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Spatial Intelligence of University Students

Miloš Prokýšek[a]*, & Jiří Štípek[a]

[a]*Charles University in Prague, Faculty of Education, Prague, Czech Republic*

Abstract

This paper deals with the spatial intelligence of university students. The objective of the study is an exploration of current state of mental rotation ability and mental cutting ability of university students and correlation with age, gender and study program of students. As a basic method of the study was used a pair of standardized test of mental rotation ability and mental cutting ability. Test were administered during winter semester 2014 by academy stuff. The primary outcomes of the survey is a description of current state of mental rotation ability and mental cutting ability of students across study years and studied subjects. The study will be followed next year with a research on influence of spatial visualization on working memory load.

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Keywords: Mental rotation ability; mental cutting ability; spatial intelligence.

1. Introduction

The paper deals with the issue of spatial intelligence of individual and its influence on process of perception and mental representation of planar and spatial visualization, sometimes called 2D and 3D visualization. The paper reports outcomes from first stage of research on spatial intelligence of university students. The objective of the study is an exploration of current state of mental rotation ability and mental cutting ability of university students and correlation with age, gender and study program of students.

The basic problem described in this paper may be formulated in the question, what is the relationship between the components of spatial intelligence and characteristics of individuals. The premise of this spatial visualization focused research is the presumption of the high educative potential of spatial visualization technology as a technical

* Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000 .
E-mail address: milos.prokysek@pedf.cuni.cz

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instructional tool and the expectation of spreading the technology into the school environment and into the educational sphere in general.

The field of spatial visualization is rather unclearly defined and its notion, from the perspective of education, psychology and technical science, is characterized by certain conceptual and terminological inconsistency. The research on the usage of the spatial visualization is usually focused on particular aspects which do not represent the topic in its whole complexity. Mainly, there are surveys on spatial imagination (Górska, 2005) and its development, or the correlation between spatial imagination and successfully learning certain subjects (Sorby, 2007). Some sources (Schnabel and Kvan, 2003) also show that the manner in which the mental representation of the perceived reality is constructed, especially the mental models, differ significantly in comparable groups of individuals, depending on whether planar or spatial models are used during the processes of creating such models representing the given object. Furthermore, there are surveys comparing the results of instruction, using either planar or spatial visualization (Esparrachiari, 2005) and surveys on virtual reality or virtual learning environment (Roussou, 2000).

However, the spatial visualization as a scientific concept has not been fully acknowledged yet. Tim N. Höffler (Höffler, 2010) published an extensive exploration based on the analysis of published articles dealing with measuring various components of spatial intelligence by means of manifold tests, presented in various ways (i.e. by planar or spatial visualisation.). This study includes very different conclusions based by the authors on collected data.

2. Aims and methods of the research

To achieve the research targets and to answer the research questions, the quantitative research methods was applied, among other methods of theoretical analysis and synthesis, analyses and comparative analyses of theoretical sources, research reports and information sources. Moreover the method of standardized test was applied.

The target group of the suggested research are university students. The character of research (this paper deals with the first stage of more complex research) requiring repeated co-operation and availability of probands does not enable the implementation of project with a wide population. It was decided for this reason to investigate a small limited subgroup of university students. In view of the present need of investigation of a heterogeneous group, it seems to be suitable to use the chosen group of pedagogical faculty's students. This group shows a considerable heterogeneity from the viewpoint of study subject, preceding experience or studies; also heterogeneity of spatial intelligence of individuals may be supposed. A non-negligible reason of this decision is also availability of these students for the needs of research.

All probands were examined using standardized tests of Mental Rotation Test (MRT). Also other data

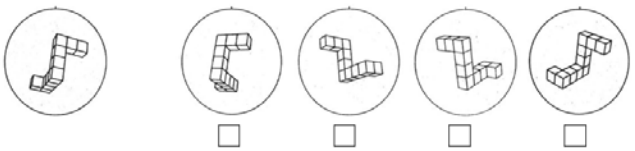

Figure 1 Example of the MRT test question

concerning the sex, age, studies subject etc. was stored to the individual probands besides the results of testing. Administration of MRT test is divided into three parts. In the first part, probands are instructed how to perform test and try set of three sample questions (See Figure 1). After introduction part follows two sets of questions (2x 10 questions, each set 3 minutes). The time pressure of subject is well displayed in result graphs later in this paper. We can see decreasing success in answering question around question 10 and 20.

3. Selected findings

Selected research findings fall within the first stage of more complex research. They concern the results of test of some parts of spatial intelligence (mental rotation ability and mental cutting ability) In order to obtain the data, we