Developing Reading Comprehension Skills in Another Language: A Computer-based 21st Century Prototype

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Abstract

This paper describes a prototype computer-based reading comprehension program. It begins with a short description, at a general level, of theoretical issues relating to the learning of comprehension skills in a foreign/second language learning. These issues cover such areas as personal meaning-making on the basis of individual differences and the need for individualized intervention to maximize the comprehension process. Modern technology facilitates this process and enables simultaneous support of large numbers of students. Specifically, from a learning perspective, the program focuses on students' personal understandings while, from a reading perspective, the construction of meaning is based on an interactive model where both high-level (global, inferential) structures are elicited/studied as well as low-level structures (e.g. vocabulary, grammar). These principles are strengthened with research findings from studies in awareness and language processing based on eye-movement analysis. As part of its reading comprehensions focus, the system also has a strong commitment to the development of critical thinking skills, recognized as one of the most important 21st Century skills. The program is then described in detail, including its ability to store students' responses and to be administered through standard learning management systems. Finally, an outline of planned future developments and enhancements is presented.

***Keywords**:* CALL, TELL, reading comprehension, language learning, language teaching

Introduction

It has been widely agreed for a long time that the development of comprehension skills is of critical importance in foreign/second language (L2) learning (e.g. Faerch & Kasper, 1986). It is also recognized that people necessarily understand differently as a result of individual differences emerging from their diverse backgrounds ranging from unclassifiable life experiences to internal schemata to sociocultural practices and cultural discourses (Eskey, 2005, p. 570). It is further understood, increasingly, that the existence of individual differences signifies that, for optimal outcomes, students need to be supported "differently", i.e. in ways which take account of these differences (Dörnyei, 2005, Ellis, 2008, p.5). In this context, a "one-size-fits-all" approach to the learning/teaching of comprehension skills is, necessarily, insufficient. These considerations, taken together, also mean that it becomes effectively impossible for a teacher or course designer to manage all the (unknown) variables involved in developing the comprehension skills of large numbers of people. For reasons of efficiency in managing the complexity of the situation, it seems more effective to transfer the responsibility of the task of growing comprehension skills to those who are closest to the problem and who, under the right circumstances, are best able to deal with it: the students. Hence, the need to develop autonomous solutions to the problem of growing L2 comprehension skills or, in Benson's terms, to enable people to "tak[e] more control over their lives" (Benson, 2006, p. 1). While these comments apply to all comprehension skills, this paper will focus on issues of reading comprehension.

In parallel with this conclusion, society is developing a new "autonomous" learning paradigm characterized by the spontaneous desire of ordinary people to solve personal problems for themselves and to take charge of their educational needs through the benefits of modern

technology, echoing Benson's sentiments (Benson, 2006). This attitude manifests itself in current Do-It-Yourself (DIY) or self-managed mindsets for solving problems as and when they occur (Lian & Pineda, 2014). The presence of these developments can be observed through at least two example phenomena: (a) the more than 12 billion (12,081,000,000) hits on the Google search engine in the United States alone during the month of August 2014 (Comscore, 2014) (people have countless questions to ask for the countless problems they wish to solve autonomously) and (b) the very large enrollments (often $40{,}000^{+}$ students in one course) (Jordan, 2014) in Massive Open Online Courses (MOOCs) together with their very high dropout rates (in the region of 90%) (Jordan, 2014), leading the observer to believe that people are enthusiastic about learning but are not interested in course completion, obtaining formal qualifications or learning beyond a certain level. In the MOOC context, they seem to be "amateurs" of learning in the original sense of the word.

The above context makes the issue of foreign/second language learning in the 21st Century particularly interesting, but it becomes even more so for people living in Asia with the rollout of the ASEAN Economic Community (AEC) in 2015 (Association of South-East Asian Nations, 2009, p. 80, p. 81 and p. 125) and the use of English as the common working language. This development creates the unusual situation where English will be used by an entire community of nations where English is actually the mother tongue of none. It is, however, an official/national language for four member nations (Brunei Darussalam, the Philippines and Singapore, with Malaysia having a large number of speakers), thus creating an imbalance in the distribution of English language skills and a resultant potential imbalance in professional and personal opportunities. Measures need to be taken to redress this imbalance and programs for English and other languages will have to be developed.

As from 2015, mobility among the member nations of ASEAN will grow. In principle, all migrant workers will be expected to know English at some level (though in the beginning many will most likely not). Further, as stated, it will be necessary to maintain and develop local languages and cultures. English, in its new status of English as a Lingua Franca (ELF), will almost certainly become largely separated from its original enveloping cultures so as to serve the purposes of all cultures. Local/national languages, on the other hand, will be required for life beyond the workplace (at least until, and if, English ever propagates emotionally sufficiently to enable it to occupy a position similar to that of current local/national languages).

Whatever happens, the likely outcome in the short to medium term will be a dramatic growth in the demand for English and related language services in both formal and informal contexts, the latter being driven largely by necessity and its unpredicted and unpredictable, "just-in-time", requirements. This will place pressure on all language professionals (not to mention the countless amateurs teaching English) to enhance their offerings and provide systems responsive to the individual needs of the large DIY generation that will create these unpredicted and unpredictable needs.

The rest of this paper describes a modest attempt to contribute to this improvement. Specifically, it deals with the development of the reading skill in a foreign/second language through a computer-based, autonomous (self-managed), approach and will use English as a prototypical example though the structure described can apply to all languages. It should also be noted that while feedback is provided in English, it could just as easily be provided in the students' native language (e.g. Thai).

Brief Theoretical Considerations

While the basic orientation of this article is of a practical nature, focusing on a description of software and interactions with students, the fundamental assumptions governing the development of this software will provide a context.

The prototype described here assumes that, from a learner's perspective, (a) meaning is constructed and not found. It is the product of each person's background knowledge (in the broadest possible sense – not just linguistically); (b) the creation of meanings depends on recognition (as it depends on knowledge and patterns already embedded in a person's background knowledge). As we cannot predict on the basis of nothing, prediction also depends on background knowledge. Thus, both recognition and prediction necessarily depend our background knowledge; (c) internal generation of meaning is constructed on recognition/prediction but can be richer than understandings already embedded in the learner's background knowledge. These new understandings can, in turn, modify learners' background knowledge. This can include attempts to understand newly-identified/perceived external signals (Godfroid & Schmidtke, 2013, p. 183) (an intellectual position not far removed from Krashen's input hypothesis (Krashen, 1985) where the new is built upon the old) and (d) difficulties and learning needs will emerge from the L2 learner's attempts to perform tasks rather than by a teachers' arbitrary decisions about what is difficult or easy. These assumptions are broadly based in constructivist views of knowledge creation and learning which all revolve around the "centrality of the learners' activities in creating meaning" (Biggs, 1996, p.347).

Against this background, the task of learning will be to change learners' background knowledge by enabling them to make sense of symbols and phenomena (including those of language) which had hitherto made no sense to them (i.e. had been excluded, by life, from their

field of relevance and were therefore unperceived, invisible and operationally unknown). This change will be achieved through a process of awareness-raising and noticing (e.g. Mackey, 2006, Schmidt, 2012) supported by self-awareness and critical thinking reflections. Critical thinking has been identified as one of the most valuable skills for the 21st century and has a high priority in education, specifically, language education (Theisen et al., 2011). It will be a main focus of the program.

From a learning theory perspective, and as a logical consequence of the above, the starting point for all learning processes will, as far as possible, be students' personal understandings as expressed either through their spontaneous productions or in response to questions or other interactions.

From a reading theory perspective, the construction of meaning from written text is based on an interactive model (e.g. Eskey 2005, Grabe & Stoller, 2013, p. 12). The system assumes that comprehending a written text is an activity that constructs meaning through the influence of both high-level units such as gist or complex/inferred ideas and low-level units such as words and grammar. These two layers constantly inform one another and use information or clues from each other to reinforce, reject or modify meanings constructed by the reader. These then are the guiding principles for the reading software to be described here. These principles will be strengthened with techniques and procedures for supporting successful meaning-making. But why choose a computer-based approach?

In light of the above, it is clear that, at least potentially, there will be a broad range of different meanings generated by learners faced with the difficulties of understanding written language. From both a learning and even an ethical perspective, these differences need to be addressed at a personal level. Technology, because of its ability to manipulate information and

connect machines and people, can enable each and every student to have the freedom to engage and test his/her personal meaning-making mechanisms in private and receive individualized feedback (either provided by the system or actually constructed by the students themselves from their interactions with the system). In this way, students actively engaging with the program will have, in principle, the majority if not all of their own questions answered and will be able to make personal progress rather than wasting time coping with the questions and uncertainties of others (as in a standard classroom). This is something which is impossible in traditional settings.

Description of the Software

Preliminary Remarks

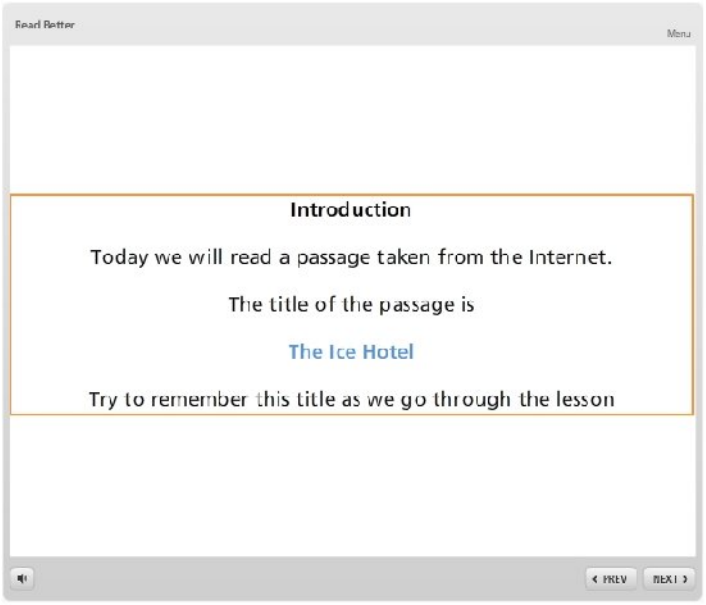
The software described below is a prototype written using the Articulate Storyline authoring system (http://articulate.com). This system provides many, though not all, of the facilities needed by advanced technology-enhanced language-learning software together with the ability to generate its own lesson variables and the potential to interface with other systems.[1]

Phase 1. The program begins with a traditional disclosure of the title of the reading passage.[2] Its purpose is to begin creating a context for the reading and to mobilize prior knowledge. In the context of this reading program, prior knowledge is not taken to mean words, expressions or phrases relevant to the topic or subject matter, nor does it provide advance organizers or other forms of preparation such as vocabulary lists or phrases likely to be found in the passage. It is broader in scope and designed to mobilize and expose the memories and, quite explicitly, the feelings of students relating to the subject of the reading in an attempt to activate and expose their current background knowledge or personal understandings for subsequent

[1] The author has no connection whatsoever with Articulate except as a user of Articulate Storyline

[2] The reading passage used here was retrieved from the Internet (http://icehotel.co.uk). It is used as an illustration of a possible text for study. Furthermore, interactions provided here are purely illustrative and do not necessarily represent genuine student interactions.

confrontation with their understandings of the reading text as they engage with it. Disclosure of the title is only the beginning of the process of bringing out students' personal understandings. These understandings are then compared and contrasted with those of others in a series of exchanges designed to alter students' background knowledge.



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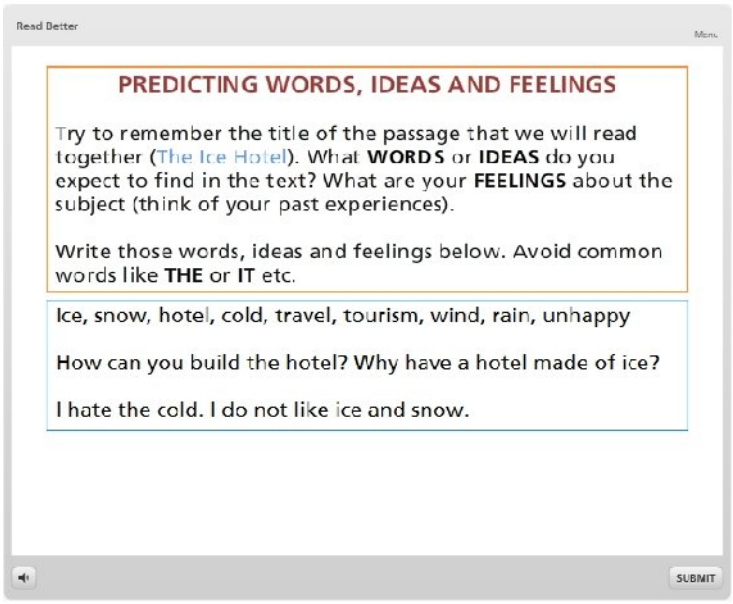
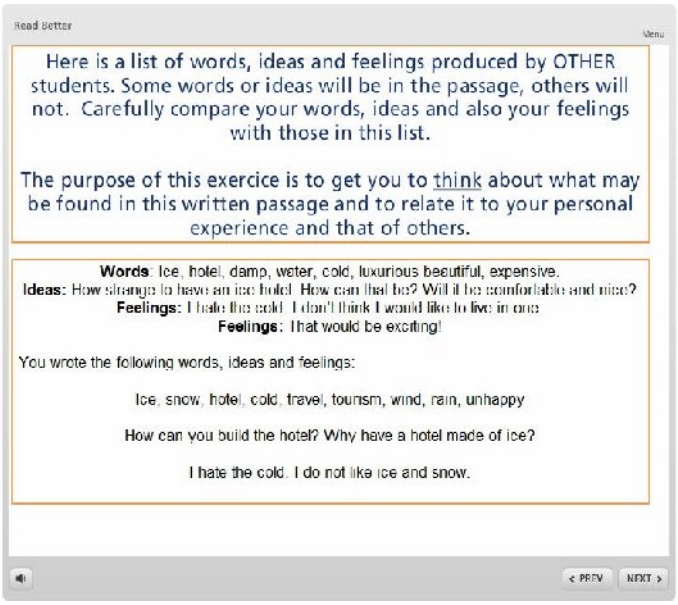


Here the students' responses are collected. While these responses will be used in the next phase of the program they can, if desired, also be stored separately in a data storage system

so as to produce a growing corpus of responses representing the understandings of, beliefs about and reactions to the subject of the passage. In due course, after large numbers of examples, this information could form a rich source of research materials to investigate for cross-cultural and cross-linguistic understandings (national, social, linguistic, etc.) that will help reveal the ways in which students from various communities process the same text or, to put it another way, how different sociolinguistic groups react to the same textual stimulus. Importantly, in this particular case, though, students' responses can be recycled automatically into the rest of the reading comprehension program, feeding into the first frame of the next screen and acting as highly diversified but authentic points of comparison between present and past users of the program. In other words, the reading program does not depend for its effectiveness on pre-determined content and responses but on its interactions with users thus creating a rich, dynamic and evolving environment where meanings are refined largely by the learners themselves on the basis of the comparisons they themselves make between the texts they generate and those of previous students. This is part of the originality of the program. The next screen will illustrate.

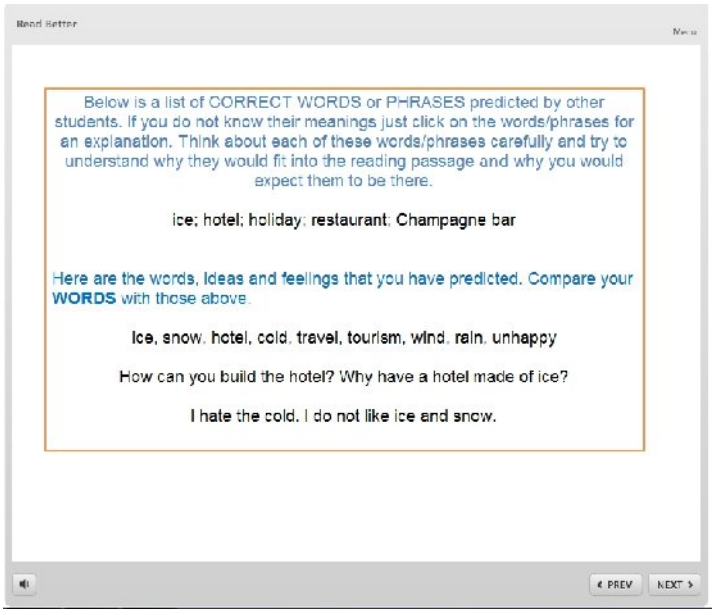


The responses offer interesting points of comparison. Some of the words, even phrases, produced by the current user are found in the list produced by previous users but some are not. The same is true of ideas and feelings which, in this case, reflect similar preoccupations and

expectations (the students were Thai and, in general, Thais do not like the cold).

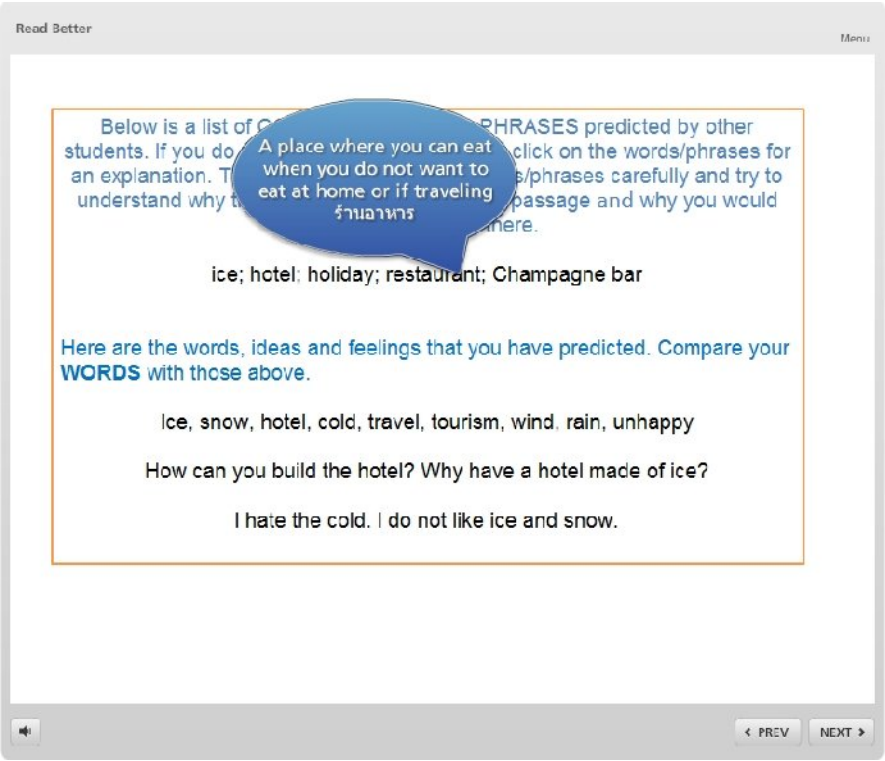
The accuracy of these preoccupations and expectations will be tested later in the program but, at this stage, form a solid student-based set of inferences on which to build. They are generated by the learner and not imposed. Comparisons made by the students themselves will begin refining the expectations they themselves have created against expectations by others to create a plausible student-generated, personally-relevant, linguistic and intellectual context for further study.

While the work done so far has revolved around the mobilization of personal background knowledge, it also lacks certainty. The next section will try to restore some certainty by focusing more on the text about to be studied and providing students with the potential to recognize some aspects of the text. This recognition may give them some confidence in relation to the processing of text and may also partially act as advance organizers which, simultaneously, will confirm or deny some of their stated (even unstated) assumptions about the nature and content of the text signaled by the title. In so doing, this procedure will narrow the students' field of inference and permit them to make more precise attempts at comprehension. This procedure does not provide "correct"



answers or make judgments about the students' knowledge. It just signals what is actually in the text.

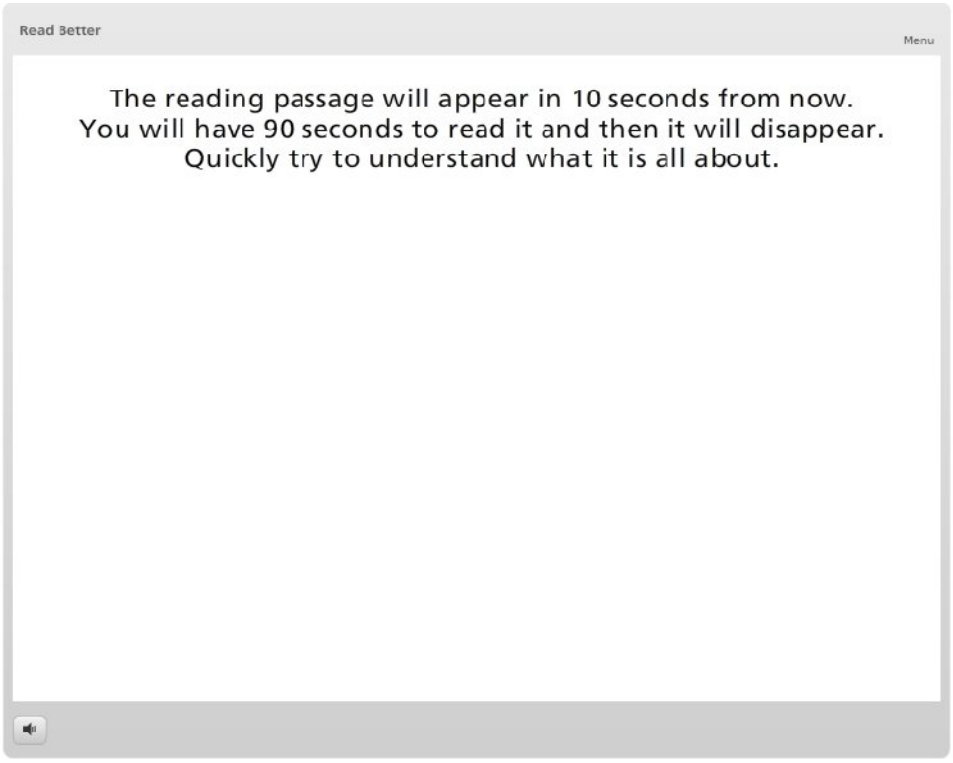
The following slide shows what happens when a hotword is clicked (note the Thai word in the bubble).



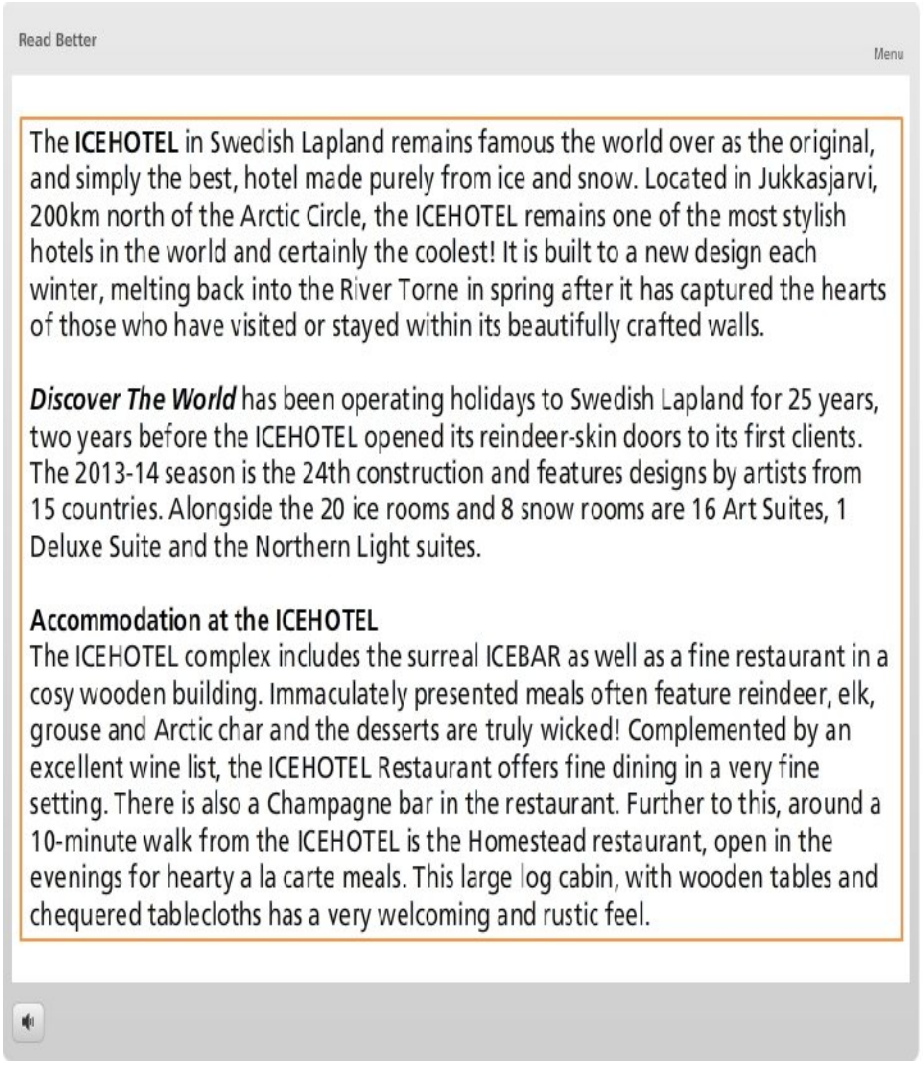
Phase 2. Phase 1 is followed by a challenging scanning exercise designed to make students focus on holistic rather than detailed meanings and to experiment with non-linear reading. They are given the timed task (90 seconds at this stage) of making quick sense of the reading text. This procedure is similar to the skimming and scanning often suggested in reading exercises (e.g. Hamp-Lyons, 1985) but, in this case, it occurs only after their background knowledge has been challenged, giving them a chance to recognize and process predicted elements of language and generating inferences about the text on the basis of this recognition. Use of the time limit tries to ensure that students focus on the construction of holistic

understandings rather than on detail. Holistic understanding is a high-level inferential and synthetic construct which requires the mobilization of multiple comprehension resources.

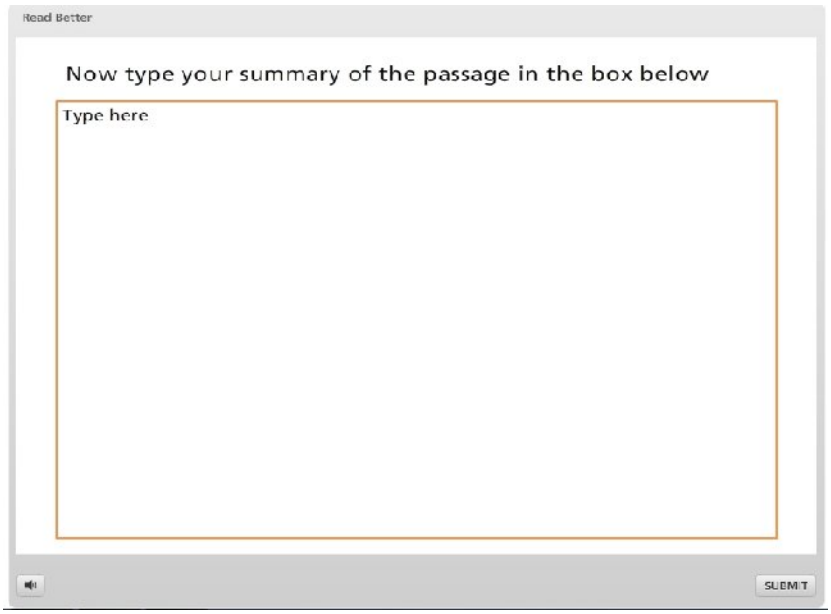
First instructions are displayed



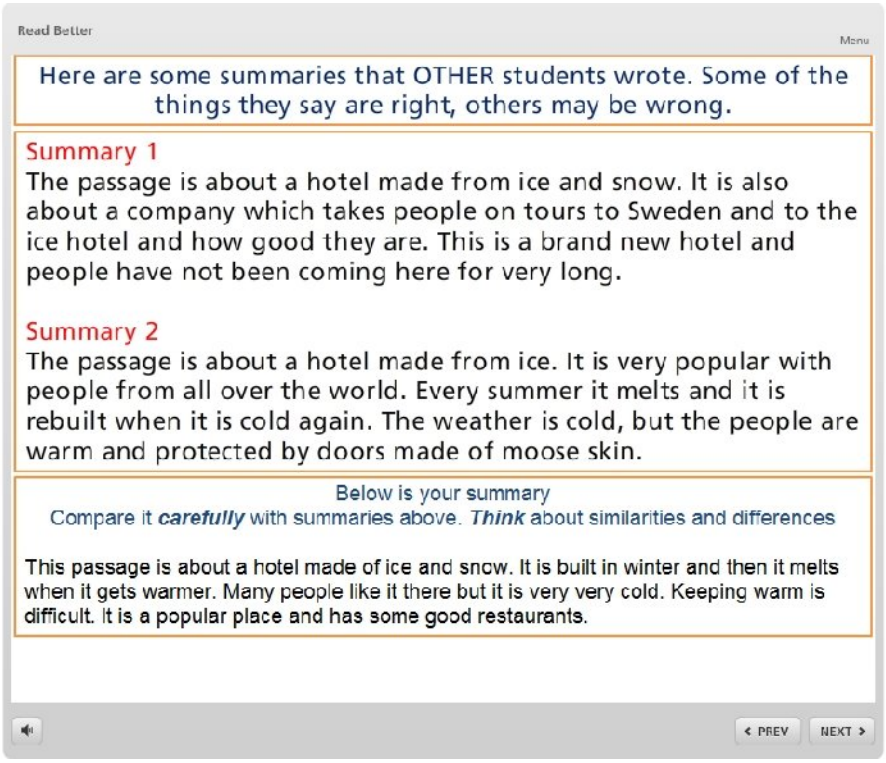
And then the text appears



Having now read the entire text for the first time and having had a first opportunity to make sense of it, the program tries to elicit from students a list of coherent statements about the reading text. This is achieved by asking students to write a summary of what they thought the text was all about. The purpose of this section is not to test students' understandings and come up with correct answers but to give students the opportunity to express their understandings on the basis of what they know or what they think they know. Certainty will come later.



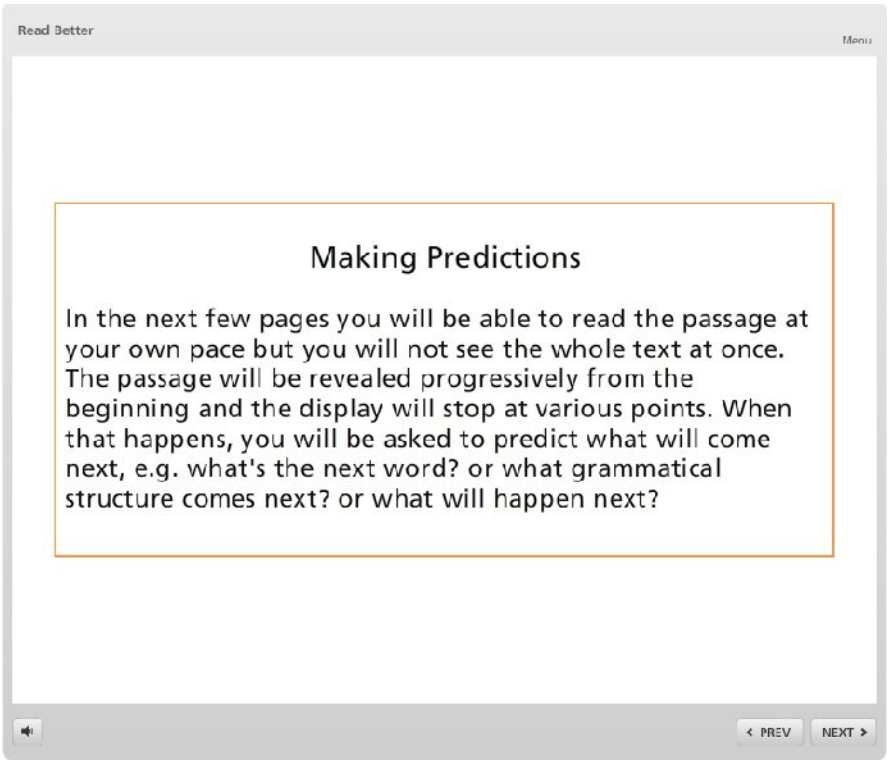
Students then compare their summaries with those of others.



Again, this comparison confronts students' understandings with those of others so as to enable them to construct their own personal meanings about the text while thinking critically about them. Students also learn to read by processing these summaries.

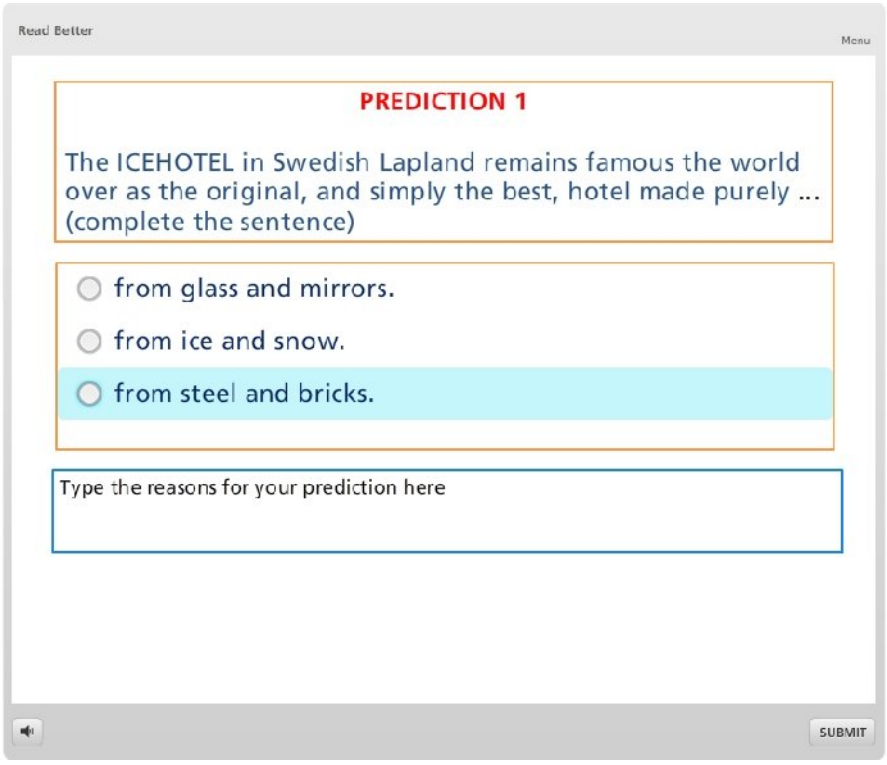
Reading is essentially, though not entirely, a linear, progressive activity. In general, readers start at the beginning of the text and move forward. While they progress in saccades, and fixate words or phrases, they also make regressions (Rayner & Castelhano, 2007) and, perhaps, even scan ahead or glance at other parts of the text. In general, though, movement is forward. The program will exploit this feature to help develop students' reading skills.[3] The program will do so by providing student with the opportunity to refine their understandings and reduce their uncertainties by requesting them to make linguistic and discursive predictions in the next section (also a product of background knowledge as mentioned earlier), thus engaging in a closer study of the reading text itself.

Phase 3. The prediction section is introduced by the following instructions.

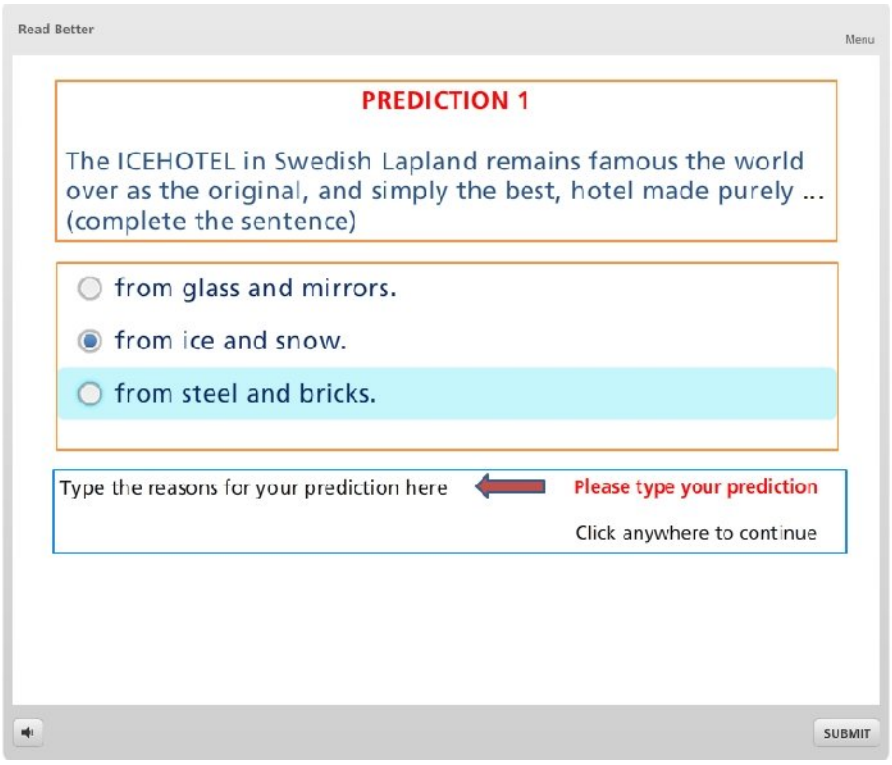


[3] While it is true that students have already been exposed to the entire text in the scanning section, it is assumed that the time constraints and subsequent study have held memorization to a negligible level.

The following slides will illustrate the kinds of interactions involved.

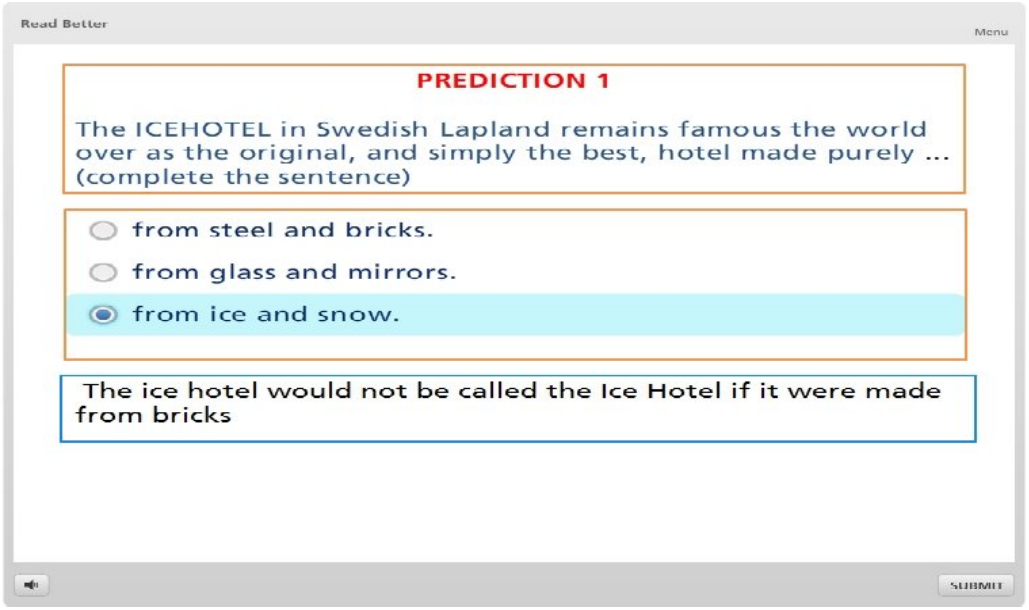


Here the student is required to make a discursive decision based on the coherence between the text written so far and factors known so far, e.g. the title. If the student makes an incorrect decision, the computer program will draw his/her attention to what has already been established earlier. For example, if the students choose the highlighted item above, the program would respond with: "`That's possible… but it does not match the title of the passage, the name of the hotel, or the likely reason for writing the story`". While this is a traditional multiple-choice quiz, it has an additional feature. The program stops here until the students provides a reason for their choice. While making the prediction is important, justifying the prediction is even more important and is designed to activate and strengthen the students' critical thinking skills. If students answer the question, even correctly, but do not provide a reason, the program reacts as follows.



Prediction questions therefore serve four purposes: identifying how well (or natively) students are reacting to textual clues are revealed progressively, developing their critical thinking skills and abilities, reducing their uncertainty and improving their ability to predict at all kinds of levels.

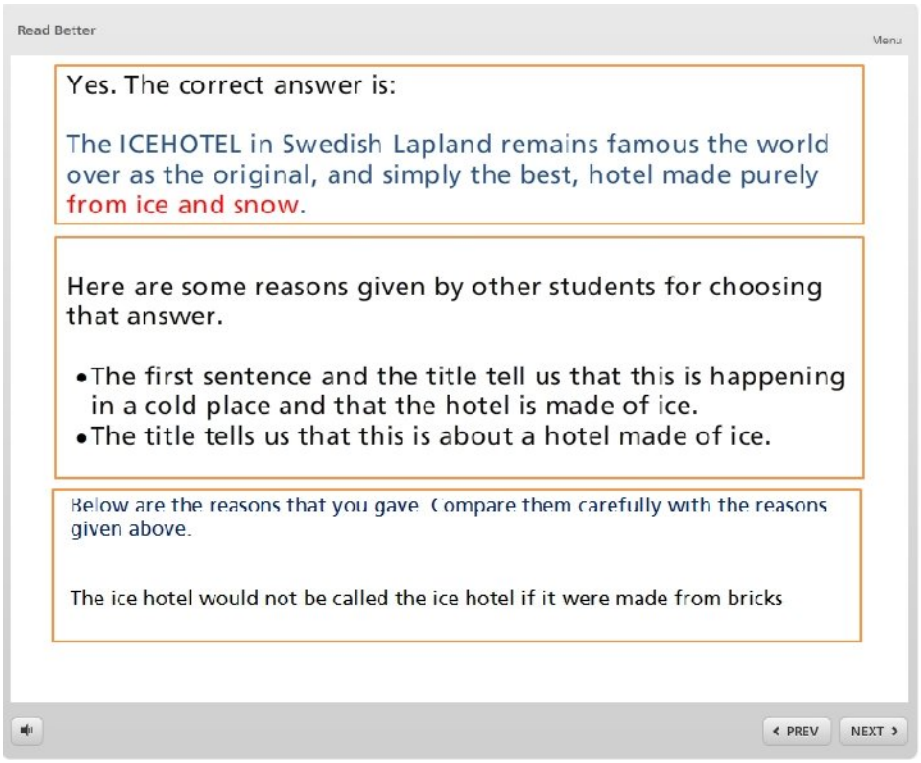
In our example, the student then fills in the justification box as follows.



The reason given does not need to be a "correct" reason but it does have to express the student's understandings at the time. These understandings will be refined or modified by the students themselves according to their developing insights into the possible meanings of the text.

In the above case, when the student clicks on the SUBMIT button, he/she receives a congratulatory message and a short explanation: "`Excellent! This is what makes the hotel really special`".

However, it does not end there. Students are then asked to compare their reasons with those of other students in order to further refine their understandings.



Other predictions could include, for instance, grammatical predictions such as:

> The ICEHOTEL in Swedish Lapland remains famous the world over as the original, and simply the best, hotel made purely from ice and snow. Located in Jukkasjarvi, 200km north of the Arctic Circle, the ICEHOTEL remains...
>
> In the current context what kind of word do you expect next?
>
> - A conjugated verb?
> - An article (e.g. a, the, one) or an adjective, or an adverb?
> - A conjunction (e.g. and, but)

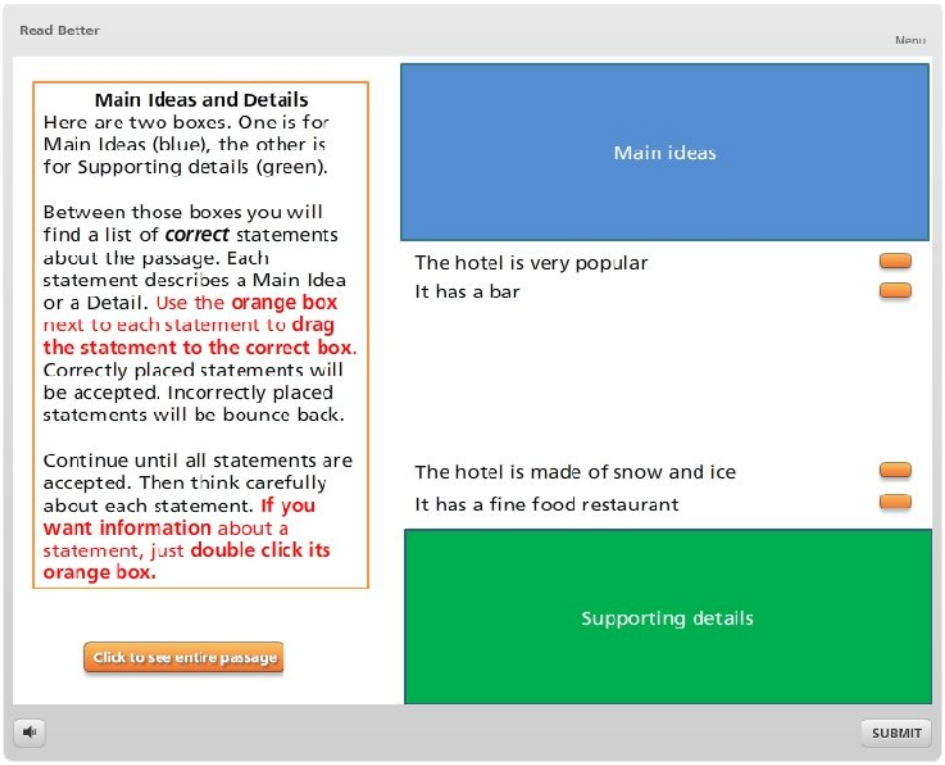
Ideally, the predictions required by the lesson-writer would be broad and varied to activate many different kinds of ideas and connections in students' backgrounds (or to enable them to construct new ones), including understandings of text structure (e.g. Q: What do you expect to read next? A: An explanation of what makes the hotel special? A description of other hotels? etc.). However, if they wished to do so, lesson-writers could adjust the predictions in

order to focus on specific content, e.g. grammar, though this would run counter to the spirit of the current structure which is to produce a rich, multi-level meaning-making experience.

Phase 4. It is broadly accepted that proficient readers tend to read in chunks (or thought groups), and that these appear to be the basic unit for processing written text. Native speakers tend to recognize and work with chunks or lexical bundles while foreign language learners do not (Valsecchi, Saage, White, & Gegenfurtner, 2008). Foreign language learners need to become familiar with the structure and collocations of chunks so as to recognize them and learn to process text efficiently and also develop their spoken or written language. The program will now try to sensitize learners to the organization of chunks in the text. It will do so through a process of computer-controlled presentation of the chunks. This will help students develop a sense of the length, order, content and complexity of chunks.

In the current version of the program, chunks are displayed sequentially at the rhythm of approximately one chunk for every 2 seconds. This translates to a rate of approximately 95 words per minute (wpm) to 100 wpm and seems adequate for the purpose that it was designed for (timing research still needs to be performed). Students are able to replay this presentation as often as they wish. This exercise is particularly useful in that it gives students enough time to focus on the structure of chunks, to connect them to one another and to integrate them into their background knowledge. (No example is provided as it simply looks like a screen with text on it. The interaction cannot be demonstrated adequately on paper).

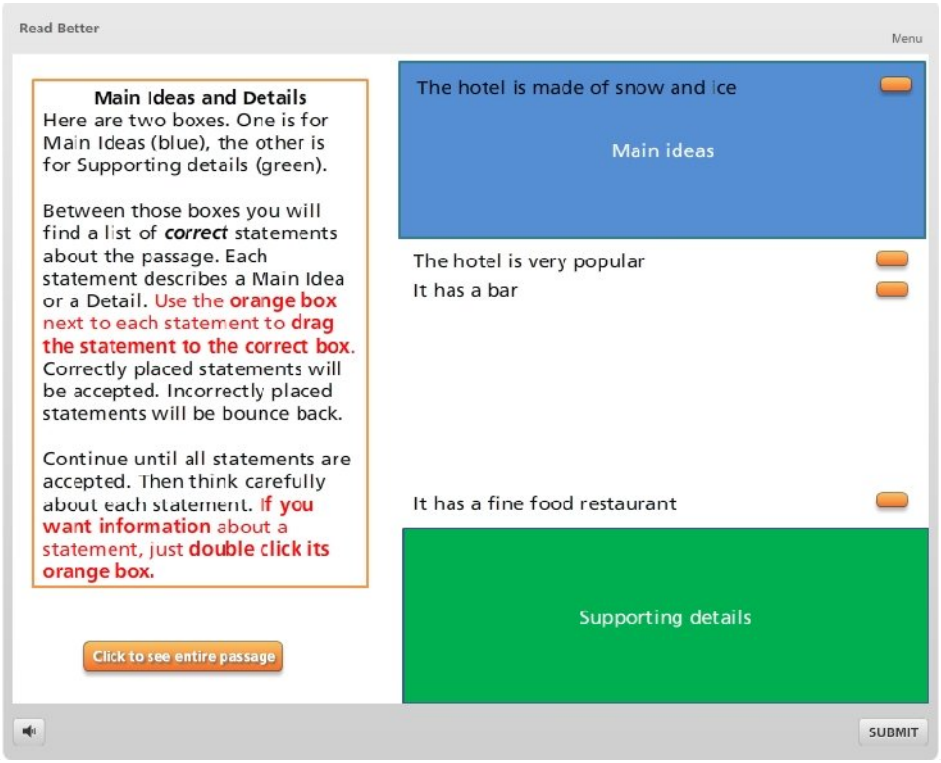
Phase 5. Up to this point, students were basically in control of interactions with the program, essentially by creating their own interpretations and summaries of the written materials as a way of generating holistic and highly personal understandings. The focus will now turn more toward the text itself and its potential understandings by a competent native speaker. By the time students reach this phase, they have processed the reading text several times both with and without assistance. They will have a reasonable understanding of the global elements of the text as well as their potential strengths and weaknesses. Students will now be given a chance to check their understandings against those of an experienced native

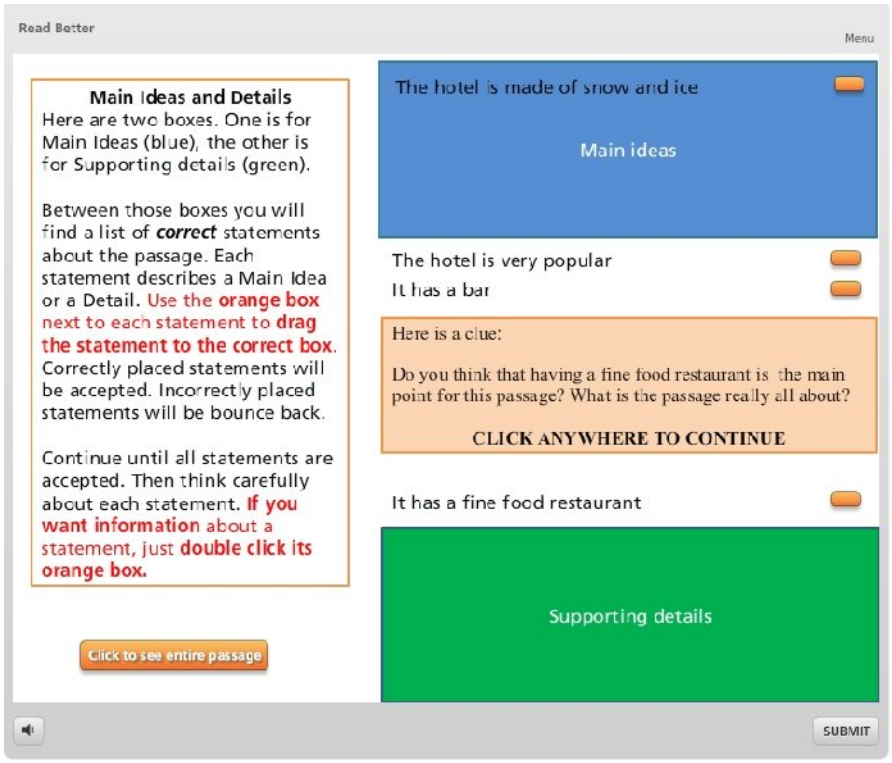


reader of text (embodied by the lesson-writer) and to modify them if necessary. Importantly, the focus remains on the student, not the text. The first point of study will be the identification of main ideas/major points and points of detail. The first activity consists of a simple drag and drop exercise but, while it looks like a quiz, it is actually an awareness-raising and verification exercise rather than a quiz.[4]

[4] Again, the example given here is illustrative only. It would normally be more complex.

Students drag the statements to the correct area. If they try to drag a statement to the wrong area, the statement simply bounces back to its original position. If a statement is dragged to the correct area, it is accepted as seen below. Students cannot make a mistake. The idea here is not to test students but to encourage them to think about why a statement has been categorized by the lesson-writer as a main idea or as a supporting detail.

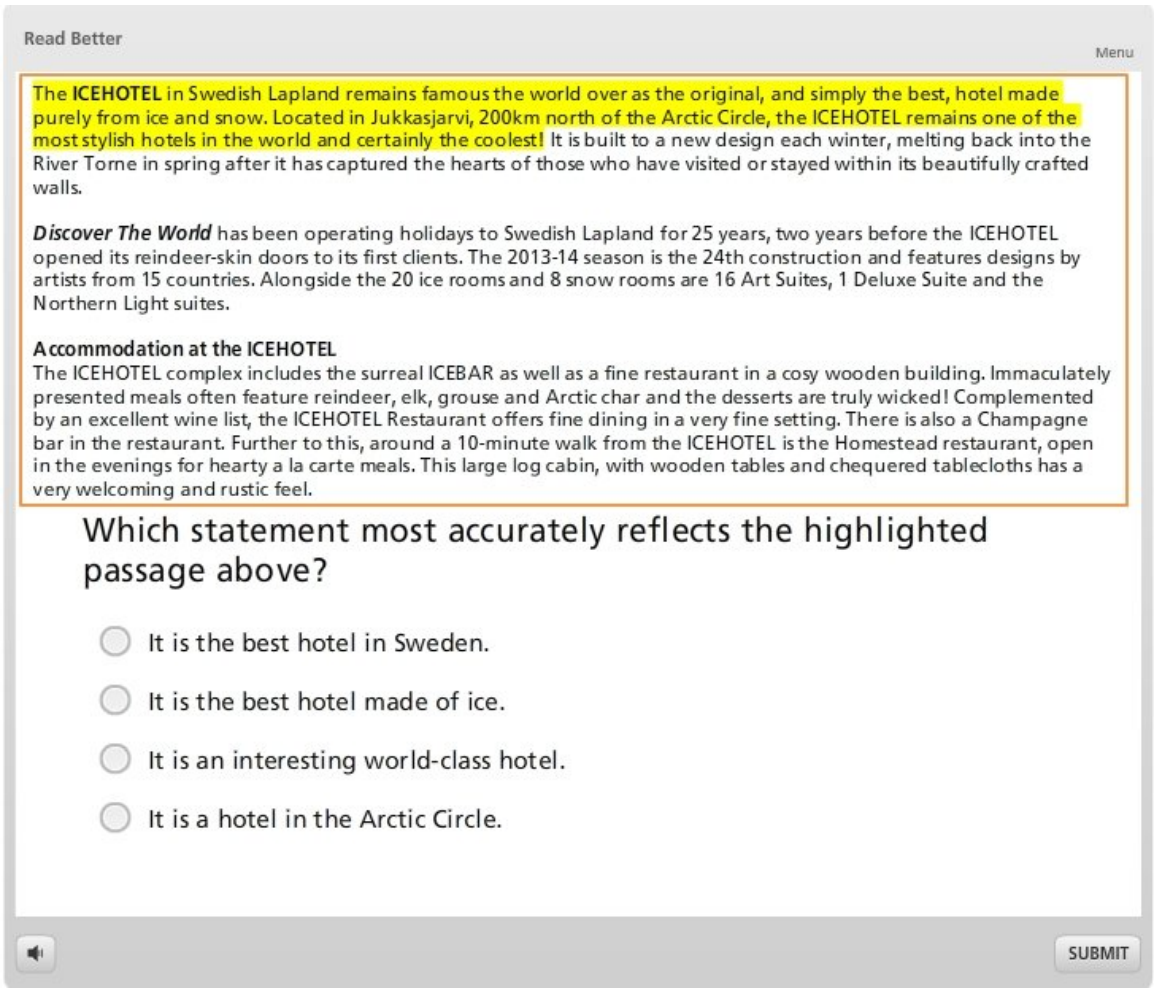




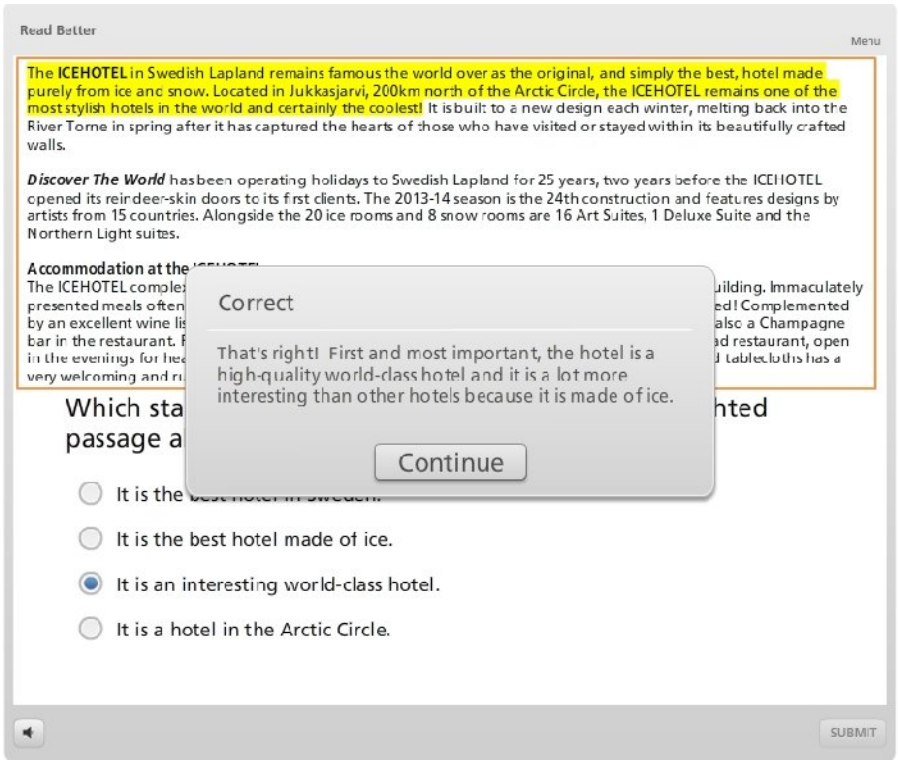
Importantly, students are free to get help or read explanations. For example, they can read the entire passage at any time or they can double-click the orange button next to each statement. In the latter case, help will be displayed as in the next screen.

This kind of interaction will enable students to quickly be able to understand how the statements were classified by the lesson-writer, to judge the correctness of their decisions and, if necessary, to think, or re-think, about the reasons for their choices (a form of critical thinking).

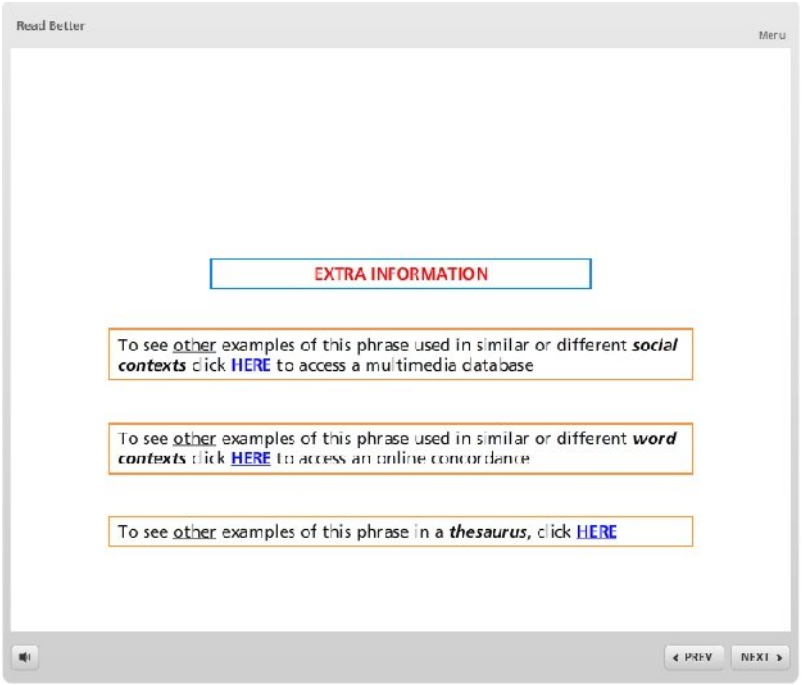
Phase 6. Phases 1 – 5 focused primarily on gist or global elements of the text and the classification of main ideas and supporting details. Phase 6 continues the focus on the text begun in Phase 5. Here the entire text is carefully examined from start to finish through the use of awareness-raising exercises. Two examples follow. The first is discursive in nature and requires fairly delicate inferencing.



Whether the student answers correctly or incorrectly, they are provided with a possible explanation of why their choice was right or wrong. This will refine their understandings of the workings of the text by comparing their reasoning with that of the lesson-writer. Here is the feedback for a correct response.

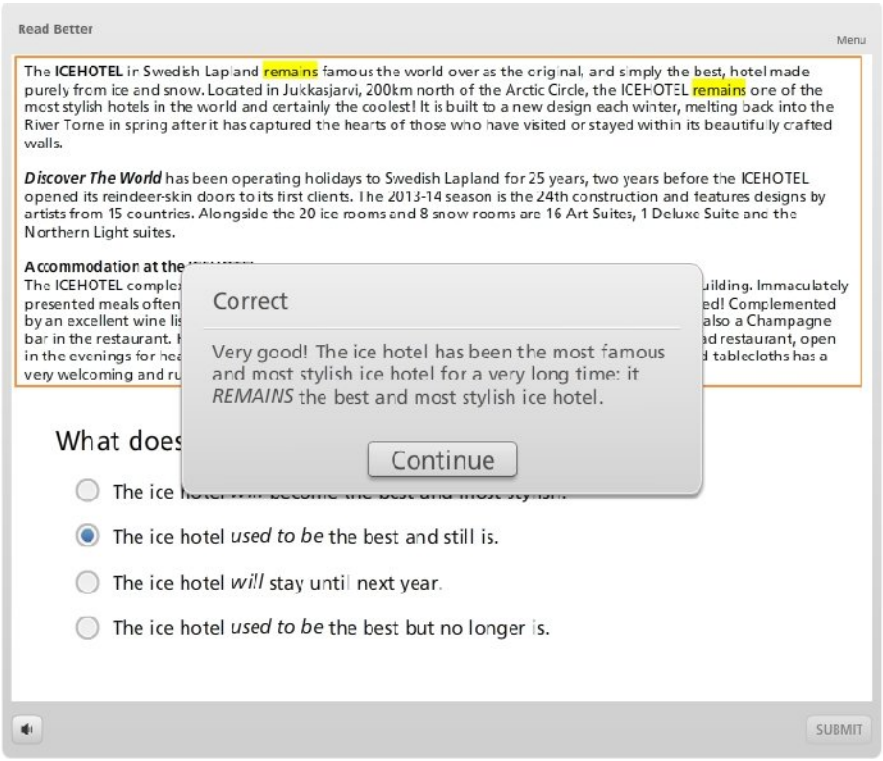


The second example is about vocabulary: specifically, the meaning of the word “remains” in this specific text (only the answer slide is shown here).



This kind of questioning and feedback continues until the entire text is blanketed from start to finish. It provides rich detailed content for most if not all aspects of the text and introduces students to new and interesting information.

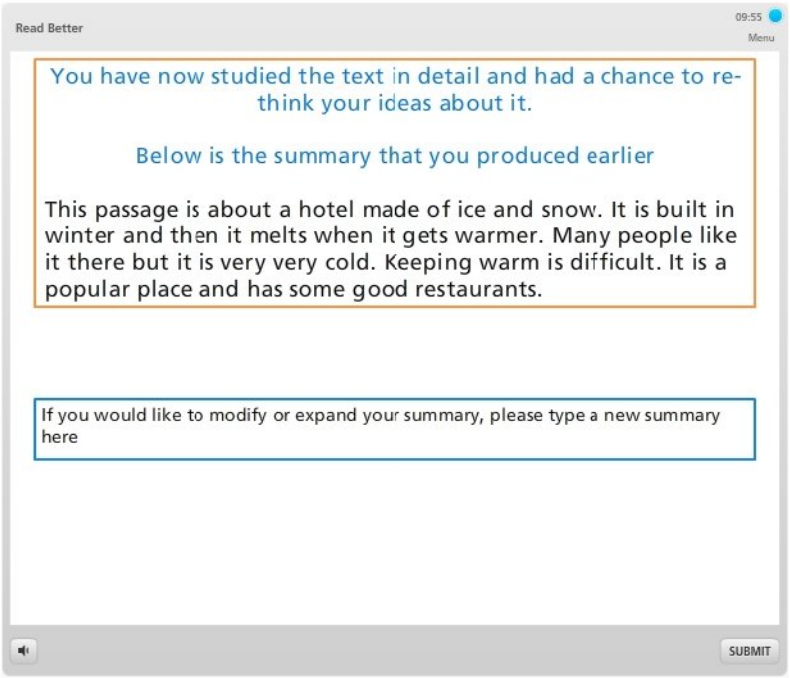
In specific instances, learners can get extra help by connecting to various online tools such as multimodal corpora, concordances, dictionaries or thesauruses. This connectivity will be strengthened in later versions of the program.



Phase 7. Here we switch back to the text as a whole so as to integrate all the detailed information studied. Phase 7 consists of accelerated reading practice. As stated previously, in comprehension depends heavily on recognition. This phase of the program will give students practice in rapidly recognizing the elements which they have studied in depth: the kind of thing they will need to do in real-life reading. This activity is essentially the same as the one described in Phase 4, but students are now given a choice of higher speeds at which the material is

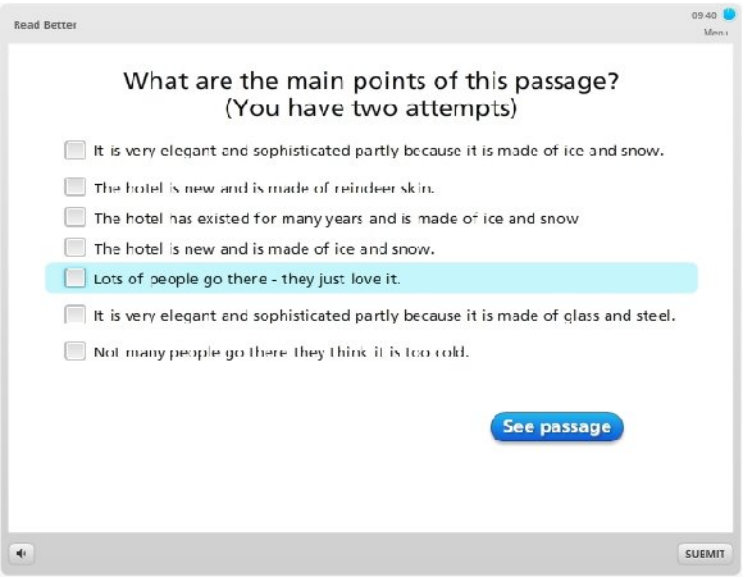
presented. This is not unlike using pacers in a speed-reading approach (e.g. http://eyercize.com)[5] however its purpose is not to force people to read at a certain pace but, rather, to give students an opportunity to recognize chunks rapidly, i.e. a rapid processing experience which they would not otherwise have. The fact that the displayed text remains in place rather than disappearing reduces the pressure on the student enables regressions to happen and lays down the groundwork for the next practice session.

Phase 8. Phase 8 concludes the program. It consists of two parts both focusing on the text as a whole. The first part provides students with the opportunity to review and revise the summary that they made during phase 2 of the program. Not only does it enable them to change their minds but, more importantly, it enables them to notice how much change has occurred in their own thinking and understandings as a result of participating in the program's activities. The screen below illustrates.



[5] Exercise is given here as an example of a pacer, not as a description of the process actually used in this program.

The second part of Phase 8 consists of a simple review of the reading text in the form of a multiple choice quiz. It requires students to pass at a level of 80% or more. The quiz is timed (see timer in top right hand corner of the screen) and students have 10 minutes to complete it. This is not a memory exercise as students have access to the reading passage in its entirety at all times, and it is the only part of the reading program which numerically assesses students for the purposes of grading. It is graded primarily to give students a sense of achievement and motivation (some students work only for grades – this will encourage them).



On passing this section, students receive a congratulatory message as below

The program then terminates.

Ancillary features, planned enhancements and future developments

The program described here is still in its early stages and is designed to be part of a much larger networked system although it can also be used as a stand-alone system. It can be run both online and offline though for security/privacy and convenience reasons an online environment based on a Learning Management System (LMS), like the popular Moodle system, is more convenient. If the LMS solution is selected, then it is possible to keep track of progress, track completion status and maintain quiz scores for both students and teachers to examine over time. This is currently achieved through the use of SCORM modules generated by the authoring system.

Structurally, the program consists of a series of templates which, if desired, can be modified according to the teaching/learning objectives although its spirit is to be as open and as general as possible in order to maximize its impact. In particular, the system is modular in structure and, potentially, presented in any order by the lesson-writer or accessed by the student in different ways (though clearly the prediction sections cannot really appear late in the

program). Further, the program can be integrated either into a highly directive hierarchical structure or into a non-hierarchical free-access structure.

Finally, the program can easily be connected to other lessons or tools with only minor pre-planning, and connections and additional support could be provided on an ad hoc or organic, needs-based, approach. Connections of particular interest could be to linguistic corpora to provide new contexts for words, multimodal culture and language corpora for illustrating language in different contexts and maximizing brain representations of words and concepts (Macedonia & Klimesch, 2014, p.83), Text-to-Speech (TTS) engines to read aloud portions of text selected by students (e.g. Oddcast, 2014) and connections to general or specialized social networks to get live feedback on problems experienced, as well as the more traditional resources of online dictionaries, thesauruses and grammar books.

The program will now be tested in the field for its effectiveness as a reading support system. Further, because of its ability to record students' writings, it is planned to use the system as a research tool to identify the ways in which students from different linguistic and cultural backgrounds make sense of written text. Especially in ASEAN contexts, these research corpora may help the development and tailoring of systems for facilitating intercultural contacts between the different groups involved.

Conclusion

This paper began by raising a common issue faced by foreign language students: how to develop their foreign language comprehension skills, specifically reading comprehension, in light of the huge diversity in their personal background knowledge and the necessity to take account of this diversity so as to optimize learning. In the face of this diversity and the impossibility of meeting all individual needs simultaneously in the traditional classroom, an

autonomous computer-based prototype solution was proposed. That solution revolved around the construction of personal understandings on the one hand and an interactive model of reading where both high-level (global, inferential) structures are elicited/studied as well as low-level structures (vocabulary, grammar). In particular, the system relies heavily on the development of critical thinking skills through a process of repeated comparison between students' understandings and those of others. Thus the system is consistent with modern theoretical approaches to the construction of knowledge and the development of reading skills and uses technology to perform tasks which could otherwise not be performed. In turn, from a technical perspective, the system is adaptable to a range of delivery platforms and learning environments and enables further development to occur with relative ease. While, for each text studied, the activities described take longer to complete than a standard reading comprehension class, the system simultaneously provides, to a large number of students, a depth and intensity of personalized/individualized learning opportunities which would be impossible using traditional approaches.

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