Effects of a digital dialogue game and epistemic beliefs on learning, argumentation, and student satisfaction

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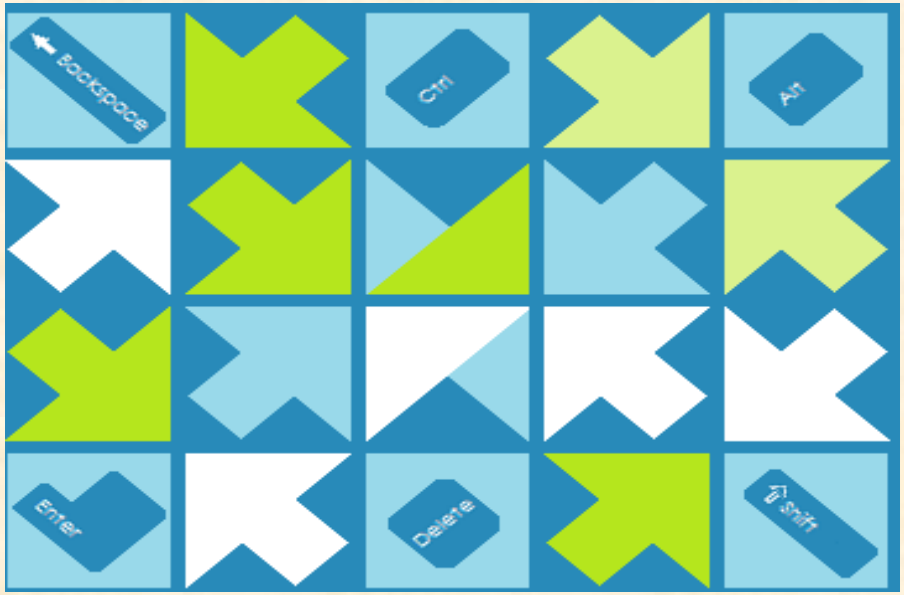

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Introduction

- WWW and computers in modern age
- Higher education and authentic problems
- Well designed educational settings are needed to prepare qualified and capable professionals and experts for solving authentic and complex problems.
- Qualified and capable professionals and experts need to acquire the skills of argumentation to be able to analyse, conceptualize, synthesize, and cope with complex and authentic problems.

Argumentation-Based Learning

- **Argumentation: Essential objective in education especially in higher education**

- **Argumentation: Not restricted to one discipline**

Difficulties for Argumentation-Based Learning

- Ignoring/not accepting opposing views (incompatibility)
- Avoiding generating counter-arguments
- Perceiving critiques as personal attacks rather than constructive feedback

Fostering Argumentation-Based Learning

- Representational scripting
- Representational visualisation

- Online environments e.g. ICT, computer-support systems
- Computer-Supported Collaborative Learning (CSCL)

Difficulties for Argumentation-Based CSCL

- **Argumentation-Based CSCL is not always productive:**
  - **Complexity and not-linear nature of argument**
  - **Lack of social context cues**
  - **Lack of motivational factors**

- **Digital dialogue game with motivational factors**

Digitalized games

- Motivate students
- Increase understanding and retention of knowledge
- Facilitate acquisition of domain-specific knowledge
- Authenticate and visualize learning contexts
- Facilitate acquiring complex cognitive skills and deep learning
- Facilitate construction of knowledge

Research questions

- **What are the effects of a digital dialogue game on students':**
- **Argumentative discourse activities**
- **Motivation and satisfaction**
- **Shift of opinion**

Method

- Study was conducted in a real educational setting at Wageningen University
- 25 MSc/BSc students: 168-h course “Life-Science Communication and Learning in the Digital Age”
- Mean age of students: 22 years
- 80% female
- Participants were divided into 5 groups of 4 or 5 students based on their perspective on controversial issue

Method

- **Topic of discussion:** Bringing GMOs to market
- **Experimental session: 2.5 hours.**
- **A pre-test, post-test design**
- They were asked to argue a controversial topic with the aim of exploring various perspectives, and the 'pros and cons' on the topic of 'Genetically Modified Organisms (GMOs)'.

Introduction and Pre-test (45 min)

- Purpose of the study
- Demographic variables
- Preliminary opinion on the GMOs'

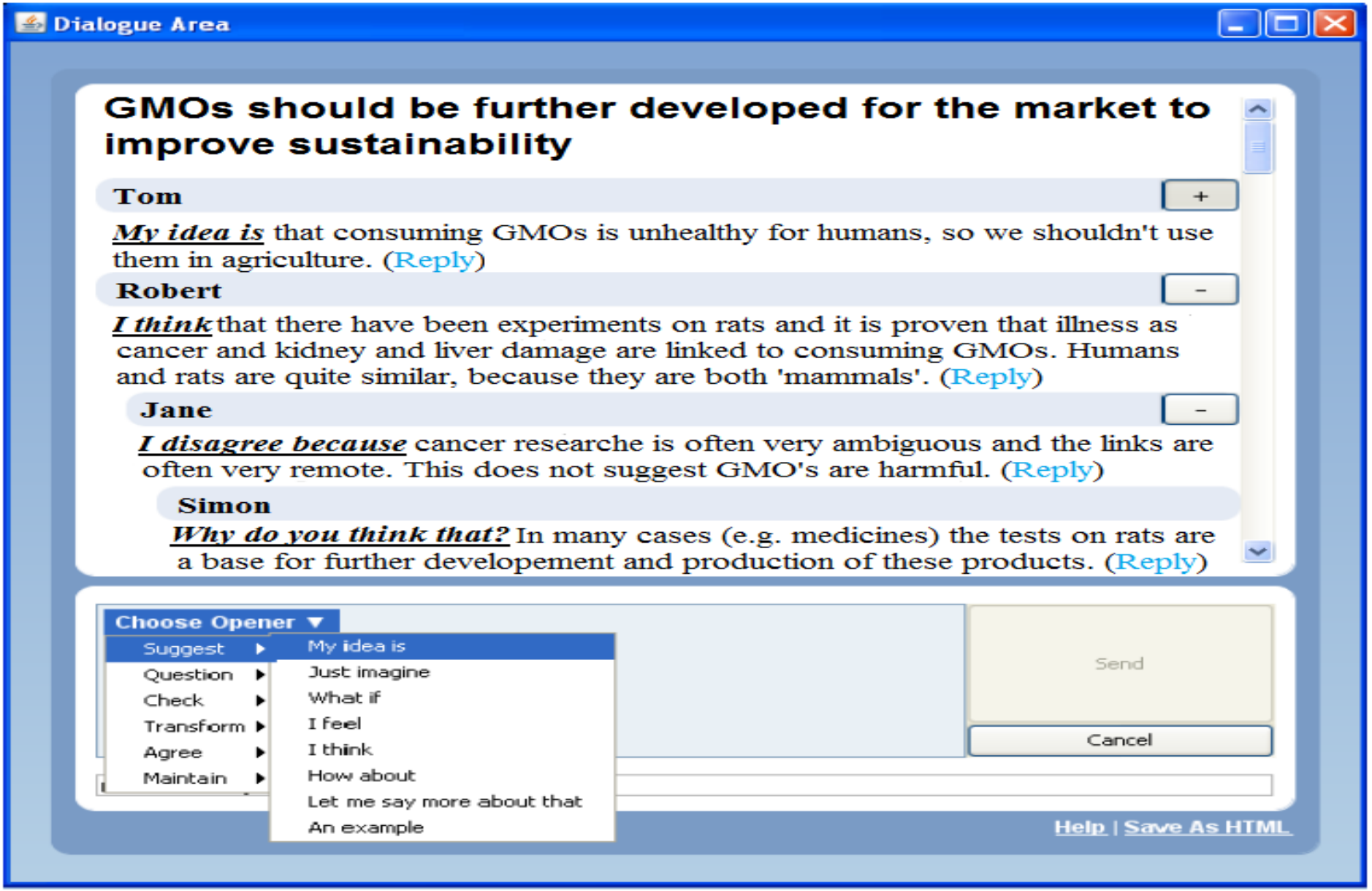
Learning process (60 min)

- 'Hands-on' training exercise
- Group discussion through digital dialogue game

Post-test (45 min)

- Final opinion on the GMOs'
- Satisfaction with the learning experience and its outcomes
- Plenary verbal session

Learning environment: Digital dialogue game



Measuring students' shift of opinion

- **A pre-test post-test two item questionnaire (on a five-point Likert scale) was used to measure students' shift of opinion on the GMO issue**

Statement	Disagree				Agree
GMOs should be further developed for the market to improve sustainability					
GMOs are a danger to biodiversity					

Measuring students' satisfaction with the learning experience and its outcomes

Perceived Outcomes of the Learning Task	It motivated me to learn.
	It provided useful social interaction.
	It broadened my knowledge.
	It improved my communication skills.
	It improved the quality of my learning.
	It had added value for students.
	It was suitable for my learning.
	It made me more interested in the topic.
	It motivated me to do good work.
	It helped me to learn a lot from peers.
Attitude towards Web-assisted Learning	The quality of student learning is improved by using computers.
	The quality of student learning is improved by using the platform.
	I really enjoyed using the computer to support my learning.
	I really enjoyed using the platform to support my learning
Ease of Use of the Dialogue Game Application	Using the dialogue game application was easy.
	Working with the dialogue game application was clear and understandable.
	It takes only a short time to learn how to use the dialogue game application.
Satisfaction with the Learning Task	I am satisfied with how much I learned while performing the learning task.
	I am satisfied with how much group work was involved in performing the learning task.
	I am satisfied with the quality of discussion in our group.
	I am satisfied with the degree to which I shared knowledge with my partner.

Measuring argumentative discourse activities

- **A content analysis coding scheme was developed to measure quality of argumentative discourse activities.**

Code	Description
Externalization	*When learners outline their knowledge without reference to earlier messages,* *When learners juxtapose externalizations (i.e. reply to earlier externalizations with an externalization).*
Acceptance	*When learners agree to what has been said before without further elaboration.* *When learners agree to what has been said before without any modification by repeating what has been said.*
Elicitation	*When learners ask for or invite a reaction from their learning partners. Typically, this is done by asking questions.* *However, learners often forget the question marks or make proposals rather than asking directly.*
Integration	*When learners adopt the perspectives of their peers and build syntheses of (various) arguments and counter-arguments that learning partners have uttered before.*
Conflict	*When learners reject, deny, or give a negative answer to evaluation of what has been said before.* *When learners modify or replace what has been said before.* *When learners slightly amend or add to the learning partners' utterances.*

Results

- Learners' satisfaction with the learning experience and its outcomes appeared to be sufficiently high (around 3.5 on a 5-point Likert scale) for all students.
- One-third of students have shifted their opinion on the GMO issue, from pre-test to post-test.
- There were a total of 403 discussion messages generated during the discourse (average of 16.12 per student).
- 129 messages were categorized as externalization, 83 elicitation, 68 agreement, 66 integration, and 57 disagreement

Results

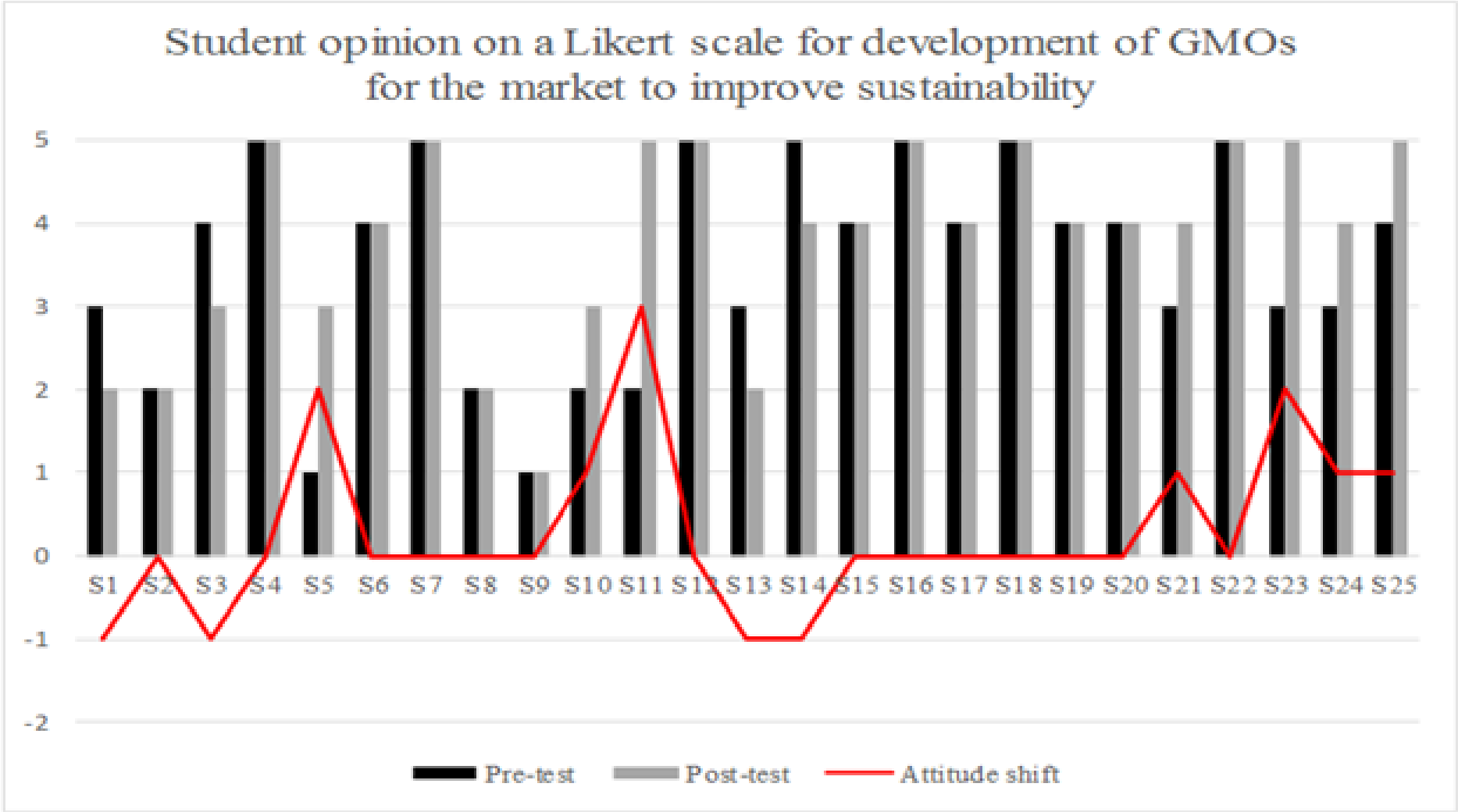


Figure 2: Attitude shift of student opinions from pre-test to post-test in terms of development of GMOs for the market to improve sustainability. The letter "S" represents student names.

Conclusions

- Dialogue and argumentation through the dialogue game led to a shift of opinion among the students who participated in the game.
- The type of argumentative discourse activities is related to shift of opinions of students: More critical questions led to bigger shift of opinions.
- Implementation of the digital dialogue game for debating a controversial issue was evaluated positively by undergraduate students.

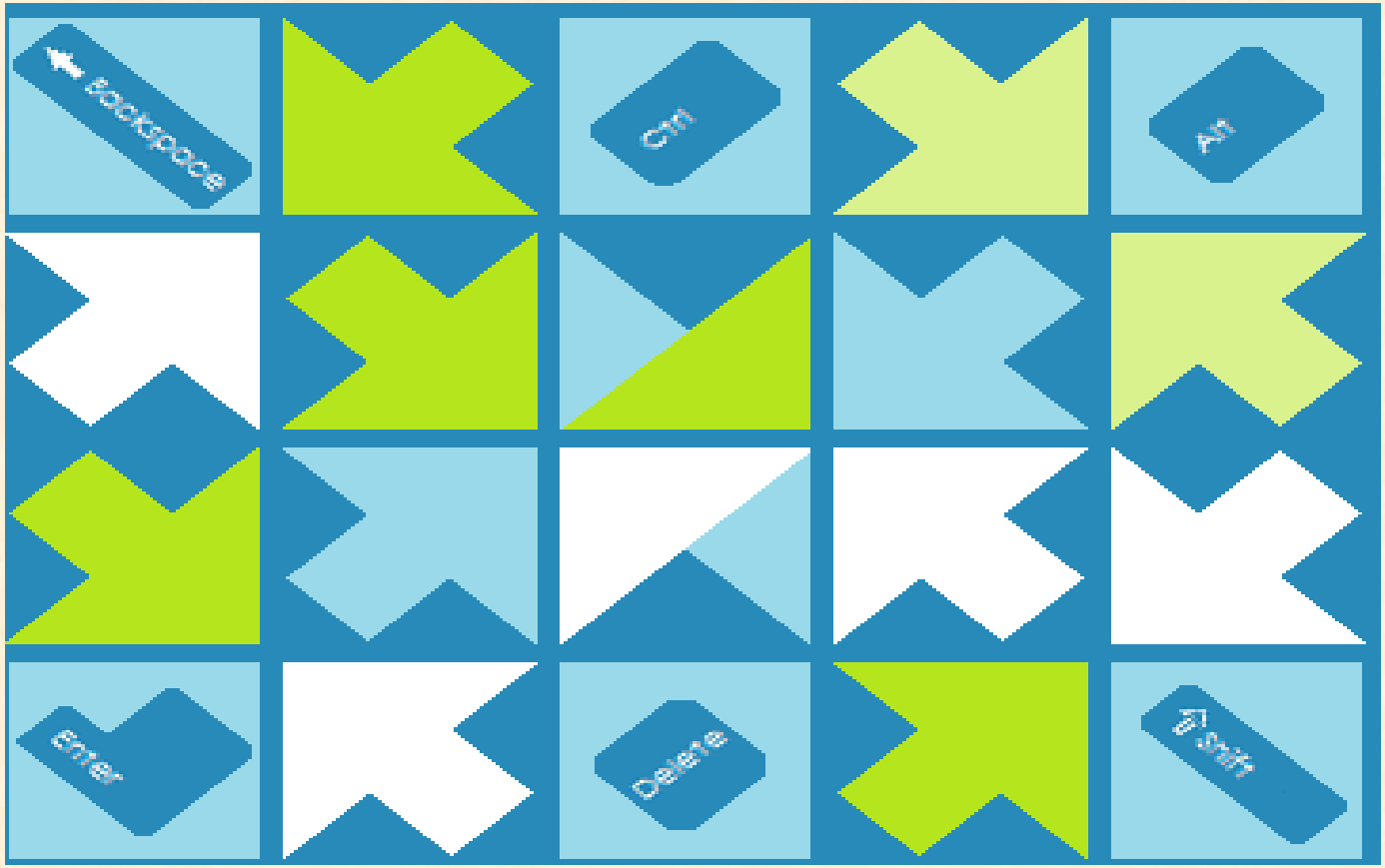
Conclusions

- The dialogue game provided a safe and respectful learning environment for students to practice their argumentation and exercise critical discussion and reasoning skills.
- User-friendliness and the design of the sentence openers of the game were positively reflected in the learners' scores for satisfaction with the learning experience and its outcomes.

Suggestions for future research

- Testing the game with higher number of students.
- Varying number of students per group.
- Varying the type of sentence openers.
- Using a tutor or a teacher to guide students dialogue during game.
- Testing domain-specific knowledge gain of students after the game.

Thanks for Your Attention



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