NEXT GENERATION-SUMER SCHOOL

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Description:

Physics is a complex discipline, with a high degree of abstraction and is required (in the secondary school) its presentation under a different aspect, namely funny „key" problems, games and imagination. The Universe, space is extremely interesting for the children through the variety of unsolved problems, through the multitude of unknowns and through the continuous need of knowledge, of discovery.

Such a project awakens the child's interest for the study of physics, it stimulates him, it urges him to discover, investigate, seek information and it helps him to understand the reality that surrounding environment.

In oder to realize this project will be applied knowledges of computer science, there will be formed and deepend the teamwork skills, for the purpose of research will be utilised notions from computer science, greography, physics, general knowledge; the students imagination and creativity will be stimulated in the work of discovery, understanding and anticipation of certain information;

the ultimate goall is the formation of small physicists, namely the `` physicists of tomorrow".

The theme is designed so the students will obtain meaningful results: the effective communication of what they have studied, solving the problems and making decisions based on critical and creative thinking, understanding the world as a series of related systems and the efficient use of technology and media.

The students
- analize the available information, propose concrete ways to use and complete these and apply them in order to answer questions;
- evaluate and synthesize information obtained independently from a variety of sources;
- record the observations, crealry identifying the points with a significant importance;
- decide the level of information required in the report;
- choose the appropiate strategy to realize the objectives;
- identify and explain the observations and draw the conclusions;
- analyze the results obtained and provide justified arguments for the modalities used for gathering the supplementary information.

Of the spatial thinking specific concepts which will be used within this scenario we mention: location, orientation, virtual space, interactive map, 2D, 3D, distance, movement, time, geographyc coordinates, astronomical coordinates, scale, planning, solving practical problems, making decisions.

Utilising the concepts: location, orientation, distance, time, coordinates and a interactive virtual environment (google maps and Stellarium), the students will be prepared to integrate these knowledge in the wide system of physics and geographical concepts.

The interactive map can be a tool that allows and favour the development of spatial thinking.

Target group: Middle-school students

Necessary time:

5 days (structured as follows: 2 hours scientific presentations, 2 hours field observations, 2 hours evaluations and conclusions, nearby hiking, volleyball games, football, table tennis, dance evening, "karaoke" and campfire)

First day (summer solstice day) began with a practical activity: determination of the meridian by measurements of the shadow (the direction of one vertical alignment, when it has the smallest length). The experiment is very instructive and interesting because combines notions of physics, spatial geometry and basic astronomy elements.

Next day the activities took place in four stages: the students processed the experimental data obtained on first day (on sheets of millimetre paper they represented the length of the shadow alignments according the time), each team realised its own sun quadrant, point were given considering the design and functionality of these quadrant, the four teams had to mimic important constellations on carton boards with phosphorescent sticky stars and the students, accompanied by the professors took a hiking trip to the surroundings, marking the interest point coordinates, using a GPS to establish the geographical coronations and at the end of the day the students realised a small map of central Marisel area based on the GPS data.

On the third day, the students were introduced to basic notions of radio astronomy, the principal categories of artificial Earth satellites: low orbit satellites (LEO), Medium orbit satellites (MEO) and geostationary satellites (GEO). The lecture was sustained by Physicist Paul Dolea, researcher at BITNET CCSS and PhD in Electronic Engineer and Telecommunications at Technical University from Cluj. There were presented several didactic demonstrative prototypes of radio transmission of audio and video signals, with directive reception antenna. We benefited from the BITNET firm help which allowed the students to visit the equipments for C and Ku bands reception, with 4m diameter parabolic antenna and 14 tones foundation. The students were also presented the S band communication equipment with low altitude artificial satellites. The parabolic antenna with 3m in diameter is able to detect everywhere on the sky the extremely fast satellites situated at thousands of kilometres distance, which „are crossing" the sky in only several minutes. Most of the students climbed the platform under the cupola designated to the astronomical observations in visible spectrum and took pictures.

The following days were lectured on topics of theoretical astronomy and astrophysics and during the nights were made astronomical observations.

All the students received diplomas to certify their participation to the first "Next Generation" Summer School.

This summer school will be organised from now on every summer, in Marisel area from Cluj. Since then the summer school has been held each year.

Objectives:

1. Getting familiar with notions: space, satellite, cartography, distance, digital maps, GPS and ways to transpose entities in the real map

2. Use of paper maps to explore the field and transposing into the virtual map (online)

3. Use of GS technologies for collecting certain field entities and transposing them into the online map

4. Use of digital map through GIS technology (Geographical Information System) to make analysis to determine distances, symbolising field elements (mountains, hills), adding photos and information about the performed activities

5. Applications of lesson specific concepts to calculate/determine different physical parameters (distance to an objective, distance between two objectives)

6. Planning of an astronomical observation session through generations and customizing their own interactive maps, using the google sky application

7. The integration of all results in a poster/ web application – StoryMap, that can be proposed to be integrated into the school site, thus bringing a greater visibility

Preparation:

The project of the summer school requires a choosing of an optimum initial preparation. A chronological progress could contain the following elements, for the beginning:

- Introduce the concepts of map, the importance of map in representing the plan of the location (in our case is represented by the Mărişel locality)
- The site map will be presented on paper
- The students are divided in four teams, each team being responsible for a certain component: the filed transposition in a digital map, collecting the

filed elements and integration on the online map; the filed spatial analysis and writing the results in the StoryMap online

- The students will receive their task before the departure, in the class, each team will receive press articles, official reports, statistics, maps, photos, the locality map. they will familiarize with the theme and will analyze the received information for research
- After this activity, they will be presented with the filed activity and field GS elements collecting activity for integration into the Digital Plan
  The students will have the possibility to use the google maps application to locate the site of the activities; will be able to obtain information on geographical and tourist elements position on the local map. The site of the activities will be decided by the students identifying the landmarks and orientation. the students will measure, determine different physical sizes and will use them in argumentation the decision. Then, they will compare in practical situations the observations and evaluate the taken decision.

Phase 1: Activities for generating the questions

- **Challenging curiosity:**
  Wheere are we going to summer school?

It will be used the modelling based on a map.

Generating questions based on the knowledge available to students:

- *How do we choose the location?*
- *What do we know about the location?*
- *What geographical elements do we know?*
- *How do we travel to the chosen location?*
- *What do we want to know ?*

Phase 2: The actual investigation

- **Propose preliminary explanations or hypotheses:**

Based on the students' answers to questions in the previous section, write on flipchart papers all the answers, resulting definitions of the cardinal points and a list of factors which influence the map orientation.

- **Planning and coordination of simple investigation:**

1. For localisation of the observation site, the students will use the Google Maps application to interact with the map, so the teacher will instruct the students on the Google Maps functions. As training methods there will be used modelling, demonstration and simulation using interactive map:
2. The use of GPS technology to collect certain entities and their transposition in the online map.

Phase 3: Creation

- **Collecting evidence based on observation:**
  The students will participate to the following actions:

1)Initiation in astronomy:

a) Lectures with Power Point presentations:

- celestial bodies and celestial objects;
- Sun and Solar System

b) Practical work:

- The observation through the telescope of the sun sports, Moon, Venus, Jupiter and Saturn
- Observation of galaxies and nebulas
- Making a solar clock and determination of local meridian direction and timing in which the Sun is in that spot

2) Initiation in Radio Astronomy, Radio Science and in modern radio communication techniques

a) Lectures with Power Point presentations:

- Earth artificial satellites
- Radio signals emitted by those.
- GPS satellites
- Radio signals emitted by other objects or celestial objects.

b) Practical work:

- Scanning the sky "with a prototype radio telescope built for educational purposes
- Drawing a radio map of the sky which will contain the Sun and some artificial satellites
- Reception of Earth live images with the aid of low orbit satellites
- Sending a video-audio at great distance, by radio, using an educational radiorelay in 2,4 GHz with reception directive antenna
- Use of emission-reception equipment on free frequencies
- Use of a GPS equipment and constructing a map with its aid

3) Sport and recreation activities:

- Hiking, volleyball games, football, table tennis, evening dance, "karaoke" and campfire.

Phase 4: Discussions

- **Explanations based on evidence:**

The students will organise the collected data in individual posters, which will also contain print screens of the google maps, as well as data collected during the activities

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Phase 5: Reflection

- **Communication of explanations:**

Organised in groups, the students will make a report that will be presented in front of their colleagues and who will answer to the original questions. The teacher will write a log sheet for reflection and self-assessment of the creation process and will present the students the conclusions of the answers analysis.

Follow-up activities and materials:

For strengthening what they have learned, the students will be challenged to create a mind map with the elements learned in the activities

Camp blog: http://generatiaurmatoare.blogspot.ro – where the results of the research will be published: photos of the posters, reports and conclusions, links to useful virtual applications, advices for planning a trip


Budapest
MARISEL
Cluj-Napoca
Romania
Vojvodina
Novi Sad
Belgrade
Bucuresti
Google earth


Spațiul și explorarea


BITNET CCSS
Observatorul astronomic
Mărișel


MEADE


Bergenbier


LEGEA


BITNET CCSS