A Reflection on Some Critical Aspects of Online Reading Comprehension

Antonella Chifari, Giuseppe Chiazzese, Luciano Seta,Gianluca Merlo, Simona Ottaviano and Mario Allegra
Institute for Educational Technologies - Italian National Research Council
Via Ugo La Malfa, 153, Palermo - Italy
E-mail: gym2learn@itd.cnr.it

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This paper reflects on some important aspects related to online reading comprehension. In particular, it explains the Interactive REading Comprehension (IREC) model that explores the different dimensions and interactions involved in an online reading comprehension process. The components of the model and their impact on the two principal processes characterizing any reading activity on the web, surfing and comprehension, are described. The final section of the paper focuses on some critical design issues related to the development of a web based tool to support online reading comprehension in relation to the model.

Povzetek: Predstavljen je model IREC, povezan z razumevanjem sprotnega branja.

1 The scenario

Today the reading scenario of an adolescent has changed. While on the one hand the book exists as a traditional vehicle for the dissemination and comprehension of knowledge, on the other hand, the web represents a new type of reading space.

Knowledge construction on the web requires the ability to flexibly integrate traditional reading comprehension skills with new strategic knowledge applications elicited by the new reading domain for processing, comprehending and sharing information. More precisely, the web has become an important resource that extends the traditional reading comprehension scenario into an open hypermedia and multimedia knowledge space where a set of online comprehension strategies are employed to effectively locate, comprehend, and use the informational contents. When students are engaged in Internet learning and communication activities, reading comprehension is affected by the presentation of the contents to read: mail, blogs, social networks, multimedia and hypermedia contents introduce a fundamental change in the architecture of acts of reading. In fact, reading comprehension becomes a more complex, ongoing, self-regulated, decision process which involves choosing from different possible links, possible texts, possible purposes and among different ways of interacting with information [1]. This situation highlights a rapid change in the nature of reading so that the online domain requires a different reading literacy from traditional ones and a change of perspective in the dynamics of reading comprehension. Readers influenced by the information and communication contexts of the web adopt new ways of reading, locating information, employing a more complex dimension of inferential reasoning strategies to construct meaning. In fact, Leu [2] stated that new comprehension skills, strategies, and dispositions may be required to generate questions, and to locate, evaluate, synthesize, and communicate information on the web. Thus, reading in Internet contexts requires the ability not only to construct meaning from a text, but also to construct meaning through flexible and purposeful choices of relevant hyperlinks, icons, and interactive diagrams [3].

However, faced with this situation, the International PISA assessments on reading comprehension skills of European adolescents reveal a worrying image of “poor” readers lacking in basic cognitive strategies such as locating information or creating a mental overview of the text, connecting the meaning of one sentence to the meaning of another, using previous knowledge to try to clarify and connect meanings of words and phrases. Besides, readers find difficulty in comparing, contrasting or categorising information, inferring which information in the text is relevant to their task, critically evaluating or hypothesising and drawing on specialised knowledge [4]. As result of this data there is a clear need to study more carefully technological and methodological aspects of online reading comprehension processes.

In the next sections the Interactive REading Comprehension (IREC) model and a definition of online reading comprehension are introduced. Then, the different dimensions and relationships involved in the model and its applications to support online reading comprehension are described.

2 The IREC model

The need to study the complex relationship between web tools and reading processes is particularly urgent in the current contexts in which new tools, often on line, are being developed, and the hypertext is becoming the main structure of many learning materials in use in the classroom, in substitution or in addition to the traditional textbook. The enhancement of the reading proficiency of students by means of specific web-based learning tools and the development of a new literacy related to the hypertextual structure of web contents are two different goals, which are often not clearly distinguished. The IREC model aims to deal with these two problems in a unitary framework, in which the text structure and the tool design are taken into account jointly and evaluated from a more general point of view. More in depth the model is inspired by theories about the design effectiveness of learning tools or devices aimed to support users' learning processes and social interactions [5,6,7], by research into instructional strategies [8,9,10] and also by novel studies of reading comprehension processes on the Internet [1,2,11,12].

It is possible to draw together the different theoretical approaches to produce the Interactive REading Comprehension (IREC) model (Figure 1) which describes a number of different situations related to the learning design in a technologically mediated environment. To evaluate interactions between the learning activities and the technology in use, it is necessary to take into account four interrelated components:

- Pedagogical component;
- Technological component;
- Content component;
- User component.

The weight of the single components and the reciprocal relations between them establishes the idiosyncratic nature of each different approach. More precisely, the model has a flexible structure depending on the type of domain of use. In fact, by selecting one of the four components it is possible to define a specific domain in which the model can be applied.

Since this study aims to explore the design issues related to development of web based tools to support online reading comprehension, the "technological" component can be considered as fixed. In this particular representation of the model, shown in figure 2, specific assumptions are made for each component: the pedagogical component is represented by the instructional strategies supported by the web tools; the user component describes the adolescent reader's characteristics in terms of prior strategic knowledge and prior contents knowledge; the content component refers to the structure of learning materials, hypertexts and multimedia; finally, the technological component, which in this case has been extrapolated, consists of the design characteristics of a web tool and it is represented by an oval inside a dotted line including the other three components.

The IREC model stresses the relationships between these three components and their impact on the two principal processes underlying the online reading comprehension process, namely the surfing and comprehension activities.

The model is based on the most recent theories according to which skilled readers are able to balance both the demands for comprehending and for orienting themselves in hypertexts [13]. This concept must be borne in mind while providing instruction, planning the contents to study and evaluating user characteristics.

The next section focuses on the web tool features and how the features can be suitably developed according to the interaction with the characteristics of the three components.

2.1 Instructional strategies

This component identifies the relationship between a chosen instructional model (peer tutoring, collaborative learning, reciprocal teaching, etc.) and the technological choices/functionalities of the tool which are needed to enhance the online reading comprehension process. So, it is important to focus the design efforts on the key instructional principles which make offline and online

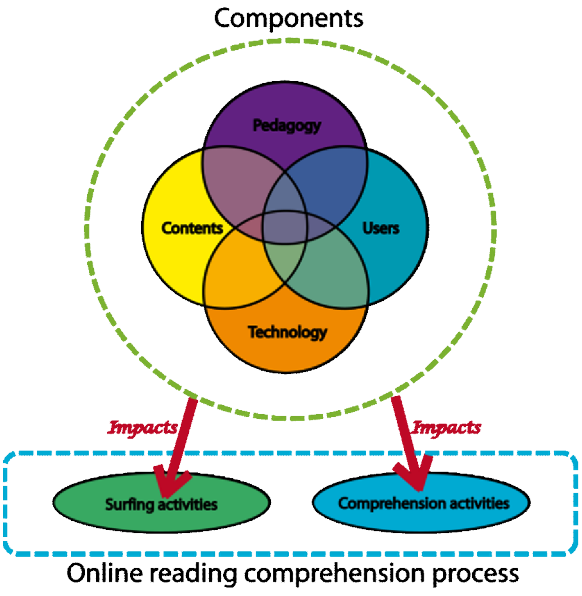

Figure 1. The IREC model.

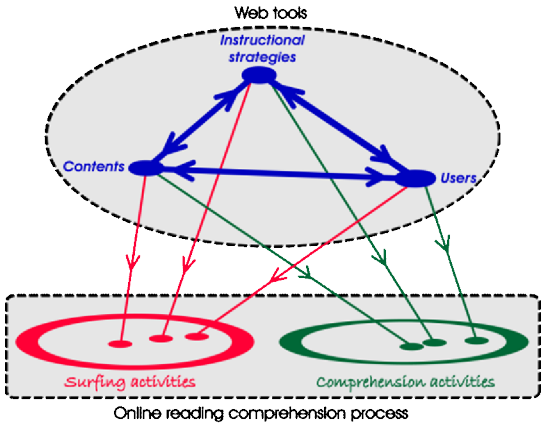

Figure 2. The IREC model for designing web tools

reading significantly different. The Texas Education Agency [10] states that instruction is effective if it is based on modelling processes and is well organized, explicit, intensive and long lasting, and if students are made aware of text organization and are motivated to read widely. In other words, the informed educational paths are much more powerful than blind ones, especially when the purpose is to stimulate metacognitive learning.

2.2 Users

This component guides the construction of users' profiles in terms of the proficiency level of online reading comprehension. The profile takes into consideration different aspects, such as prior strategic knowledge, prior contents knowledge, motivation, social and communication skills, planning skills, etc. Proficient online readers are able "to manage their strategic action as a part of a complex metacognitive domain". An independent reader is like a mental manager who plans his online reading strategy with awareness and implements strategic activities (e.g. asking and responding to questions, constructing meaning according to links chosen during surfing, critically evaluating the credibility of a source) [14]. The knowledge of an initial proficiency level assists in the construction of a more precise user profile and the provision of more effective metacognitive training activities.

2.3 Contents

This component regards two principal aspects: the first aspect is technological and related to the structure of information in terms of its level of multimediality and hypermediality. In fact, it is a central design issue and takes into account some well-known aspects such as modularity, linearity, multimediality, granularity, interactivity and the different characteristics of texts (narrative, informational, scientific, etc.). The second aspect is educational, regarding important guidelines for developing learning materials consistent with the students' level of proficiency and with their personal perception of meaningful information so as to provide a rich context for learning. According to Baker [9], if the material is essentially meaningless to the student, he will have a great deal of difficulty in retaining it. On the contrary, if the student perceives the logical structure of the material, he will be better able to learn from it.

2.4 Online reading comprehension process

The online reading comprehension process applied by the user is a complex set of strategies employed to construct meaning. More precisely, two levels of strategies are employed: a first level of cognitive strategies for orienting oneself in hypertext reading and for comprehending textual information, and a second level of metacognitive strategies employed for monitoring and checking the efficacy of reading comprehension and surfing processes.

Traditionally, reading comprehension is a complex active process of constructing meaning that is interactive, strategic and adaptable [10] It is interactive because it involves not just the reader but also interaction with the text in which reading takes place [15]; it is strategic since readers have goals that guide their reading and they use different cognitive strategies and skills as they construct meaning [9, 16] it is adaptable because readers change the strategies they use as they read different kinds of text or as they read for different purposes [17]. At the same time, we define the surfing process as a complex, active process of constructing paths and finding directions. It is interactive because it involves hypertext links through which browsing take place; it is strategic because surfers have information to find that orients their choice of links and they use different cognitive and metacognitive strategies and skills while they are following a path; it is adaptable since surfers change their strategies according to the design characteristics of different content structures. The combination of these two processes employed by students during the comprehension of online contents gives a new meaning to the acts of reading. This is because hypertext readers need to became competent both in constructing meaning and also in the employment of strategies for managing the different aspects of the surfing process [1].

3 The interaction among the studied components

The main intention of the IREC model is to stress the relationships between the components, and their impact on the two principal processes characterizing any study activity on the web: surfing and comprehension.

In particular, regarding the three components considered above, pedagogy, users and contents, while it is sufficiently clear that the choice of an instructional model must be the result of careful evaluation of the characteristics of both the users and contents in use, it is less evident that the assessment of users' proficiency should be made according to the instructional model applied and the structure and organization of didactic materials. In the same way, the content design is influenced by user characteristics: the contents can be developed to satisfy different user profile and different reading proficiency levels. So, different contents could be developed for supporting the learning of specific strategies such as locating information, creating a mental overview of the text; connecting the meaning of one sentence to the meaning of another. Moreover the instructional strategies can affect the level of interaction of the content in terms of personal, reciprocal and collaborative construction of meaning on the web. Finally, the users' characteristics, in terms of prior knowledge, motivation, cognition and metacognition strategies, mental managing, proficiency and mastery, have to be taken into account in order to establish a suitable level for the teaching topic and the structure of the contents, and to plan the learning activities.

But the model also wants to emphasize that these characteristics are not static, they evolve over time and so some specific tools are needed to keep pace with this evolution. Generally, this aspect is discussed in relation

to the rapid changes in information and communication technologies. The development of new techno-based systems appears to be a major stress factor in the educational environment, with teachers and students running a non-stop race to acquire the latest novelties. Little attention is paid to the parallel evolution of pedagogical methodologies, users' behavioural habits, multimedia and hypermedia languages. One of the reasons why the diffusion of some technology based educational tools has also been possible is due to the increasing familiarity of learners and teachers with new modalities of interaction as well as the development of pedagogical approaches based on, for example, simulation and visual knowledge management.

But the evaluation of the relationships between the components is not sufficient. It is also necessary to recognize how these components impact on surfing and on comprehension activities. For example, any decision aimed at improving the surfing process might have a negative effect on the comprehension activity, and vice versa. So, web tools designed to facilitate the storage of web pages, a typical surfing feature, might limit the students' ability to identify the main concepts of a text, an important comprehension activity; likewise, tools designed to organize the contents graphically, a useful reading comprehension activity, might hamper orientation on the web, a surfing aid for monitoring surfing behaviour.

All these relationships have different impacts on the design of web tools to support on line reading comprehension processes, so the design has to be a multi-level activity, involving different professional figures, such as teachers, pedagogues, psychologists, and technicians. But many solutions can arise from theoretically based observations of on line learning practices. In this respect the IREC model may prove to be a useful tool to distinguish the most relevant variables and dimensions involved in a web-based learning experience.

4 Conclusions and discussion

The rapidity of technological change and the increasingly frequent use of Internet for educational purposes have increased the learning demands for comprehension and for thoughtful navigation.

The additional value of the presented model can be ascribed to a systemic design perspective in which the characteristics of each component interact dynamically. Any variation of the intrinsic value of a component affects not only the characteristics of other components, but also the design domain. In this context the level of proficiency in reading comprehension affects not only the selection and construction of specific contents and instructional strategies but also design choices to enhance the empowerment of each component.

Focusing attention on the technological characteristics that a web tool requires for supporting online reading comprehension more effectively has the advantage both of stimulating theoretical research in this field and inviting a reflection on design and implementation issues, so that the technological solution represents an effective support, enabling students to become proficient readers during on line surfing.

From a theoretical point of view, it is necessary to investigate the processes that regulate online reading behaviour and in particular cognitive and metacognitive strategies, social competences and the effects of content structure on reading comprehension. It is also essential to find new indicators to measure levels of reading proficiency more accurately. Equally important is a reflection on comprehension instruction to promote students' cognitive scaffolding.

From a technological point of view, the IREC model suggests a reflection focusing on the following design choices: setting out a clear purpose for the intended tool; identifying a target and defining user profiles; identifying an instructional comprehension model and evaluating how it could be applied in a web-based environment; balancing surfing and comprehension features according to the established goal; including motivational features/activities to promote greater user participation [18].

Consequently, some of the following features could be implemented into a web tool: aids for monitoring all online comprehension behaviour such as reflection and annotation tools, cognitive and metacognitive prompts; aids to improve the research for information such as choosing keywords, identifying the best query results, evaluating web credibility; aids for organizing contents graphically such as conceptual maps and flow charts; aids for managing web page storage such as history, bookmarks/social bookmarks; opportunities for students to self-assess their knowledge; aids to promote a shared understanding of the goals for metacognitive activities and so on.

In conclusion, the IREC model could provide a starting point for further research discussion about the nature of online reading comprehension and the development of new online reading comprehension tools.

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