



## ReaderBench: The Learning Companion

Mihai Dascalu, Larise L Stavarache, Philippe Dessus, Stefan Trausan-Matu,  
Danielle A Mcnamara, Maryse Bianco

### ► To cite this version:

Mihai Dascalu, Larise L Stavarache, Philippe Dessus, Stefan Trausan-Matu, Danielle A Mcnamara, et al.. ReaderBench: The Learning Companion. 17th Int. Conf. on Artificial Intelligence in Education (AIED 2015), 2015, Madrid, Spain. hal-01672087

**HAL Id: hal-01672087**

**<https://hal.science/hal-01672087v1>**

Submitted on 23 Dec 2017

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# ***ReaderBench: The Learning Companion***

Mihai Dascalu<sup>1</sup>, Larise L. Stavarache<sup>1</sup>, Philippe Dessus<sup>2</sup>,  
Stefan Trausan-Matu<sup>1</sup>, Danielle S. McNamara<sup>3</sup>, Maryse Bianco<sup>2</sup>

<sup>1</sup> University Politehnica of Bucharest, Computer Science Department, Romania  
{mihai.dascalu, stefan.trausan}@cs.pub.ro,

larise.stavarache@ro.ibm.com

<sup>2</sup> LSE, Univ. Grenoble Alpes, France

{philippe.dessus, maryse.bianco}@upmf-grenoble.fr

<sup>3</sup> LSI, Arizona State University, USA

dsmcnama@asu.edu

**Abstract.** Continuous progress tracking in terms of automated essay scoring, assessment of reading strategies, and evaluation of learners' involvement in collaboration groups represents a key component in technology-scaffolded learning. Our educational software, *ReaderBench* [1, 2], is based on current research in the automated essay scoring field (*E-rater*, *iSTART*, *Coh-Metrix*), but provides an integrated approach centered on cohesion. *ReaderBench* supports both tutors and students, affording automated evaluations of reading strategies, course materials selection, and CSCL collaboration. *ReaderBench* has been designed to flexibly allow multiple configurations for various educational scenarios and languages (English, French, and Italian).

## **1 *ReaderBench's Purpose***

*ReaderBench* targets both tutors and students by providing a fully functional learning model approach including individual and collaborative learning methods, cohesion-based discourse analysis [2], dialogical discourse model [3], textual complexity evaluation [1], reading strategies identification [4], and participation and collaboration assessment [5]. By using natural language processing techniques, the main purpose of this framework is to bind traditional learning methods with new trends and technologies to support computer supported collaborative learning (CSCL). *ReaderBench*, by design, is not meant to replace the tutor, but to scaffold both tutors and learners by enabling continuous assessment, self-assessment, collaborative evaluation of individuals' contributions, as well as the analysis of reading materials to match readers to their appropriate class level text.

Overall, *ReaderBench* is a fully functional automated software framework, designed to be an educational helper for students and tutors. The system makes uses of text-mining techniques based on advanced natural language processing and machine learning algorithms to design and deliver summative and formative assessments using multiple data sets (e.g., textual materials, behavior tracks, self-explanations).

## 2 Outline and Experiments

From a learner's perspective, *ReaderBench* can act as a Personal Learning Environment (PLE) that incorporates: a) *individual assessment* of textual materials making use of the textual complexity metrics (semantics, morphology, surface factors integrated by support vector machines) that reflect the textual organization and structure of reading materials [1]; b) *comprehension prediction* by identifying reading strategies employed by students in their self-explanations or by automatically evaluating student summaries [4]; c) *collaboration* and *participation evaluation* in CSCL conversations based on cohesion graphs and on Bakhtin's dialogism [5].

In the first representative experiment, French students aged between 8 and 11 years old (3<sup>rd</sup>–5<sup>th</sup> grade) explained what they understood from two French stories comprised of about 450 words, resulting in 149 summaries and post-test examinations used to assess their comprehension of the reading materials [4]. As expected, paraphrasing, control and causality strategies were more reliably identified than information stemming from students' experience, whereas comprehension was reliably predicted by using the identified reading strategies from learner's self-explanations or from the textual complexity factors extracted from their summaries [4].

A second experiment included 110 4th year undergraduate 1st year master students asked to manually annotate 3 chat conversations [5]. We opted to distribute the evaluation of each conversation due to the amount of time required to manually assess a single discussion. In the end, based on an average of 33 annotations per conversation, the overall results indicated a reliable automated evaluation of both participation ( $ICC = .97$   $Rho = .84$ ) and collaboration ( $ICC = .90$ ;  $Rho = .74$ ) [5].

**Acknowledgements** This research was partially supported by the ANR DEVCOMP 10-BLAN-1907-01 and the 2008-212578 LTfLL FP7 projects, by the NSF grants 1417997 and 1418378 to Arizona State University, as well as by the POSDRU/159/1.5/S/132397 and 134398 projects.

## References

1. Dascalu, M., Dessus, P., Bianco, M., Trausan-Matu, S., Nardy, A.: Mining texts, learners productions and strategies with ReaderBench. In: Peña-Ayala, A. (ed.) Educational Data Mining: Applications and Trends, pp. 335–377. Springer, Switzerland (2014)
2. Dascalu, M.: Analyzing discourse and text complexity for learning and collaborating, Studies in Computational Intelligence, Vol. 534. Springer, Switzerland (2014)
3. Dascalu, M., Trausan-Matu, S., Dessus, P., McNamara, D.S.: Dialogism: A Framework for CSCL and a Signature of Collaboration. In: CSCL 2015. ISLS, Gothenburg (in press)
4. Dascalu, M., Dessus, P., Bianco, M., Trausan-Matu, S.: Are Automatically Identified Reading Strategies Reliable Predictors of Comprehension? In: ITS 2014, Vol. LNCS 8474, pp. 456–465. Springer, Honolulu, USA (2014)
5. Dascalu, M., Trausan-Matu, S., Dessus, P.: Validating the Automated Assessment of Participation and of Collaboration in Chat Conversations. In: ITS 2014, Vol. LNCS 8474, pp. 230–235. Springer, Honolulu, USA (2014)