following teaching activities:						
a. Lecture.....	1	2	3	4	5	
b. Worksheets.....	1	2	3	4	5	
c. Drills (repetition to learn information).....	1	2	3	4	5	
d. Simulations (plays, making models).....	1	2	3	4	5	
e. Experiments/Labs.....	1	2	3	4	5	
f. Debates.....	1	2	3	4	5	
g. Games.....	1	2	3	4	5	
h. Project Reports/Presentations.....	1	2	3	4	5	
i. Group Projects.....	1	2	3	4	5	
j. Brainstorming/Circle of Knowledge.....	1	2	3	4	5	
k. Field Experiences.....	1	2	3	4	5	
6. I use the following teaching aids:						
a. Overheads.....	1	2	3	4	5	
b. Films/Videos.....	1	2	3	4	5	
c. Slides.....	1	2	3	4	5	
d. Computers.....	1	2	3	4	5	
e. Laboratory science materials (rocks & minerals, microscopes, plants, test tubes, models etc.).....	1	2	3	4	5	
7. I promote Question/Answer classroom interaction.....	1	2	3	4	5	
8. I use teacher demonstration.....	1	2	3	4	5	
9. My students ask many questions during class.....	1	2	3	4	5	
10. I spend time with my students outside of class.....	1	2	3	4	5	
11. I use readings beside the required textbook.....	1	2	3	4	5	
12. My coursework requires my students to use computers.....	1	2	3	4	5	
13. I assess my students' learning techniques at the beginning of the year.....	1	2	3	4	5	

	Never	Sometimes			Very Frequently
14. I supervise my students' work closely.....	1	2	3	4	5
15. Facts and concepts are the most important things that students should acquire in my class.....	1	2	3	4	5
16. I team-teach with another teacher.....	1	2	3	4	5
17. I prefer to teach alone.....	1	2	3	4	5
18. When a student asks a question, I provide the answer.....	1	2	3	4	5
19. When a student asks a question, I tell the student how to find the answer.....	1	2	3	4	5
20. I teach students how to learn and understand information.....	1	2	3	4	5
21. When I give homework assignments, I assign:					
a. Readings from the textbook.....	1	2	3	4	5
b. Readings from outside sources (articles, newspapers, other books.).....	1	2	3	4	5
c. Worksheets.....	1	2	3	4	5
d. Projects/Labs.....	1	2	3	4	5
e. Problem sets.....	1	2	3	4	5
f. Reading guides.....	1	2	3	4	5
g. Lab conclusions.....	1	2	3	4	5
22. I teach various comprehension strategies:					
a. To all my students throughout the year.....	1	2	3	4	5
b. To all my students at the beginning of the year.....	1	2	3	4	5
c. If I feel a particular student needs it.....	1	2	3	4	5
23. I try to solve problems that I have with students by:					
a. Working with the student.....	1	2	3	4	5
b. Talking with other teachers.....	1	2	3	4	5
c. Talking with the students' parent(s) or guardian(s).....	1	2	3	4	5
d. Talking with the school counselor.....	1	2	3	4	5
24. I give my students the responsibility for learning the material.....	1	2	3	4	5
25. I explain to my students what they are going to do next in class.....	1	2	3	4	5
26. My students know the purpose of class activities.....	1	2	3	4	5
27. I use the state standards to guide my teaching practices.....	1	2	3	4	5
28. I teach to the state standards test.....	1	2	3	4	5
29. I teach to the course textbook.....	1	2	3	4	5
30. I teach to my students' predominant learning style.....	1	2	3	4	5
31. My most important goal is to cover as much content as possible. 1	1	2	3	4	5

