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**REGIONAL GEOGRAPHY AND GRAPHIC ORGANISERS
GEOGRAPHY-SPECIFIC AND DIDACTIC COMPETENCES IN
UNIVERSITY**

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Abstract

Quality training to become a teacher is a prerequisite for a good start in the educational system. Therefore, assessing the quality of this training and improving the future teachers' both scientific and didactic competence levels is crucial. Our research started from the observation that Geography university students at the Faculty of Geography, in Babeş-Bolyai University, from Cluj-Napoca, Romania, who train during the Psychological and Pedagogical module in order to become teachers, have difficulties in approaching Regional Geography topics. To identify the differences between their competence levels, we analysed the graphic organisers realised by these students at diverse specialisations by means of an assessment tool. Students elaborated the graphic organisers as homework. Each of these students had to realise a graphic organiser for another country. Their products were analysed according to a series of criteria: included information, data correctness, the criteria they used to classify or systemise information, etc. Findings showed the challenges these students had to cope with and their competence level in elaborating cluster-type GOs for Regional Geography topics during their university studies.

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Keywords: Regional Geography, assessment, heuristic strategies, Geography teachers.



1. Introduction

Quality training to become a teacher is a prerequisite for a good start in the educational system and institutional marketing about the provided educational services is important in attracting motivated students (Precup & Chiş, 2017). Therefore, assessing the quality of this training and improving the future teachers' scientific and didactic competence levels is crucial (Catalano & Chiş, 2016; Chiş & Grec, 2017). In Geography, the information discovered daily increases exponentially, which is why it is necessary to develop the competence to select and organise it according to logical criteria. In the last two decades, in the Romanian geographical pre-university education system, an interest was shown in organising Regional Geography information into graphic organisers of different types (tables, clusters, tree, Venn diagram, etc.) (Dulamă, 2010) and also in representing space within map sketches (Bagoly-Simó, Dulamă, Ilovan, Kosinszki, & Răcăşan, 2016).

The formation and development of the competences to process and organise information take place both in pre-university education, during Geography classes, and in Geography university courses as well. In this context, organising information is useful to showing specificity in Regional Geography and Regional Geography studies underlined that specificity is very important for understanding the territorial features and the development of regions (Ilovan, Jordan, Havadi-Nagy, & Zametter 2016b, 2016c; Scridon & Ilovan, 2016). In addition, recent research showed that feed-forward in Geography university education is crucial for improving students' competence level (Dulamă, Ilovan, & Buş 2016a; Dulamă, Vana, & Ilovan, 2016b; Dulamă & Ilovan, 2016; Ilovan, Dulamă, Boţan, & Buş, 2016a; Ilovan et al., 2017).

Moreover, scientific literature recommends using the heuristic schemes method to record and create ideas (Buzan & Buzan, 2012, p. 20). Heuristic schemes are considered to be an effective tool that helps organise thinking, sketch and refine ideas on a topic, visualise links between them, and assemble a clear, comprehensive and meaningful structure about a certain topic (Buzan & Buzan, 2012, p. 21).

Finally, in scientific knowledge, data mining techniques are well-known knowledge discovery tools (Taniar, Dahayu, Lee, & Daly, 2008; Williams, Soares, & Gilbert, 2012). Clustering is one of them that is defined as a method in which data are divided into groups according to certain criteria and observing the similarity principle (i.e. objects in each group share more similarity than with other objects in other groups) (Havens, Bezdek, & Palaniswami, 2013). Clustering is an essential data mining and tool for analysing big data (Shirkhorshidi, Aghabozorgi, Wah, & Herawan, 2014). Considering all these, our research fills in a gap related to how university students organise information in Regional Geography.

2. Problem Statement

Our research started from the observation that Geography university students at the Faculty of Geography, in Babeş-Bolyai University, from Cluj-Napoca, Romania, who train during the Psychological and Pedagogical module in order to become teachers, have difficulties in approaching Regional Geography topics and in organising information employing graphics. Our hypothesis was that these difficulties were determined by the fact that these university students had trained within different specialisations in this faculty and then they had to work as a group to train for becoming teachers.

3. Research Questions

The research questions were: How can we establish the Geography university students' competence level in elaborating cluster-type graphic organizers (GOs) at Regional Geography classes? What are the pieces of information about a country that university students represent when they elaborate a cluster-type GO? How do students systemize information about a country using GOs?

4. Purpose of the Study

The aim was to establish the Geography university students' competence level in elaborating cluster-type GOs for Regional Geography topics.

5. Research Methods

5.1. Participants.

In this research, 90 students were involved. They studied at the Faculty of Geography, Babeş-Bolyai University, Cluj-Napoca: 25 students from Geography specialisation (G), 44 students from Geography of Tourism (GT), 9 students from Cartography (C), 7 students from Territorial Planning (TP), and 5 students from Hydrology-Meteorology (HM). These students have optionally attended the Psychological and Pedagogical Studies Programme, level I (single specialisation).

Method. At the Didactics of Geography course (2 hours of lecture, 2 hours of seminar), in the second semester of their 2nd year of study, students received several tasks and the solutions were included in a portfolio. Each student documented about a country, designed at home several learning activities related to it and items for evaluation, and developed GOs of various types (e.g. cluster, tree, and table) to systematise information about that country. Portfolios were handed in for evaluation at the end of the semester.

5.2. Assessment tool.

In order to achieve the research objectives, we analysed the cluster-type GOs made by these students, through an assessment tool (Table 1). We evaluated three aspects: the content, the use of mental heuristic strategies and the general aspect of the GO. We rated 12 criteria to which we associated scores from 1 to 5. We awarded 2-3 points for the last four criteria in the grid. The maximum score that could be achieved was 50 points and the minimum was 12 points. To determine the competence level, we set the average (1-5) by dividing the total score by the number of criteria. Thus, we ranked the GO into competence categories: average of 1-2 - low competence level; average of 2.1-4.5 - medium competence level; average of 4.5-5 – high competence level.

The research material was represented by the students' cluster-type GOs.

Table 01. Assessment tool used to evaluate the competence of elaborating cluster-type GOs at Regional Geography

Evaluated aspect	Evaluation criteria (C)	Score
Contents	C1 Enlargement (coverage of the whole topic)	1-5
	C2 Depth (coverage of details)	1-5
	C3 Information systematization / organization	1-5
	C4 Information accuracy	1-5
	C5 Information relevance	1-5
	C6 Highlighting the relationship between information	1-5
	C7 Synthesis, regional characteristics and country / territory specificity	1-5
Use of mental heuristic strategies	C8 Symbols	1-5
	C9 Connection lines and text boxes	1-2
	C10 Colours	1-3
General appearance	C11 Layout	1-2
	C12 Spacing	1-3

6. Findings

In Table 2, in Fig. 1 and Fig. 2, we present the results obtained by the students. In this part, we also present and discuss the research findings.

6.1. Content analysis represented in GOs

C1. Enlargement (covering the whole topic). For this quantitative criterion, we analysed the coverage degree of information for the whole topic. The students from the Geography study programme obtained a better result (average of 4.1) than those from other specialisations. 80% of all GOs were developed with branches made up of four oval stems detached from the central core, indicating a large expanse and a large amount of information about the subject. 13% of the GOs had 3-4 oval branches, and 7% had short branches with 1-3 ovals.

C2. Depth (coverage of details). This criterion has been analysed in terms of quantity. The length of the branches and the oval crowd at the ends of the cluster indicate the degree of detail coverage, so the longer the branches, the more details they contain. Most GOs had many details. We exemplify some categories of details included on some GOs: general data - GDP value, country area in km²; climate - average annual temperature, annual rainfall value, in January and July, number of rainy days per year, the name of the predominant wind; water bodies - names of lakes and rivers; vegetation - names of plant and animal species; fauna - the total number of species of mammals, birds, fish, insects; population - total number of inhabitants, percentage of a certain ethnic group, official languages, name of religions and percentage of believers; tourism – the number of tourists received in one year, world ranking by number of tourists, number of places for tourists' accommodation, names of spa resorts, etc. We consider it a positive aspect to include these details in the GO, even if it is about studying the country in the 6th grade, because it indicates students' good documentation and knowledge of the subject, its rigorous analysis and representation on the GO and this favours correct understanding from a spatial / regional perspective.

C3. Information systematization / organization. As a result of discussions with their professor, students systematised the information analytically, around five key words or phrases: localisation, natural conditions, population, settlements, and economy. Information on natural conditions has been systematised around other key words: landforms, climate, water, vegetation, fauna, and soils. Information on the economy has been grouped starting from the key words: agriculture, industry, transport,

commerce, and tourism. Based on this structure, the information is organised in the 6th and 7th grade Geography school textbooks when studying the states, in the 4th, 8th and 12th grades when studying the Geography of Romania, unlike the school textbooks from other states in which there is an emphasis on country specificity. In a GO from the GT specialisation, some ovals / text boxes contain more information (e.g. all the information about: religious structure, ethnic structure, settlements, fauna, vegetation, etc.), which demonstrates a misunderstanding of the rules for organising information in GOs.

C4. Information accuracy. The GOs contained some mistakes. For example, vegetation was mixed with wild plants and cultivated plants (in Portugal, the cactus, which is not specific, along with olives and citruses, which are fruits). Since the years, for which some statistical data were presented, were not mentioned, it was not possible to determine how up to date they were.

C5. Information relevance. Many students had difficulties in choosing the relevant information for the represented country. There was a tendency to represent several pieces of information associated with a unit (such as Vegetation, Fauna, Industry, etc.), but without being able to identify which was the most relevant information (for example, which plant association / type of vegetation was predominant as surface or in the landscape? Which animal species had a larger or more representative population for that country?).

In Switzerland, from the key word “tourism” there were ramifications to the terms Events, Winter Sports, Cities and Culture without the details being included for them. Resources mentions as resources salt and timber. With Croatia, at Types of tourism, there are several categories stated (mountain, sports, summer, weekend, extreme sports, cultural, adventure), but without including details. The Cultivation of crops referred to agricultural crops (wheat, corn, citrus, sugar beet, barley, potato, vines, olive trees), but these would have been relevant if they had been cultivated extensively in Croatia, if it produced a large amount, if a particular crop had a big share in the country, if the country were a big producer in Europe or worldwide. All categories of transport (road, rail, air, naval) were mentioned for Brazil, but without details on their characteristics and specificity.

C6. Highlighting the relation between pieces of information. In all GOs, links were drawn between pieces of information. There were / we noticed some wrong connections. For example, from the information box on Religion and Religious Structure, to the outside of the GO, the following box contained information about the ethnic structure, but those information categories did not come from one another. In some GOs, the lines did not represent logical connections.

C7. Synthesis, regional characteristics and country / territory specificity. In most GOs, the information was synthesised in a concise and systematised manner based on similarity. We noted several more difficulties and mistakes. In some GOs, with some represented concepts (settlements, animal breeding, plant cultivation, imports, and exports), the pieces of information were not detailed. For these short-branch GOs (for example, for Luxembourg, 2-3 boxes with chain / branch information) that gave the impression of a good synthesis, but lacked the details, if the name in the central core was deleted, one could not indicate for which country the information was represented. We observed some data structuring / synthesizing mistakes based on logical criteria. For example, primarily circles / boxes related to the central core, concepts (cities, population, economy, surface, hydrographic network, diversified climate, fauna, vegetation) were mentioned, which indicated an ignorance of the structured model discussed.

Regarding the regional characteristics and the specificity of the countries, we noticed that, in most GOs, these were not presented. However, some GOs included only the country's regional characteristics (Iceland: the country's territory - basalt plateaus, \approx 100 volcanic cones, plains - restricted areas on the seaside, etc.). In other GOs, regional characteristics were mixed among detailed information (short water streams in Finland, narrow coastal plains in Japan, etc.). After analysing these GOs, other didactic activities carried out with these students insisted on the identification of the regional characteristics and the specificity of the countries. The importance of awareness and promotion of cultural diversity through the use of effective educational strategies was emphasized (Cuc, 2013a, b, Cuc, 2014).

6.2. Use of mental heuristic strategies

C8. Symbols. When making GOs, handwriting (not in capital letters) was recommended to increase readability and students complied with this requirement. A GO (USA) was made in capital letters (which were handwritten). In some GOs, some key words were written: location, natural conditions, population, settlements, and economy. Some GOs were made using the black pencil, others with a blue pen. GOs made with the pencil allow changes to be made among them. At a GO, the corrector was used to make changes.

There was a requirement for a word or phrase to be included in a circle, but not all students met this requirement. In 7% of the GOs, more information was included in a text box, indicating a lower synthesis capacity and a lack of knowledge concerning the rules, which made it more difficult to understand. At most GOs, the writing was horizontal, only at some GOs the writing was slightly oblique (even vertical), making it more difficult to read. Some GOs did not use abbreviations of cardinal points (N - North). Some GOs used abbreviations: km², GDP, \$, %, ‰. The GOs did not include any symbols other than those mentioned, especially since the use of drawings in their realisation had not been indicated. If students had used different designs, then the GOs would have been more difficult to understand by other people.

C9. Connection lines and text boxes. It was required to include words and syllables in circular or oval-shaped boxes, even if the rectangular shapes can also be used for GOs. It was recommended to use lines, not arrows, to avoid overloading. In most GOs, the information (from the circles / ovals) was linked by lines and only in a few, by arrows. In several GOs, some details from the outside of the cluster were not in circles, probably because the students appreciated that the text was more legible without this framing.

C10. Colours. The use of colours was not recommended in order for the sight to be attracted by the content expressed in words and syntaxes, and not by the coloured lines and surfaces. However, in some GOs, students coloured with different colours the lines or arrows and the main circles (the first and second row of circles) located in the central area (the lines, not the surface) in which the key words were written (for example: Location, Natural Conditions, Population, Settlements, Economy). We noticed that those various writings of words and that partial colouring of the GOs were, however, useful in understanding the systematization of information and facilitating the study of the content.

6.3. General View

C11. Layout. The Landscape format had been recommended, and students complied with that requirement. Most GOs occupied the entire page and only five GOs occupied 1/2 or 2/3 of the sheet surface. At a GO, which had branches with 1-2 circles, the student drew the lines very long and placed circles with information at the edge of the sheet to fill the space. In some situations / cases, the cluster occupied the central part of the sheet, leaving a wide area at the edges of the sheet.

C12. Spacing was generally appropriate. In most GOs, there was space between the text boxes, which facilitated quick content decipherment and overall reading. A GO was made on a square grid sheet.

6.4. Competence level

We ranked the GOs into competence categories: average of 1-2 - low competence level; average of 2.1-4.5 - medium competence level; average of 4.5-5 – high competence level.

Table 02. Assessment tool used to evaluate the competence of elaborating cluster-type GOs at Regional Geography and students' final scores according to specialisation

Evaluated aspect	Evaluation criteria (C)	Total score				
		G	GT	C	PT	HM
Contents	Enlargement (coverage of the whole topic)	4.1	3.8	3.7	3.7	3.6
	Depth (coverage of details)	3.5	3.2	3.1	3.1	3.0
	Information systematization / organization	3.0	2.9	3.0	2.9	2.8
	Information accuracy	5.0	5.0	5.0	5.0	5.0
	Information relevance	3.4	3.2	3.1	3.3	3.0
	Highlighting the relationship between information	4.8	4.7	4.8	4.7	4.6
	Synthesis, regional characteristics and country / territory specificity	2.8	2.5	2.4	2.4	2.3
Use of mental heuristic strategies	Symbols	4.0	3.9	4.1	3.9	3.8
	Connection lines and text boxes	5.0	4.9	4.9	4.9	5.0
	Colours					
General appearance	Layout	4.9	4.8	4.8	4.9	4.8
	Spacing					
Mean value		4.05	3.89	3.89	3.88	3.79

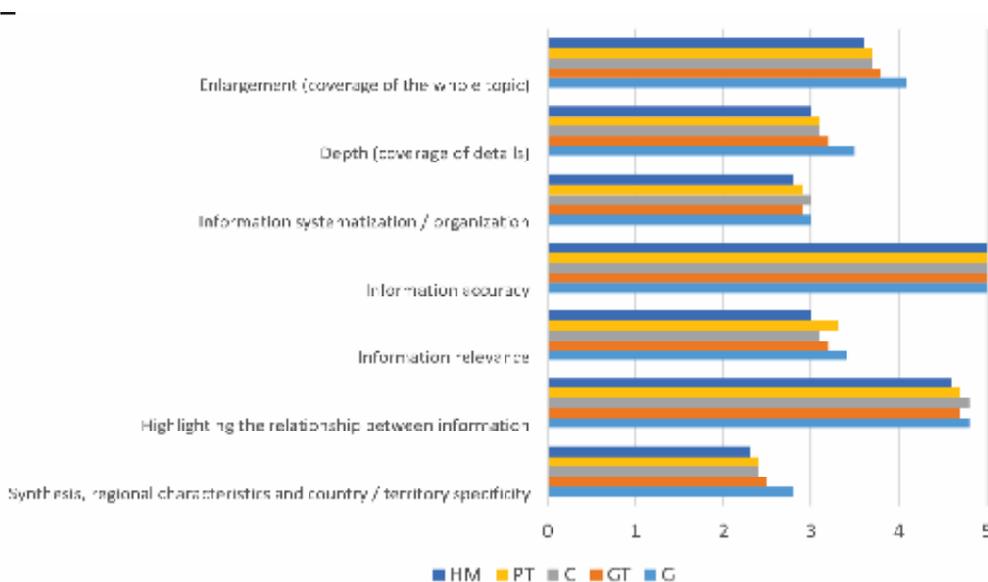


Figure 01. The contents represented in cluster-type graphic organisers

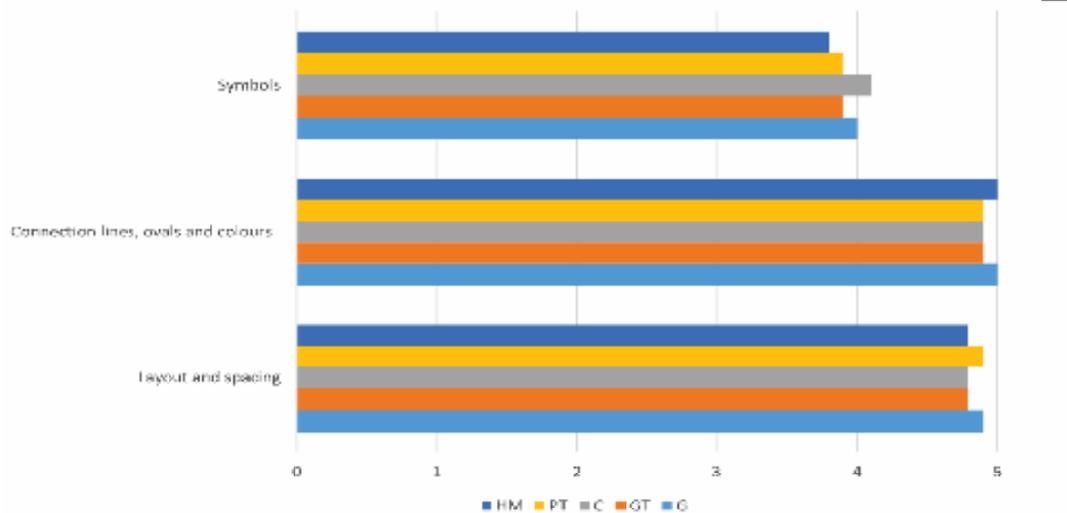


Figure 02. The appearance and use of mental heuristic strategies

7. Conclusion

Judging from the average analysis, it was noted that there were no significant differences between the students of the five specialisations/study programmes, although they had not attended the Geography of the continents / countries courses. Individual differences were explained by their general level of knowledge that they had acquired by training throughout schooling, in Geography and by differences in the quality of documentation. The results of each specialisation showed us an average competence level for the students in the achievement of a cluster-type GO concerning a country.

With regard to **content**, most GOs contained a lot of information, structured according to the model suggested and used in Romanian textbooks, even if that approach of the subject did not observe the essential principles of Regional Geography where emphasis was placed on essential characteristics, on the relations between components, and on specificity. There was a tendency to represent insignificant details. Apparently, it could be considered a profound approach to the theme, but it was just a quantitative rather than a qualitative presentation because the details were not relevant for that country. Information was systematised / organised using lines and text boxes (circles / ovals), but not all were structured logically.

Concerning **the use of mental heuristic strategies**, we noticed some difficulties in using symbols, in synthesizing information, in particular, in key words. In most of the GOs, writing was easily legible and lines represented logical relations between information. Because the lines were thin and slightly coloured, they allowed focusing on the words / information, and not on them.

In conclusion, the clustering is an essential technique in exploring Regional Geography data about a country, by analytical methods, but also by synthetic methods of representing this data in a systematised structure based on logical criteria, observing the principles of similarity

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