

Exploring the Possibility of Using Humanoid Robots as Instructional Tools for Teaching a Second Language in Primary School

Elective in Artificial Intelligence

Human-Robot Interaction

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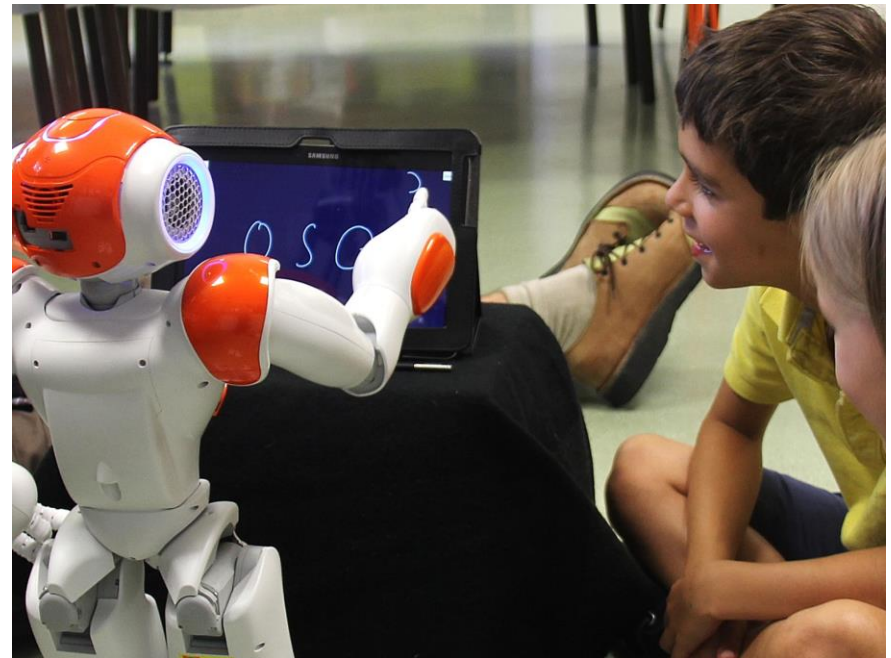
Outline of the presentation

- **Introduction**
- **Instructional tools for teaching elementary language**
- **Characteristics of robots**
- **Categories of educational robots**
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- **Discussion**
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Introduction

Studies have shown that **robots can help students** develop problem-solving abilities and **learn computer programming, mathematics, and science.**

The paper is focused on **educational humanoid robots for teaching a second language in a primary school.**



Instructional tools for teaching elementary language: overview

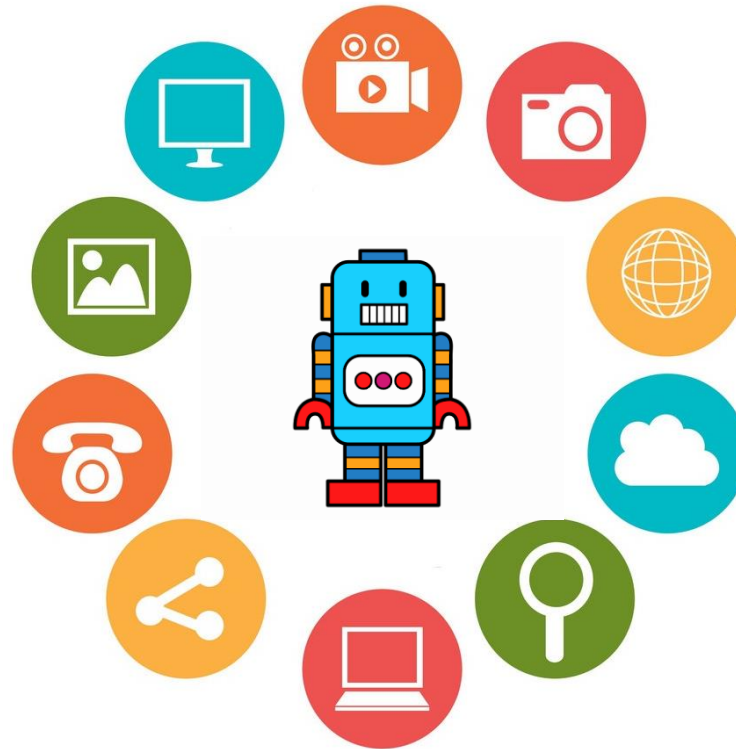
Common instructional tools can be classified as **visual**, **audio**, **video**, **computers**, **multimedia**, **Internet** and **mobile devices**.



Multimedia instructional tools are significantly better than mono-media in facilitating learning. In particular, using such category of tools also facilitates students in developing language capabilities.

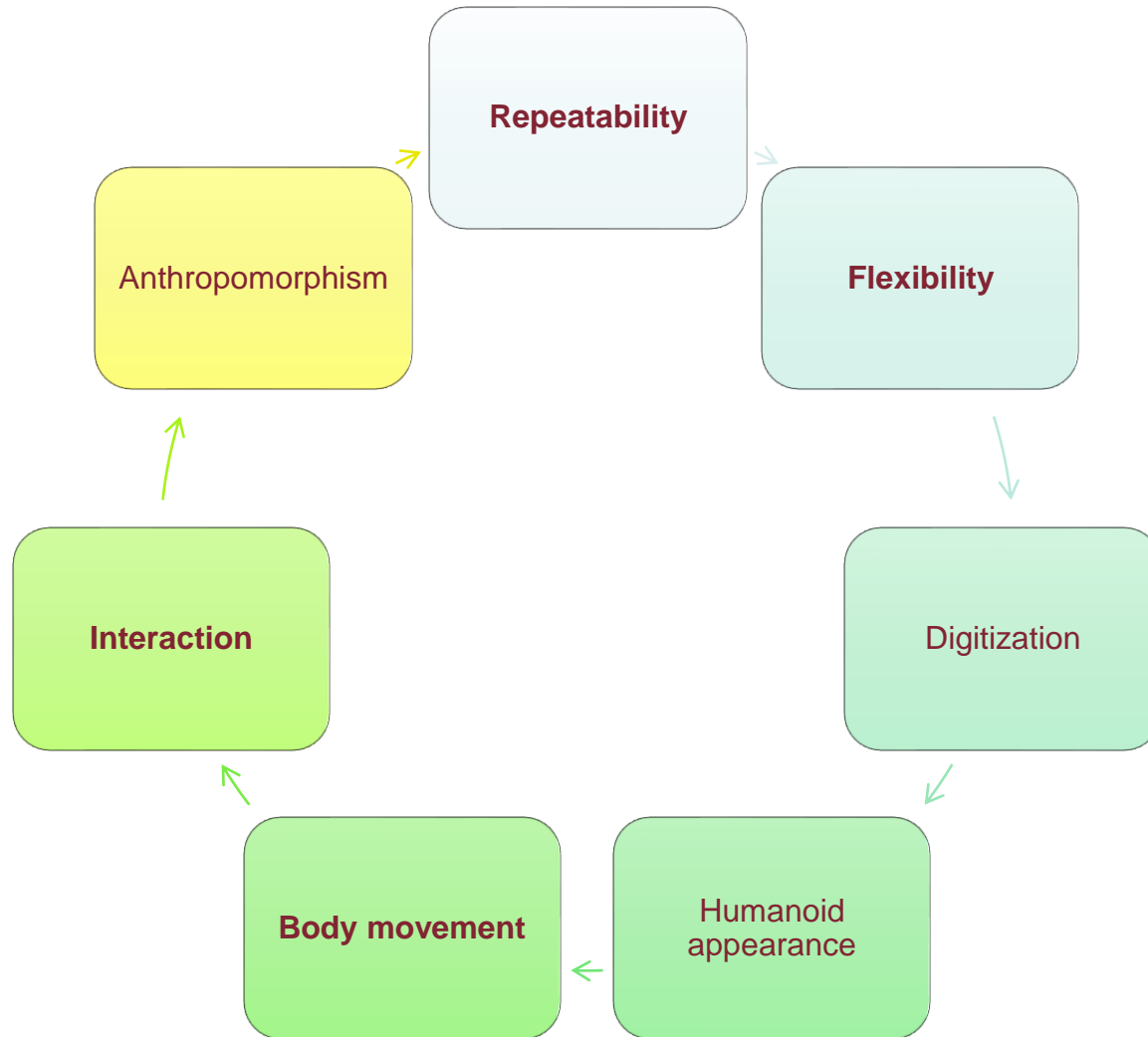
Instructional tools for teaching elementary language: humanoid robots

Humanoid robots can integrate many multimedia tools into one single element and can be programmed to perform tasks, like “hear” or “speak”, to support teaching and to enhance users’ enjoyment and engagement.



Characteristics of robots

Seven common characteristics that might support instruction:



Categories of educational robots

1 Learning materials

Learners can design and develop their own robots and learn in the process. This results in increased motivation and improved skills.

GENTORO supports children's storytelling in a physical space via the child's use of a handheld projector and a robot.



Learning companions/pets

Humanoid robots can naturally be regarded as learning companions.

2

ROBOVIE behaves as an English peer tutor for Japanese students to encourage children in improving their language abilities.

3 Teaching assistant

Robots that accompany and encourage students to learn. They can help instructors to present materials.

IROBI displays information via a monitor in its belly and can move the arm to direct students to key points on the monitor.



Experimental scenarios: modes

Storytelling mode

- The robot can present stories with different voices and combine speaking with actions or sound effects.
- Telling a story in an effective way to stimulate students to learn a language.

Oral reading mode

- The robot leads students to recite vocabulary and sentences.
- Students exercising their verbal ability will learn to speak more fluently.
- In the meanwhile, the teacher can focus on students' pronunciation.

Cheerleader mode

- The robot encourages students to participate in the games.
- When a team/child wins, the robot will dance and shout for joy.
- In this way, children are encouraged to participate in the learning activities.

Action command mode

- The robot asks students to perform a task and viceversa.
- Children acquire comprehension ability by responding to commands.

Question-answer mode

- The robot can chat with a child and invite him/her to continue talking.
- Students are encouraged to use the foreign language to communicate and improve their competence.

Experimental scenarios: pictures



Teacher telling a story with the robot.

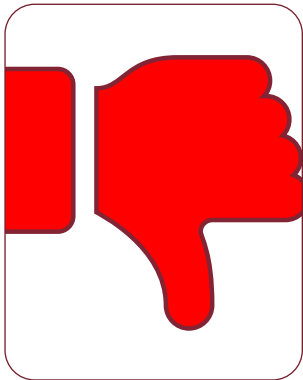


Students giving the robot commands.

Discussion



- 1) Students demonstrated positive and engaging reactions with more attention and participation during the lectures.
- 2) Robots can be used as interactive interlocutors for teachers and pupils.
- 3) Teachers and students can design their own teaching materials that subsequently get performed by the robot.



- 1) Robots can be expensive and complex.
- 2) Instructors worry that children can destroy or damage the hardware.
- 3) Challenge to design easy-to-use human-robot interfaces for non-expert teachers.

Conclusions and comments

- Educational robots are helpful for students in developing collaboration and problem-solving abilities.
- Robots have the potential to be useful in language teaching.
- Students responded with high motivation levels. They practiced listening and speaking by interacting with the robot.
- Children's reactions and teachers' opinions indicated that robots could create an interactive and engaging learning experience.
- Our project aims at providing a human-robot interactive framework to teach users a second language.
- The adopted robot will be humanoid (e.g., Pepper) to exploit the benefits addressed in the reference paper.
- Users can not be necessarily of primary-school level: our work will be referred to every category of students.

References

- **Chih-Wei Chang, Jih-Hsien Lee, Po-Yao Chao, Chin-Yeh Wang and Gwo-Dong Chen**
“Exploring the Possibility of Using Humanoid Robots as Instructional Tools for Teaching a Second Language in Primary School”, 2010, Article in *Educational Technology & Society*.