UDK: 37.091.3:811.111'243]:007.52(497.5)
Review paper

PROPOSAL FOR THE IMPLEMENTATION OF HUMANOID ROBOTS IN TEACHING ENGLISH AS A FOREIGN LANGUAGE IN CROATIA[1]

Petra Karabin
Faculty of Teacher Education
University of Zagreb
Republic of Croatia
petra.karabin@ufzg.hr

1 The work of doctoral student has been fully supported by the "Young researchers' career development project – training of doctoral students" of the Croatian Science Foundation. The paper is projected in the detailed career development plan of the doctoral student, DOK-09-2018. It was funded by the Croatian Science Foundation through the project UIP-2017-05-5917. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of Croatian Science Foundation.

ABSTRACT

The particularity of foreign language teaching is that it includes a variety of teaching topics, and in addition to that, language skills are being acquired with the use of various teaching tools. The latest teaching tool, which is being gradually introduced in foreign language teaching, is an educational robot (Nikolić, 2016). According to Randall (2019), the most widely used robots in the teaching process are those with an anthropomorphic appearance, the so-called humanoid robots.

As the development and implementation of robots as teaching tools in the teaching process is still in its early stages in the Republic of Croatia, this review paper aims to offer the participants of the educational process a description of three humanoid robots (Meccano Meccanoid 2.0 G16, Leju Aelos 1S, UBTECH Alpha 1 Pro) that can be used in teaching English as a foreign language in primary education. Along with the robots' description, this paper offers the examples of teaching activities that correlate two different subjects (English as a foreign language and ICT) and achieve interdisciplinary educational and learning outcomes. Proposed teaching activities, which will be only one of the activities of the lesson, will include various types of class organization and usage of different educational materials. Alongside, they will be complemented by actual textbook examples and a proposal regarding the grade in which they can be used.

Key words: educational robots; humanoid robots; teaching English as a foreign language.

INTRODUCTION

As a means to improve the educational skills of students, various educational technologies are gradually being introduced into the educational process. Educational technology includes the study and practice of learning by creating, using, and managing the appropriate technological process and educational resources to improve students' educational skills (Committee of the Association for Educational Community, 2008). The authors (ibid., 2008) further state that educational technology uses already known resources in theory and practice (such as textbooks, books, museums, and libraries) in combination with digital technologies (such as computers, tablets, and smartphones) that contain hardware and software, and digital media (such as web pages). The latest addition to digital technology that is gradually being researched, developed, and implemented in the teaching process is the educational robot (Nikolić, 2016). The results of various content analysis research (e.g., Benitti, 2012; Anwar et al., 2019; Evripidou et al., 2020) show the gradual development of the implementation of robots into the educational process. For instance, the content analysis by Evripidou et al. (2020) indicates that there are more than 2,000 scientific papers, including key words related to education robotics (e.g. educational robots, educational robotics, learning robotics), published in the scientific base Scopus. Moreover, the results of the research also show that more than 50% of the mentioned papers were published between 2015 and 2020.

With the development of educational robots, a new term appeared in the teaching process: robot-assisted learning (Mubin et al., 2013). Even though the robot-assisted learning is mostly associated with the subjects being part of the STEM area (e.g., Chiou, 2012; Gomoll et al., 2016), Eguchi (2014) points out the effective robot usage in subjects including writing, reading, creativity, and communicating. One such example is foreign language teaching, which is very convenient, as it covers a wide range of teaching topics, the acquisition of different skills, and the usage of a variety of teaching tools (as well as robots). Consequently, the term robot-assisted language learning has been developed (Han, 2012). In the Republic of Croatia, the implementation of robots in teaching is a relatively unknown process to the participants of the educational process. Croatian Robotics Association (Hrvatski robotički savez, 2022) gathers 25 member associations in the Republic of Croatia, which includes as many as 5,400 users. This indicates that quite a number of students are already familiar with robot usage.

Eguchi (2014), furthermore, states that the majority of the activities including educational robotics are part of the various extracurricular activities. The results

of Cergol and Karabin (in press) suggest that the students attending robotic workshops (in the Republic of Croatia) experience flow while working with robots. Aside from the robot itself, the influence of the teacher, who provides clear instructions and feedback, and creates a motivating environment, contributes to the utter enjoyment of the students in the work with robots. In line with the mentioned positive factors, and the contemporary and digital area we are all part of, the implementation of robots into the education process in the Republic of Croatia is inevitable. Therefore, this paper aims to bring humanoid robots closer to potential future users, accompanied by examples of teaching activities.

CHARACTERISTICS OF EDUCATIONAL ROBOTS

In her research, Randall (2019) made a content analysis of the topic of robot-assisted language learning. The content analysis included 79 papers published in December 2017 or prior. According to the analysed content, robots used in language learning can be divided in several ways: related to the robot design (robot appearance, the voice of a robot, robot control), and interaction possibilities (the role of robots, giving feedback to users).

Based on their appearance, robots are divided into anthropomorphic, zoomorphic, mechanomorphic, and cartoon-like. Anthropomorphic robots are robots that look like humans, that is, they have a head (with facial features), a torso, and limbs. Zoomorphic robots resemble some animals, and mechanomorphic robots have an industrial appearance and may possess machine-like characteristics (e.g. the ability to transform into various shapes). Moreover, robots differ in terms of the voice they produce and are thus divided into those that have a synthetic voice and those with a pre-recorded voice. When it comes to their role in the teaching process, robots can have the role of a teacher, teacher's assistant, peer/tutor, or learner. Robots can also be divided depending on whether they react with the user (such as gesturing, engaging in eye contact, smiling), depending on giving feedback to the user (such as corresponding to correct / incorrect answers, head nods, happy faces/sad faces), and depending on the connection with the user (which depends on one's ability, progress or emotional state). Lastly, depending on how the robot is controlled, robots can be of an autonomous, teleoperated, or transformed type (Han, 2012). Autonomous robots are those that can be programmed and that perform a specific action on their own or possess artificial intelligence and can respond to the given instruction. Teleoperated robots are robots that are controlled by remote control. Transformed type robots are those that can be controlled by a

controller, but they can also be programmed to perform a specific action on their own (ibid.).

EXAMPLES OF HUMANOID ROBOTS USED IN TEACHING ENGLISH AS A FOREIGN LANGUAGE

Various robots have been involved in previous research in the world (e.g. chicken-like robot in the work of Shwu-Ching Young et al., 2010; LEGO Mindstorms in the form of a crane in the work of Bers et al., 2002; or a dragon-like robot in the work of Kory, Breazeal, 2014). The most commonly used educational robots in language learning classes are those of anthropomorphic appearance (Randall, 2019). Such robots are also called humanoid robots because, apart from having a human appearance, they usually have the ability to produce voice and mechanically use their head, torso, and limbs (raising/lowering arms, walking forward / backward, turning, bending, etc.).

Interestingly, when imaging the robots, the students mostly think of the humanoid ones. Karabin et al. (2022) carried out research with the students (aged 8–16; N = 23) who participated in a summer robotic camp where they used robots (LEGO Mindstorms EV3 and LEGO SPIKE Prime). For the research, the students were asked to draw a robot they envision using in learning English as a foreign language (when learning about the everyday content: fruits and vegetables or store-related words). The results have shown that they envisioned robots of an anthropomorphic (humanoid) or mechanomorfic appearance. Furthermore, Storjak et al. (2020) and Storjak et al. (2022) conducted longitudinal research where one of the research questions was to investigate how the students perceived the robots. Both studies (2020; 2022) showed that the students thought of a robot with an anthropomorphic appearance. Namely, more than 80% of drawings included a robot that looked like a human. To be more specific, it occurred before and after the treatment (i.e. the workshop with educational robots with mechanomorphic appearance). Though the drawings of the humanoid robots prevailed, according to the results of the questionnaire, most of the students shared that the robot can resemble a machine or a vehicle, a human, an animal, or be cartoon-like, as in Randall's (2019) classing. Consequently, not only are the robot characteristics and functions, which will be presented below, important when choosing a robot for educational purposes, but also the students' perception of them and preferences should be borne in mind.

ROBOVIE

The first robot mentioned in research on the topic of educational robots is the Robovie robot (Ishiguro et al., 2001, Figure 1). Kanda et al. (2004) conducted the study, including first- and sixth-grade pupils, where Robovie was programmed to produce more than 300 sentences and recognize about 50 words in English that the pupils would pronounce. In addition, Robovie could perform about 70 interactive actions, such as greeting, shaking hands, hugging, pointing at objects in the environment, exercising, playing the rock-paper-scissors game, etc.

Figure 1. Robovie (Ishiguro et al., 2001)

iRobiQ

iRobiQ, a robot used in the research by Hyun et al. (2008), is an example of a static humanoid robot (Figure 2). This medium-sized robot has a head and torso, but its arms are not as flexible as Robovie's. There is a screen on the robot's body that can display certain images. The robot also has a speaker that produces sound. In this study, iRobiQ read preschool children a story in an interactive way (e.g. paired reading, shared reading, asking questions, displaying images and producing sounds).

Figure 2. iRobiQ (Hyun et al., 2008)

NAO

The most widely used humanoid robot in research is the NAO robot. According to Randall (2019), the use of this robot in language learning is mentioned in 26 research papers, all from the last decade. The NAO robot (Figure 3) is very convenient to use due to its characteristics, mostly because it has sensors, cameras, the ability to recognize voice, voice production, limb movement, etc.

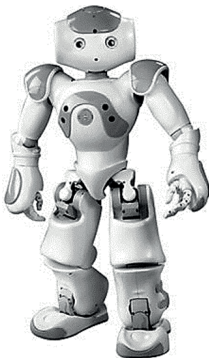

Figure 3. NAO Evolution (Alemi et al. 2017)

The participants in a study conducted by Alemi et al. (2017) were preschool children in an English language classroom. In that study, the NAO robot played the role of a teacher's assistant who called out children's names, sang songs, encouraged children to participate, answered their questions, and deliberately answered teachers' questions incorrectly (so that children would not feel bad if they ever made a mistake). In a study by Schodde et al. (2017), along with the tablet, the students used the NAO robot. The robot described the animal in the children's native language and pronounced its name in English and in that way preschool children would learn animal names in English. The children had pictures of four animals on the tablet and had to choose the one the robot named. In their study, Ishida et al. (2016) used two NAO robots that interacted with adult students (students aged 18–24; N = 61). The robots were pre-programmed to engage in an individual conversation in English and they would ask the students questions they had to answer. Therefore, the students had to follow (and understand) what the robots were talking about and get involved in the conversation by providing their own answers on time.

AIM OF THE PAPER

The aim of this paper is to provide examples of three humanoid robots (Meccano Meccanoid 2.0 G16, Leju Aelos 1S, UBTECH Alpha 1 Pro)[2] to the participants of the educational process that can be used in teaching English as a foreign language. Within the description of the robots, examples of activities in which robots can be used will be briefly given. In addition, the textbook on which the activity is based (randomly selected) and the grade it is intended for will be mentioned. These activities can be adapted to the needs of students and class size and applied in other grades in teaching English as a foreign language.

METHODOLOGY

In this paper three humanoid robots will be described: Meccano Meccanoid 2.0 G16, Leju Aelos 1S, and UBTECH Alpha 1 Pro. Each description will include the external appearance of the robot, its internal components, and the functions that the robot possesses. Apart from the description, examples will be provided of teaching activities for English lessons that would include the use of the described robots. The approved primary school textbooks (see References under Approved textbooks) will be used when creating teaching activities.

Besides examples of teaching activities, the grade the activity is intended for, learning outcomes for ICT, learning outcomes for the English language, class organization, expected duration of activities, and necessary teaching tools will be defined. Teaching activities and other accompanying features will be listed in the table after each robot description.

In addition to textbooks, to develop teaching activities, English Curriculum for Primary Schools (Ministarstvo znanosti i obrazovanja, 2019a) and ICT Curriculum for Primary Schools (Ministarstvo znanosti i obrazovanja, 2019b) will be used. The teaching activities are intended for students who are in the concrete operational stage, according to Piaget's theory of cognitive development (Slavin, 2006). The reason is that students in that stage begin to think logically, they understand the concept of conservation on already known and concrete examples and the concepts of serialization, transitivity, and classification appear. In addition, it is assumed that if students encounter information and communication

2 The reason for choosing and presenting these particular robots is that they are owned by the Faculty of Electrical Engineering and Computing, University of Zagreb, or more precisely they are part of the project UIP-2017-05-5917, sponsored by the Croatian Science Foundation, on which the author is employed.

technologies earlier, they will be more inclined to use them later (cf. Varney et al., 2012).

OVERVIEW OF ROBOTS

Meccano meccanoid 2.0 g16

Meccanoid 2.0 G16[3] robot is a product of the Meccano company (Figure 4). It is a robot construction set that has 497 pieces. When built, it is humanoid in shape and reaches a medium size. The robot's head has big eyes with built-in coloured LED lights. Inside the head, there is a brain or the so-called *Meccabrain* with a microphone and speaker included. Four motors are inside the robot's arms and they memorise human movements, while two motors are inside its legs and are used to move the robot. Meccanoid is made of durable ABS and polycarbonate construction pieces. It runs on four D batteries. Meccanoid can respond to more than 40 pre-programmed voice commands and more than 70 simple phrases. In addition, it can say more than 4,000 phrases (e.g. jokes, questions, interesting facts), it can dance, perform Kung Fu movements, walk forward or backward, turn around and simulate exercise. In addition, the user can program Meccanoid using *Learned Intelligent Movement*, *Ragdoll Avatar,* or *Drag-and-Drop Programming*.

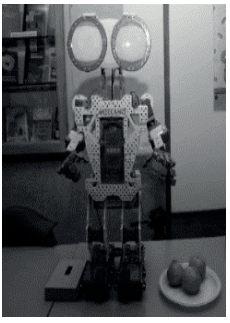

Figure 4. Meccanoid 2.0 G16

Table 1 shows the teaching activity designed according to the teaching content of the textbook New Building Blocks 1, page 22.

3 To describe the robot, the manual accessible at the following link was also used: http://intl.meccano.com/instructions-results.

Table 1. Proposal of a teaching activity in which Meccanoid 2.0 G16 robot is used as a teaching tool

<table>
<tr><td colspan="4">Grade: 1st grade (7 y.o.)</td></tr>
<tr><td colspan="4">Teaching topic: Teacher says! – revision</td></tr>
<tr><td>ICT learning outcomes:</td><td colspan="2">Information and Digital Technology</td><td>Digital Literacy and Communication</td></tr>
<tr><td></td><td colspan="2">After the first year of studying ICT in the domain of Information and Digital Technology a student recognizes digital technology and communicates with familiar people with the help of teachers in a secure digital environment.</td><td>After the first year of studying ICT in the domain of Digital Literacy and Communication a student uses the proposed programs and digital educational content with the support of the teacher.</td></tr>
<tr><td rowspan="4">English learning outcomes[4]:</td><td>Communicative Language Competence</td><td>Intercultural Communicative Competence</td><td>Independent Language Learning</td></tr>
<tr><td>Responds nonverbally and verbally to spoken English words and very short and simple instructions and questions.</td><td rowspan="3">Recognizes and imitates basic standards of polite behaviour in simulated and / or real intercultural encounters.</td><td>Recognizes and uses the most basic cognitive language learning strategies.</td></tr>
<tr><td>Recognizes graphemic images of simple words.</td><td>Recognizes and uses the most basic metacognitive language learning strategies.</td></tr>
<tr><td>Uses common words by imitating the English phonemic system.</td><td>Recognizes and uses the most basic socio-affective language learning strategies.</td></tr>
<tr><td colspan="4">Class organization during the English lesson: individual work, group work</td></tr>
<tr><td colspan="4">Expected duration of the activity during the English lesson: 6 minutes</td></tr>
<tr><td colspan="4">Teaching tools: textbook New Building Blocks 1 (p. 22), Meccanoid 2.0 robot, word cards</td></tr>
<tr><td colspan="4">Teaching activity:
The student gets a word card with an instruction that he or she must read. The word cards contain already known instructions that the students have previously acquired. The instruction is also accompanied by an image. Instructions can be: turn around, wave your hands, sit down, stand up, and others. If the student cannot read the instruction, the teacher helps the student. The student reads aloud the instruction and instructs the robot to do it. The robot and the other students follow the instructions. The student then translates the instructions to Croatian. Students take turns giving instructions.</td></tr>
</table>

4 In the statements, which are under the domains of Communication Language Competence, Intercultural Communication Competence and Independent Language Learning, a student is the subject.

LEJU AELOS 1s

Leju Aelos 1S[5] is a medium-sized white robot. The rechargeable battery is located inside the robot and it can last for more than an hour. External memory can be inserted in the form of up to 1 GB MicroSD Card. The main control panel is located on the back of the robot. Moreover, the robot has a microphone and speaker that allow voice recognition and the production of voices and sounds. In addition, this robot can be controlled by voice, programming, a remote control, and a smart mobile phone. Robot programming is done using AELOS STEM software available for Windows and iOS systems. It is possible to talk with the robot if it is connected to a Wi-Fi network. The robot will respond to the user's voice either if you touch the back of its head (where the touch sensor is located) or if the command "OK AELOS" is clearly pronounced. The robot can perform the following commands: walking, dancing, singing, presenting weather forecasts, presenting information on concepts, stating exact time and date, and adjusting its voice (quietly or loudly). The educational version of the robot, Aelos 1Edu[6] (Figure 5), apart from all the mentioned characteristics, also includes additional sensors (e.g. humidity sensor, flame sensor, light sensor, touch sensor, etc.) and LED lights, the motor fan, and a collision responsive switch. When programming, it is possible to record a voice recording that the robot can perform with a certain movement. Additionally, the software contains a number of basic movements (e.g. getting up, clapping, touching the head, waving hands, shaking hands, etc.), football movements (e.g. kicking, dribbling, falling, and turning), and boxing movements (e.g. front/rear high/low kick).

5 To describe the robot, the manual accessible at the following link was also used: http://www.lejurobot.com/wp-content/themes/LejuWP/download/Aelos%201S%20Robot%20User%20Manual%20.pdf (4/3/2022)

6 To describe the robot, the manual accessible at the following link was also used: http://www.lejurobot.com/wp-content/themes/LejuWP/download/Aelos%201Edu.pdf (4/3/2022)

Figure 5. Aelos 1Edu robot

Table 2 shows the teaching activity designed according to the teaching content of the textbook New Building Blocks 3, page 31.

Table 2. Proposal of a teaching activity in which Aelos 1Edu robot is used as a teaching tool

Grade: 3rd grade (9 y.o.)			
Teaching topic: What can Robbie do? – I can … / I can't …			
ICT learning outcomes:	Digital Literacy and Communication	Computer Thinking and Programming	
	After the third year of studying ICT in the domain of Digital Literacy and Communication a student creates simple digital works according to the instructions.	After the third year of studying ICT in the domain of Computer Thinking and Programming a student creates a program using a visual environment in which he or she uses a sequence of steps, iteration and decision, and with the teacher's help evaluates his or her solution.	
English learning outcomes[7]:	Communicative Language Competence	Intercultural Communicative Competence	Independent Language Learning
	Reads aloud simple sentences with familiar English words.	Recognizes and imitates key conventions of polite behaviour in intercultural encounters.	Selects and applies the most basic metacognitive language learning strategies.
	Talks to another person and exchanges memorized simple sentences.		Selects and applies the most basic socio-affective language learning strategies.
	Writes simple sentences in English.		Expands the range of the most basic creative expression techniques in speaking and writing.
Class organization during the ICT lesson: individual work, pair work			
Class organization during the English lesson: individual work, pair work			
Expected duration of the activities during the ICT lesson: 15 minutes			
Expected duration of the activities during the English lesson: 15 minutes			
Teaching tools: computer, New Building Blocks 3 textbook (p. 31), tablet, Aelos 1Edu robot, notebook			

7 In the statements, which are under the domains of Communication Language Competence, Intercultural Communication Competence and Independent Language Learning, a student is the subject

Teaching activities:
1st teaching activity: Students work in pairs and use the New Building Block 3 textbook. Based on the comic on p. 31, they create a short dialogue in English between the student and the robot and write it down in their notebooks.
2nd teaching activity: Students use a computer, tablet, Aelos 1Edu robot and their own notes of a previously prepared dialogue. One student reads the robot's part of the dialogue, and the other student records it on the tablet using an audio recorder. Students attach the recorded sound to the robot software and associate pre-programmed simple actions that the robot will perform.
3rd teaching activity: Students perform a practiced dialogue with the robot and present it to others.

UBTECH ALPHA 1 PRO

UBTECH Alpha 1 Pro[8] is a medium-sized white robot made of aluminum alloy, a personal computer, and ABS housing (Figure 6). It has a rechargeable Lithium battery, which can last a little over 60 minutes. The internal memory of the robot is 128 MB and it can support external memory of up to 32 GB. The robot can be connected with a Bluetooth connection. The robot's limbs (arms and legs) have 16 movable joints that allow the robot to move. The pre-programmed movements of the robot are hand strikes, turning to different sides, getting up from a lying position, moving to different sides, moving forward, and performing push-ups. Since it has a mono speaker, the robot can be programmed to produce sounds, for example, talk to the user, tell a story, or perform certain movements accompanied by music. The robot is compatible with Windows, iOS, and Android systems and can be programmed using the appropriate software. The robot can be operated via smartphone or tablet.

Figure 6. UBTECH Alpha 1 Pro robot

In a study by Qin et al., (2018) this robot performed dance movements (programmed using software) to pre-composed music that represented different

8 To describe the robot, the manual accessible at the following link was also used: https://www.bhphotovideo.com/c/product/1323390-REG/ubtech_alpha_1p_humanoid_robot.html (4/3/2022)

emotions (happiness, excitement, and enthusiasm). The research results showed that the robot appropriately accompanied the music with its dance movements. The research participants showed interest in programming the movements and wanted to see new dance movements performed by the robot. This robot was also used in the research by Lytridis et al. (2020) in which two robots were used to present different scenarios. The scenarios in which the robots were involved were therapeutic and are supposed to help in working with students diagnosed with Autism Spectrum Disorder. In the interactive scenarios, Alpha 1 Pro and NAO robots introduced themselves, used gestures (shook hands, hugged, kissed), performed dance moves, used phrases and idioms, and expressed basic emotions. The research results showed that the robots were well coordinated with each other and cooperated well. The participant (8 years old) was calm, concentrated, and more and more engaged with each activity.

Table 3 shows the teaching activity designed according to the teaching content of the textbook Hello World!, page 36.

Table 3. Proposal of a teaching activity in which Alpha 1 Pro robot is used as a teaching tool

<table>
<tr><td colspan="4">Grade: 5th grade (11 y.o.)</td></tr>
<tr><td colspan="4">Teaching topic: From morning until evening – I can talk about my day</td></tr>
<tr><td rowspan="2">ICT learning outcomes:</td><td colspan="2">Computer Thinking and Programming</td><td>Digital Literacy and Communication</td></tr>
<tr><td colspan="2">After the fifth year of studying ICT in the domain of Computer Thinking and Programming a student uses a programming tool to create a program that uses input and output, and iteration.</td><td>After the fifth year of studying ICT in the domain of Digital Literacy and Communication a student uses multimedia programs to realize more complex ideas in a communication and collaborative environment.</td></tr>
<tr><td rowspan="5">English learning outcomes[9]:</td><td>Communicative Language Competence</td><td>Intercultural Communicative Competence</td><td>Independent Language Learning</td></tr>
<tr><td>Reads aloud expressively a short and simple text in English on a familiar topic.</td><td rowspan="4">Chooses friendship, cooperation, altruism, solidarity and accepting diversity and uniqueness in different contexts of intercultural experiences.</td><td>Recognizes and uses basic cognitive language learning strategies.</td></tr>
<tr><td>Produces a short and simple oral text on a familiar topic using very simple language structures.</td><td>Recognizes and uses basic metacognitive language learning strategies.</td></tr>
<tr><td>Writes a short and simple text on a familiar topic using very simple language structures and distinguishing the use of basic punctuation marks.</td><td>Recognizes and uses basic socio-affective language learning strategies.</td></tr>
<tr><td>Writes simple frequently spoken words.</td></tr>
<tr><td colspan="4">Class organization during the ICT lesson: individual work, pair work</td></tr>
<tr><td colspan="4">Class organization during the English lesson: individual work, pair work</td></tr>
<tr><td colspan="4">Expected duration of the activities during the ICT lesson: 15 minutes</td></tr>
<tr><td colspan="4">Expected duration of the activities during the English lesson: 15 minutes</td></tr>
<tr><td colspan="4">Teaching tools: computer, Hello World! textbook (p. 36), tablet, Alpha 1 Pro robot, notebook</td></tr>
</table>

9 In the statements, which are under the domains of Communication Language Competence, Intercultural Communication Competence and Independent Language Learning, a student is the subject.

Teaching activities:
1st teaching activity: Students work in pairs and use Hello World! textbook (p. 36). In pairs, students come up with everything the robot does in one day. They write sentences in English in their notebooks.
2nd teaching activity: Students use a computer, tablet, Alpha 1 Pro robot, and their own notes of a previously prepared text. One student reads the robot's part of the text, and the other student records it on the tablet using an audio recorder (students take turns). Students attach the recorded sound to the robot software. Students programme the actions that the robot will perform at the same time.
3rd teaching activity: Students present what their robot does in one day. Other students carefully follow what the robot says and does and they make brief notes. Students (pairs) take turns in presenting their work.
4th teaching activity: Based on their own notes, students form sentences about what the robot does or does not do in a day. In that way they practice the negative form of the verb or reporting in the third person singular.

CONCLUSION

The development and implementation of robots as teaching tools in the teaching process has been actively taking place in the world for the last two decades (Han, 2012), but it is still in its early stages in the Republic of Croatia. The proposed implementation of robots into the English Language Curriculum in the Republic of Croatia included examples of simpler non-humanoid robots (STEMI Hexapod, Cubelets Robot Blocks, and Thymio), and these are to be found in Karabin (2022). On the other hand, the humanoid robots offer versatile possibilities in usage due to their anthropomorphism in design (appearance and functions). Moreover, it should be noted that, according to the previous studies, the students mostly envision robots as humanoid ones. Consequently, this paper aimed to offer the participants of the educational process a description of three humanoid robots that can be used in teaching English as a foreign language in primary education. By using the English Language Curriculum, ICT Curriculum, and approved English language textbooks, examples were provided of teaching activities that correlated two different subjects and achieved interdisciplinary educational and learning outcomes. It is expected that robots could have a very positive effect on the working atmosphere among students, their interest in work, involvement, and motivation, which has already been shown in previous research (e.g., Bers et al., 2002; Hyun et al., 2008; Mubin et al., 2013). It is also assumed that students who are currently in schools, or the so-called members of the Net Generation (Matijević, 2017), would have a positive approach to the new teaching tools because they expect the use of digital and modern teaching materials in the teaching process. This is surely supported by the attitudes of future teachers of the English language. According to Karabin et al. (2022), the future teachers of the English language, though aware of the difficulties and advantages of using robots, express readiness in implementing them in their future work. They believe that robots are innovative educational

materials that can boost students' motivation, confidence, and engagement in the educational process. In future research, it is certainly necessary to empirically examine the practicability of educational and learning outcomes of the proposed teaching activities and to further develop and gradually introduce the educational robot in the educational processes in the Republic of Croatia.

REFERENCES

1. Alemi, M., Meghdari, A. and Haeri, N. S. (2017). Young EFL Learners' Attitude Towards RALL: An Observational Study Focusing on Motivation, Anxiety, and Interaction. *ICSR 2017: Social Robotics* (252-261). Cham: Springer. https://doi.org/10.1007/978-3-319-70022-9_25
2. Anwar, S., Bascou, N. A., Menekse, M. and Kardgar, A. (2019). A Systematic Review of Studies on Educational Robotics. *Journal of Pre-College Engineering Education Research*, 9(2), 1-24. https://doi.org/10.7771/2157-9288.1223
3. Benitti, F. B. (2012). Exploring the educational potential of robotics in schools: A systematic review. *Computers & Education*, 58(3), 978-988. https://doi.org/10.1016/j.compedu.2011.10.006
4. Bers, M. U., Ponte, I., Juelich, C., Viera, A. and Schenker, J. (2002). Teachers as Designers: Integrating Robotics in Early Childhood Education. *Information Technology in Childhood Education Annual,* 1, 123-145. https://www.learntechlib.org/primary/p/8850/ (4/3/2022)
5. Cergol, K. and Karabin, P. (in press) (2022). Educational Robots and Flow Experience. 13th International Conference on Robotics in Education (RiE 2022), Virtual Event.
6. Chiou, A. (2012). Teaching Technology Using Educational Robotics. Proceedings of the Australian Conference on Science and Mathematics, (9-14).
7. Committee of the Association for Educational Community. (2008). Definition. In A. Januszewski, and M. Molenda, *Educational Technology* (1-14). New York: Taylor & Francis Group, LLC.
8. Državni zavod za statistiku Republike Hrvatske. (2021). *Osnovne škole kraj šk. g. 2019./2020. i početak šk. g. 2020./2021.* Zagreb: Državni zavod za statistiku Republike Hrvatske. Retrieved on https://www.dzs.hr/Hrv_Eng/publication/2021/08-01-02_01_2021.htm (4/3/2022)
9. Eguchi, A. (2014). Educational Robotics for Promoting 21st Century Skills. *Journal of Automation, Mobile Robotics & Intelligent Systems*, 8(1), 5-11. doi:10.14313/JAMRIS_1-2014/1
10. Evripidou, S., Georgiou, K., Doitsidis, L., Amanatiadis, A. A., Zinonos, Z. and Chatzichristofis, S. A. (2020). Educational Robotics: Platforms, Competitions and Expected Learning Outcomes. IEEE Access, 8, 219534-219562. https://doi.org/10.1109/ACCESS.2020.3042555
11. Gomoll, A., Hmelo-Silver, C. E., Šabanović, S. and Francisco, M. (2016). Dragons, Ladybugs, and Softballs: Girls' STEM Engagement with Human-Centered Robotics. *Journal of Science Education and Technology*, 25(6), 899-914. https://doi.org/10.1007/s10956-016-9647-z
12. Han, J. (2012). Emerging Technologies – Robot Assisted Language Learning. *Language Learning & Technology,* 16(3), 1-9.
13. Hrvatski robotički savez. (2022). *Hrvatski robotički savez*. Retrived on https://hrobos.hr/ (8/5/2022)
14. Hyun, E.-J., Kim, S.-Y., Jang, S. and Park, S. (2008). Comparative Study of Effects of Language Instruction Program Using Intelligence Robot and Multimedia on Linguistic Ability of Young Children. *Proceedings of the 17th IEEE International Symposium on Robot and Human Interactive Communication* (187-192). Munich: IEEE.
15. Ishida, M., Khalifa, A., Kato, T. and Yamamoto, S. (2016). Features of Learner Corpus Collected with Joining-in Type Robot Assisted Language Learning System. *2016 Conference of The Oriental Chapter of International Committee for Coordination and Standardization of Speech Databases and Assessment Techniques* (128-131). Bali: IEEE.

16. Ishiguro, H., Ono, T., Imai, M., Maeda, T., Kanda, T. and Nakatsu, R. (2001). Robovie: an Interactive Humanoid Robot. *Industrial Robot,* 28(6), 498-503. https://doi.org/10.1108/01439910110410051 (4/3/2022)

17. Kanda, T., Hirano, T., Eaton, D. and Ishiguro, H. (2004). Interactive Robots as Social Partners and Peer Tutors for Children: A Field Trial. *Human-Computer Interaction,* 19, 61-84. https://doi.org/10.1207/s15327051hci1901%262_4

18. Karabin, P. (2022). Implementacija robota u Kurikulum predmeta Engleski jezik u Republici Hrvatskoj. *Napredak*, 162(3-4), 371-394.

19. Karabin, P., Cergol, K., Mikac, U., Sović Kržić, A. and Pushkar, L. (2022). Future Teachers' Attitudes on Using Robots as Educational Tools. In I. Cindrić, I. Milković (Eds.), *Zbornik radova simpozija Trendovi i izazovi u učenju i p(r)oučavanju stranih jezika*, (89-101).

20. Karabin, P., Storjak, I., Cergol, K. and Sović Kržić, A. (2022). Pupils' perspectives regarding robot design and language learning scenario. In M. Merdan, W. Lepuschitz, G. Koppensteiner, R. Balogh, D. Obdržálek (Eds.), *Robotics in Education - RiE 2021*, (146-152).

21. Kory, J. and Breazeal, C. (2014). Storytelling with robots: Learning companions for preschool children's language development. *The 23rd IEEE International Symposium on Robot and Human Interactive Communication* (643-648). Edinburgh: IEEE.

22. Lytridis, C., Papadopoulou, C. I., Papakostas, G. A., Kaburlasos, V. G., Nikopoulou, V. A. and Kerasidou, M. (2020). Robot-Assisted Autism Spectrum Disorder (ASD) Interventions: A Multi-Robot Approach. *020 International Conference on Software, Telecommunications and Computer Networks (SoftCOM)*, (1-4). Split.

23. Matijević, M. (2017). Na tragu didaktike nastave za net-generacije. In M. Matijević (Ed.), *Nastava i škola za net-generacije* (19-46). Zagreb: Učiteljski fakultet Sveučilišta u Zagrebu.

24. Ministarstvo znanosti i obrazovanja. (2019a). *Kurikulum nastavnog predmeta Engleski jezik za osnovne škole i gimnazije.* Ministarstvo znanosti i obrazovanja. Retrieved from https://skolazazivot.hr/wp-content/uploads/2020/07/EJ_OSiGM_kurikulum2.pdf (4/3/2022)

25. Ministarstvo znanosti i obrazovanja. (2019b). *Kurikulum nastavnog predmeta Informatika za osnovne škole i gimnazije.* Zagreb: Ministarstvo znanosti i obrazovanja. Retrieved from https://skolazazivot.hr/wp-content/uploads/2020/06/INF_kurikulum.pdf (4/3/2022)

26. Mubin, O., Shahid, S. and Bartneck, C. (2013). Robot Assisted Language Learning through Games: A Comparison of Two Case Studies. *Australian Journal of Intelligent Information Processing Systems,* 13(3), 9-14. Retrived on http://hdl.handle.net/10092/9198 (4/3/2022)

27. Nikolić, G. (2016). Robotska edukacija – *"robotska pismenost" ante portas?* **Andragoški glasnik,** 20(1-2), 25-57.

28. Qin, R., Zhou, C., Zhu, H., Shi, M. and Chao, F. (2018). A Music-Driven Dance System of Humanoid Robots. *International Journal of Humanoid Robotics,* 15(5), 1850023-1–1850023-31. https://doi.org/10.1142/S0219843618500238%20"

29. Randall, N. (2019). A Survey of Robot-Assisted Language Learning (RALL). *ACM Transactions on Human-Robot Interaction,* 9(1), 1-36. https://doi.org/10.1145/3345506

30. Schodde, T., Hoffmann, L. and Kopp, S. (2017). How to Manage Affective State in Child-Robot Tutoring Interactions? *2017 International Conference on Companion Technology (ICCT)* (1-6). Ulm: IEEE.

31. Shwu-Ching Young, S., Wang, Y. and Jang, J.-S. (2010). Exploring perceptions of integrating tangible learning companions in learning English conversation. *British Journal of Educational Technology,* 41(5), 78-83. https://doi.org/10.1111/j.1467-8535.2009.00989.x

32. Slavin, R. E. (2006). *Educational Psychology – Theory and Practice.* Boston: Pearson/Allyn & Bacon.

33. Storjak, I., Pushkar, L., Jagušt, T. and Sović Kržić, A. (2020). First steps into STEM for young pupils through informal workshops. Proceedings of Frontiers in Education (1-5).

34. Storjak, I., Sović Kržić, A. and Jagušt, T. (2022). Elementary School Pupils' Mental Models Regarding Robots and Programming. IEEE Transactions on Education, 1-12. https://doi.org/10.1109/TE.2022.3158472

35. Varney, M. W., Janoudi, A., Aslam, D. M. and Graham, D. (2012). Building Young Engineers: TASEM for Third Graders in Woodcreek Magnet Elementary School. *IEEE transactions on education,* 55(1), 78-82. https://doi.org/10.1109/TE.2011.2131143

Approved textbooks:

1. Čajo Anđel, K., Domljan, D., Knezović, A., Singer, D. (2020). *New Building Blocks 1, udžbenik engleskoga jezika za 1. razred osnovne škole*. Zagreb: Profil Klett.

2. Čajo Anđel, K. and Knezović, A. (2020). *New Building Blocks 3, udžbenik engleskoga jezika za 3. razred osnovne škole*. Zagreb: Profil Klett.

3. Kirin, I., Uremović, M. (2019). *Hello, World!, udžbenik engleskoga jezika za 5. razred osnovne škole, 5. godina učenja*. Zagreb: Profil Klett

PRIJEDLOG UPOTREBE HUMANOIDNIH ROBOTA U NASTAVI ENGLESKOGA KAO STRANOGA JEZIKA U REPUBLICI HRVATSKOJ

SAŽETAK

Posebnost nastave stranoga jezika jest u tome što ona uključuje najrazličitije nastavne teme te se jezične vještine usvajaju korištenjem raznovrsnih nastavnih materijala. Posljednji nastavni materijal, koji se postupno uvodi u nastavu stranoga jezika, jest obrazovni robot (Nikolić, 2016). Nadalje, prema Randallovoj (2019), najčešće korišteni roboti u nastavnome procesu u svijetu su oni antropomorfnoga izgleda, tzv. humanoidni roboti.

Budući da je razvijanje i uključivanje robota u nastavni proces u Republici Hrvatskoj tek u povojima, ovim se preglednim radom dionicima odgojno-obrazovnoga procesa želi ponuditi opis triju humanoidnih robota (Meccano Meccanoid 2.0 G16, Leju Aelos 1S, UBTECH Alpha 1 Pro) koje je moguće upotrebljavati u nastavi engleskoga jezika u osnovnoškolskome obrazovanju. Uz opise robota, u radu će se predložiti nastavne aktivnosti koje koreliraju dva različita nastavna predmeta (Engleski kao strani jezik i Informatiku) te međupredmetno ostvaruju odgojno-obrazovne ishode učenja. Predložene nastavne aktivnosti, u kojima se rabe različiti oblici rada i nastavni materijali, samo su dio nastavnoga sata kreiranoga sukladno odobrenim udžbenicima za određenu dob učenika.

Ključne riječi: edukacijski roboti; humanoidni roboti; nastava engleskoga kao stranoga jezika.