LEGO-Robotics & Astronomy Research Project - 2014

Description

Program Theme	Russian in the Sky and Outer Space
Elective Project	LEGO-Robotics Research Project "Mars explorations with LEGO-Robotics"
Language	Russian
Time Frame	July 21 – August 15, 2014 (14 lessons)
Unit Objectives	The incoming level of proficiency for students is Intermediate High, so Can-Do statements are targeted at the Intermediate High to Advanced Low levels. **Students Can…** **Interpersonal Communication** • Exchange with peers detailed information related to astronomy, engineering and math topics; work flexibly with Russian astronomy, engineering and math terms and definitions **Int. H.;** • Express ideas and opinions when engaged in lengthy discussion about astronomy and engineering topics **Adv.L.;** **Interpretive Listening** • Identify the main idea and some details from discussions on topics related to space exploration presented through documentary films **Int. H.;** • Follow informal conversations with my peers on a variety of topics including the research project topics **Adv.L.;** **Interpretive Reading** • Read and understand authentic texts: Russian articles, biographies, math problems, and technical descriptions related to astronomy and technology topics **Int. H.;** • Read and understand articles in nonliterary texts on technology and astronomy topics **Adv.L.;** • Understand the main idea and most details from technology and astronomy problems to solve them **Adv.L.;** **Presentational Speaking** • Express post-activity feelings and experiences in after-project reflections **Int. H.;** • Make an oral presentation about the research project findings in a formal style **Int. H.;** • Present findings from research projects and technology problem solving **Adv.L.;** **Presentational Writing** • Create a PowerPoint presentation and/or write an article about the research

project topic using style, language, and tone appropriate to the audience and purpose of the presentation **Adv.L.;**

Cultures

- Describe the history of the space exploration;
- Explain the historical context of space exploration;

Comparisons

- Consider Russian perspectives on the Space Race and international collaboration vs. American viewpoint;
- Identify significant differences between the Russian and American systems of education;

Connections

- Use mathematics to calculate the main physical and dynamic characteristics of celestial bodies, satellites and Mars rovers;
- Recognize general trends in the development of science and technology;
- Describe basic stages in the development of the space industry, and explain the importance of space research;
- Make predictions and conclusions based on data gathered;
- Recognize ways in which technology has increased our understanding of the universe;
- Describe the branches of astrophysics, celestial mechanics, and theory of flight.

Communities

- Research their project topic during visits to the UW libraries and the Museum of Flight;
- Present their project findings in a public setting for parents and community members, as well as teachers and peers.

(Unit Objectives related to linguistic outcomes may be coordinated with LinguaFolio CanDo Statements, accessible here: LinguaFolio for STARTALK)

End of Project Performance Tasks (How can students demonstrate what they have learned in this project?)

What culminating performance tasks will provide evidence that students have achieved the stated learning objectives? Indicate how students will be assessed for each mode of communication through interpretive, interpersonal and presentational performance tasks. Students can then upload these tasks to LinguaFolio Online to provide evidence of their progress.

- **Interpretive tasks** require students to receive and comprehend oral or written communication, for example, print, audio-visual material, speech etc.
- **Interpersonal tasks** require direct oral communication between individuals who are in personal contact, or direct written communication between individuals who come into personal contact.
- **Presentational tasks** require students to produce oral or written communication for people with whom there is no immediate person contact

Interpretive tasks:

- Read and understand authentic texts: Russian scientific articles, scientific news on the Internet, books, professional astronomical databases;
- Understand other students' presentations, video and audio materials, take critical notes;

Interpersonal tasks:

- Discuss ideas and opinions related to their research topics;
- Participate in before- and after-presentation discussions of scientific issues;

Presentational tasks:

- In order to make an oral presentation of their findings at the end of the program in front of their parents, teachers and classmates, write text for a PowerPoint Presentation thesis and/or article (optional) on the basis of own investigation
- The students present findings from research projects orally with computer presentation slides.
- Students present their LEGO-Robots, discuss and explane their mission in their research topics.

Outline of Project Lessons

	What is the major focus of each lesson for this unit?	**Amount of time for each lesson**
Lesson 1 July 22	Presentation of elective project options by the instructors: Students choose elective projects Note: This is the introductory lesson for all of the elective projects.	**1,5 hrs.**
Lesson 2 July 23	Discussing the problem of Mars exploration. Historical review and the current state of the problem. Discussion of possible ways for further development. The basics of LEGO robot construction (LEGO-Mindstorm). Building LEGO-base robot	**1,5 hrs.**
Lesson 3 July 24	Methods of searching for and processing information of the chosen theme. Setting of the research problem. Planning research project products: steps, timing, scientific methodology, tools, and rubrics LEGO robotics research: Introduction to mobil robots creation. Study of basic LEGO-robot programming using EV3 software.	**1,5 hrs.**
Lesson 4 July 28	The students study the basics of algoritmic programming: coding, algoritm creation. Students study different types of alhorithms through specific problem solving. The students do LEGO robotics research. The students develop programming skills focusing on manipulating the EV3 software and study simple programming tasks such as forward, backward, and turning robot movements.	**1,5 hrs.**
Lesson 5 July 29	The students study the physical and dynamical characteristics of Mars related to the chosen research project theme. LEGO-robotics research: Building and programming LEGO-robots which can solve target goal of team project	**1,5 hrs.**
Lesson 6 July 30	The main ideas of using robots in space explorations. LEGO robotics research: Study of the basics of LEGO robot programming using EV3 software. Exploration of programming tools such as loop and switch..	**1,5 hrs.**
Lesson 7 July 31	Working on the chosen theme on astronomy/technology. LEGO robotics research: exploration of the LEGO Mindstorm sensors – touch, sound, ultrasonic, gyro and light. Exploration of the ranges and limits of each sensor through specific problems and design challenges.	**1,5 hrs.**
Lesson 8 August 4	Working on the chosen theme on astronomy/technology. LEGO robotics research: exploration the EV3 software date wires/ Exploration of the ranges and limits of each tool through specific problems and design	**1,5 hrs.**

Lesson 9 August 5	Working on the chosen theme on astronomy/technology. LEGO-robotics research: working on the team robotic mission of the project	**1,5 hrs.**
Lesson 10 August 6	Discussion, conclusions and evaluation of the results of the research (workshop). Creating a presentation: the first draft, consultation with instructor (computer lab). LEGO robotics research: working on the team robotic mission of the project	**1,5 hrs.**
Lesson 11 August 7	How to do an oral presentation of the project in formal style/ (workshop). LEGO robotics research: working on the team robotic mission in the project	**1,5 hrs.**
Lesson 12 August 12	Discussion of how to write an article and/or PowerPoint Presentation in astronomical/technology science. Preparation for the final presentation.	**1,5 hrs.**
Lesson 13 August 14	Preparation for the Conference. Conference. The students showcase their final projects to the rest of the class.	**1,5 hrs.**
Lesson 14 August 14	After-project reflection, discussion of possible future improvement and important discoveries. Disassembling of robots, fixing and packing of robot components.	**1,5 hrs.**