

# Teaching of geographical space relations for cartography – *Academic Outdoor Station in Poznan (Poland).*

Beata Medynska-Gulij<sup>a,\*</sup>, Maciej Smaczynski<sup>a</sup>, Dariusz Lorek<sup>a</sup>, Łukasz Halik<sup>a</sup>,  
Łukasz Wielebski<sup>a</sup>, Tymoteusz Horbinski<sup>a</sup>, Paweł Cybulski<sup>a</sup>

<sup>a</sup> Affiliation for all authors: Department of Cartography and Geomatics, Adam Mickiewicz University, Poznan, Poland  
bmg@amu.edu.pl, maciej.smaczynski@amu.edu.pl, kupal@amu.edu.pl, lukasz.halik@amu.edu.pl, lukwiel@amu.edu.pl,  
tymoteusz.horbinski@amu.edu.pl, p.cybulski@amu.edu.pl

\* Corresponding author

**Keywords:** academic outdoor station, spatial relations for cartography, outdoor teaching, plates of coordinates systems, virtual and augmented reality table, wall of cartographic visualizations

## Abstract:

The identification of geographical phenomena and relations between them are most frequently visualized, analyzed and interpreted indoor by the display screen. The difficulties with capturing basic spatial relations significant in the process of teaching cartography become the main problem. The objective of teachers from the Department of Cartography and Geomatics was to enrich typical classes carried out in computer rooms by adding the outdoor academic classes that would encourage students to observe those relations directly in the field. In October 2018 the outdoor station of the area of 15x20 m by the university campus next to *Collegium Geographicum* was handed over to the disposal of students. The projects of the elements of the station were created on the basis of the lecturers experience as a part of subjects on the following courses: topographical cartography, survey techniques, cartographic design, virtual and augmented reality in cartography, geovisualization and geomatics. Sets of several constructions that can be used either separately, as tools for explaining specific principles or together, as instruments for teaching subsequent measurement, location and visualization relations occurring in cartography and geomatics, were placed on the premises of the station.

In order to study historical ways of marking borders, the erratic, a replica of the boundary stone from 1653 with the triangle engraved in the place in which three countries connect, was placed in the field. Contemporary ways of the stabilization of the border points and points of the grid reference are farther located. The point marked on the metal horizontal plate, on the spot in which the meridian and the parallel of latitude cross, inform about multiple ways of recording the exact location in space. The values of coordinates were calculated for that point and engraved on the board in several nation and global reference systems. Students, standing on other three plates with the points marked where meridians cross parallels of latitude, create basic elements of the grid of latitude and longitude of 0.2''.

On a single plate three directions of the north, i.e. the geographic, topographic and magnetic one, are visible. One of the meridians marks the line of analematic sundial to 12:00 a.m. and the student standing on the area of the specific month becomes a gnomon whose shadow indicates the hour of the local meridian. Two surveyor's levelling rods with two values differing by approximately 16 cm demonstrate different values of contour lines on topographic maps worked out in Poland. Properly oriented topographic table shows the same fragment of space in four ways: on the classic, north-oriented topographic map, on the orthophotomap at 1:10 000 scale, on the simplified visualization of a few layers from the national topographic base at enlarged 1:2 000 scale and on the 3D printout on which the height of buildings was determined from the attribute table.

Authors of the Academic Outdoor Station in Poznan prepared for the conference guests the multimedia presentation with the explanations of the aforementioned constructions and other elements, i.e. the wall of cartographic visualizations with perspective and optical illusions presented on 2D boards, virtual and augmented reality table, triangular signal, and others. We hope to receive feedback from cartographers and hear some ideas concerning new constructions for our station