



Application of qualitative reasoning models in the scientific education of deaf students

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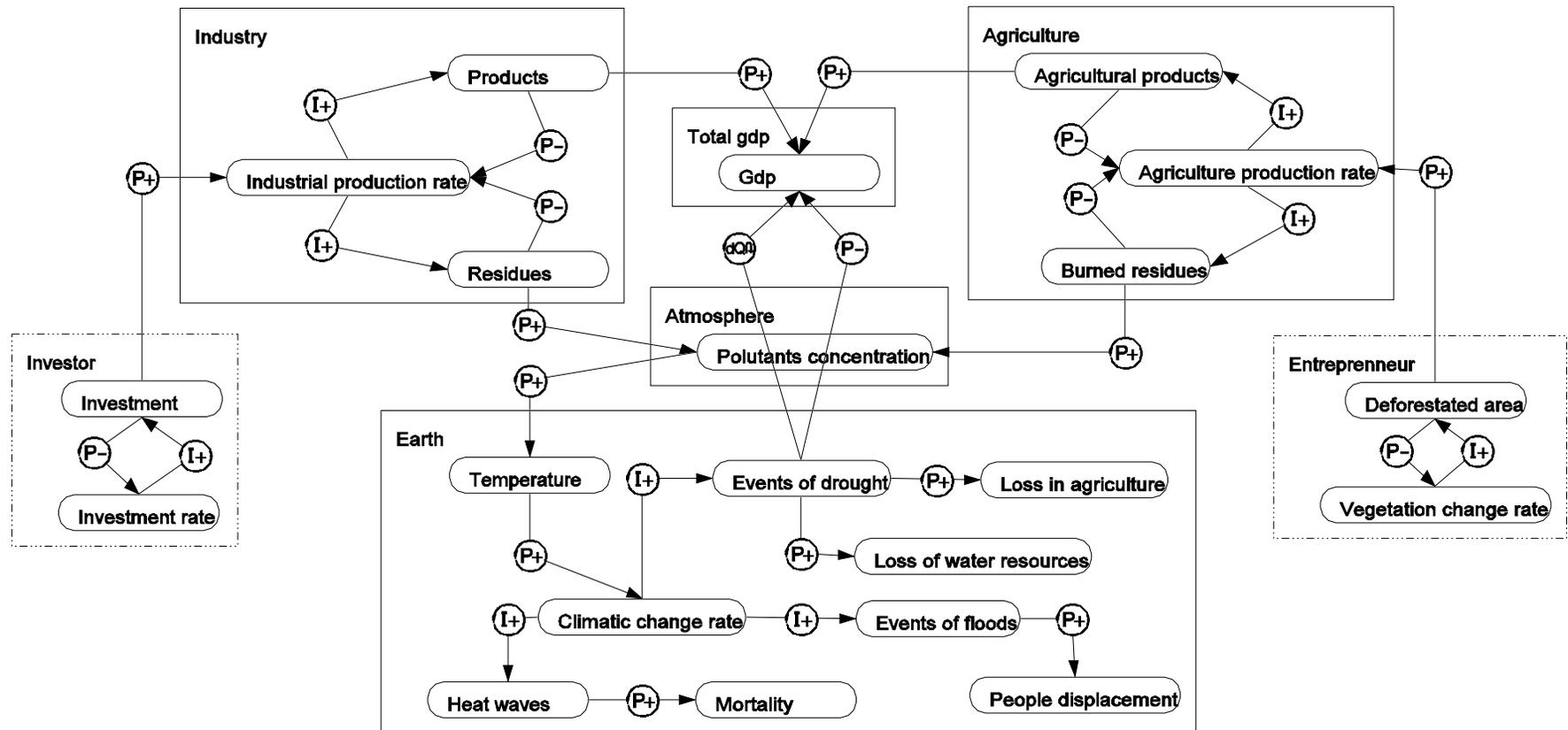
Motivation

- The Brazilian educational system is promoting the education of deaf students along with hearing students in inclusive classrooms.
- This paper aims at investigating what are the requirements for supporting the deaf students to learn the scientific knowledge presented in classroom.
- Special attention is given to the acquisition of concepts and vocabulary, and the development of competence on written skills and logical reasoning.

What has been done (in this work) to meet these requirements

- Implementation of a QR model about 'Global Warming'
- Development of didactic material to explore this model
- Creation in sign language (LIBRAS) representations for QR modelling primitives and models
- Validation of the model and of the LIBRAS signs
- Creation of a DVD to be used in secondary schools containing all the material produced in this work

A model about global warming and climatic changes



Causal model obtained in a simulation with the 'global warming' model, which was implemented in the Garp3 Workbench (Bredeweg et al., 2006)

Didactic materials to explore the QR model

- Assignments were created in a sort of collaborative work involving the researchers and 8 secondary school teachers during a course about using QR models in science education.
- The teachers were exposed to five models, including the 'global warming'. For each model, the group discussed the terminology used to describe relevant concepts and identified the most important modeling primitives.
- The main product of the course was a set of assignments exploring entities, quantities, model fragments and simulations with the 'global warming' model.

QR models expressed in sign language

A group of 6 undergraduate deaf students created 32 terms in sign language to express concepts used to build QR models, in three steps:

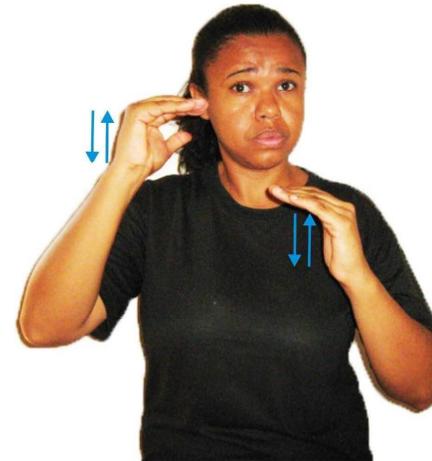
- deaf students were exposed to QR modeling primitives and models in order to understand their meaning;
- the deaf students created signs for each modeling primitive;
- the signs were validated by a group of 17 undergraduate deaf students and by hearing teachers.



SYSTEM



ENTITY



QUALITATIVE REASONING

A DVD with the didactic material

Contents:

- a glossary of the modelling primitives;
- the simple QR model (tree and shade);
- the model about climatic changes.

**SEE
DEMONSTRATION**

All these materials are presented in LIBRAS
and in written and spoken Portuguese

+ assignments exploring the models.

Validation

- conceptual and operational validation of the model by expert and deaf students;
- validation of the signs created in LIBRAS for the modelling primitives by the 17 deaf students and 8 teachers
- Validation of the DVD in ongoing work at secondary schools with deaf and hearing students

Concluding...

In order to bring QR models into the classroom for the deaf,

- focus on bilingual education, which has the potential to fulfill the needs of both deaf and hearing students;
- involve the deaf community, experts, teachers to create vocabulary for expressing scientific concepts in sign language and to validate it;
- follow the visual pedagogy and integrate a diagrammatic approach with written Portuguese in didactic material based on QR models, to explore concept acquisition, the development of language skills and of logical reasoning.

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(*Portuguese as a second language in scientific education
of deaf students*).