
FORMING AND ASSESSING THE COMPETENCE TO ELABORATE TOURIST STREET PLANS

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Abstract: We initiated this study since we have noticed that university students make certain mistakes when elaborating tourist street plans. Therefore, our research focuses on the following objectives: analyze the competences to elaborate tourist street plans, detect and analyze the mistakes made by students in elaborating the tourist street plans, track and analyze the causes triggering these mistakes, establish and analyze the level of competence students have in elaborating tourist street plans, and identify ways to improve the educational process and student achievements. In order to achieve these objectives, we have studied the activity of forming students' competence to elaborate tourist street plans in case of Geography students and master students at the University of Bucharest, during the academic year 2012-2013. We described and analyzed this competence and the procedural approach of the training. We evaluated 74 tourist street plans with the help of an analytical assessment grid with a dichotomous scale that includes 13 criteria, we identified the existing mistakes in these results and we looked for causes leading to them, we established and analyzed students' competence level. We concluded by suggesting ways to improve this activity of gaining these competences. In the end, we believe that the assessment grid used to establish the students' competence level could be considered both a work model and also a further research subject for other teachers that lecture diverse courses at various universities in the world.

Key words: tourist street plan, level of competence, evaluation grid, evaluation criteria, indicators, undergraduate level, master level, digital cartography, Geography Teaching in Higher Education

Introduction

Tourist street plans and maps are thematic representations (plans/thematic maps) used both in research and especially in practice, reason for which geographers and cartographers elaborate them very frequently. When geography students start learning how to elaborate these tourist street plans, they find out that there is a multitude of tourist street maps and plans described in the scientific literature: informative and tourist orientation maps, maps displaying the tourist flows, and typological maps (Alexandrescu, 2005, 51-54). Students can make use of lots of models on tourist street plans, which were elaborated in Romania and around the world (city plans included in the Geographical Atlas of the Socialist Republic of Romania printed in 1985, county plans included in the Tourist and Road Atlas of Romania, printed in 1996, etc.). We would also like to clarify some issues brought up by the fact that the scientific literature makes the distinction between a plan (at a scale larger than 1:20,000; G. Osaci-Costache, 2008, 2009) and a map (at a scale smaller than 1:20,000) and that this classification according to scale sometimes differs from one country to another and sometimes includes exceptions too (some of the thematic cartographic representations, even if at a larger scale, are still called "maps", as, for example, the geomorphologic map, the steep map, the hypsometric map etc.).

Our approach aims to analyse the way geography students form and develop their competence to elaborate the tourist street plan of a city by using computer software. In choosing this type of cartographic representation we took into account the extensive use of the tourist street plan (in tourist brochures, street panels etc.) and its facile elaboration by using the computerized GIS program. The

subject of the plan was selected due to its simplicity (most of the lines for the street network are straight, there are points for placing tourist attractions and geometrical areas, with an easy-to-follow outline, for blocks of flats, parks etc.). In this context, the research objectives are as follows: (1) to analyze the competence to elaborate tourist street plans; (2) to detect and analyze the mistakes of the tourist street plans elaborated by the students; (3) to detect and analyze the causes leading to these mistakes; (4) to establish and analyze the level of students' competence in elaborating the tourist street plans; (5) to identify some solutions to improve the learning process and the students' achievements. In the end, we believe that the assessment grid used to establish the students' competence level could be considered both a work model and also a further research subject for other teachers that lecture diverse courses at various universities in the world.

To achieve these objectives, we organized an activity of forming the competence to elaborate tourist street plans as part of the practical work at the Faculty of Geography (University of Bucharest), at the courses "Methods and techniques of cartographic representation" and "Thematic cartography". Later on, we analysed and evaluated a number of 74 tourist street plans elaborated by the students, reflecting their level of competence.

Theoretical background

The scientific literature rather lacks in studies referring to the formation and evaluation of the competences specific to geography, despite the fact that forming competences is a priority, both in the high-school and in the higher academic education. We started our research from the definition of the competence given by R. Brien (1997), who stated that a competence includes the set of declarative knowledge, procedural knowledge and attitudes that are activated in the planning and execution of a task.

As it has been proved in previous studies (Osaci-Costache et al., 2013a, 2013b) on the competence to elaborate a column-type chart and a topographic profile, in this study we approach the competence to elaborate tourist street plans and detail it according to the analytical grid used by M. E. Dulamă (2009, 247, 410; 2010, 323). Consequently, we systematized the procedural approach in stages and steps displayed in a table, similar to that of the same author (Dulamă, 2010, 323) that tested the efficiency of these curriculum design tools. For the formation of the competence we analysed a model applied at the University of Mauritius by A. Q. Mohabuth (2011, 3-5), but we also experimented the model for the formation of a competence proposed by M. E. Dulamă (2011, 100), which we considered more efficient for the formation of this competence. This model is structured in six stages: i) the preparation stage (cognitive); ii) the realization stage (associative); iii) the integrating-self-assessment stage (initial assessment); iv) the stage of re-doing the product or of repeating the action; v) the final assessment stage and vi) the stage for using the competence.

For the evaluation of this competence, we elaborated and tested an analytical assessment grid with a dichotomous scale that includes criteria and descriptors associated with every criterion (according to Dulamă, 2010, 86, 105; 2011, 106-107, 120-122; Osaci-Costache et al., 2013a, 2013b). To establish the level of competence, we based on the models presented by M.E. Dulamă (2013, 69) and on the manner in which these models are applied in practice (G. Osaci-Costache et al. 2013a). Since we did not find other studies on presentation, formation and assessment of the competence to elaborate tourist street plans, we consider that our research could fill a gap in the scientific literature both in case of theory and methodology.

Material and method

Subjects and research content

The subject of our study comprises 74 tourist street plans, elaborated in the academic year 2012-2013 by 44 first year students (undergraduate level, majoring in Cartography) and 30 master students majoring in "Geomorphology and cartography with cadastre elements" from the Faculty of Geography, University of Bucharest. The first year students acquired this competence during the course of "Methods and techniques of cartographic representation", while those at master studies at the course of "Thematic cartography". The students that took part in this study had all classes and

seminars with the same teacher/professor and used the same course material/textbooks (although overall there were differences between undergraduate and master level).

Both at the undergraduate level and at master level, there were differences between students who were part of the analysed population (subject variable) in terms of initial formation (knowledge, level of competence). In case of master students there are differences between the majors graduated (undergraduate level, 3 years, Bologna process). They graduated the following majors: Geography (33%), Cartography (30%), Geography of Tourism (20%), Land Measurements and Cadastre (10%) and Environmental Geography (7%). Except for the students that graduated Land Measurements and Cadastre at University of Agricultural Sciences and Veterinary Medicine, most of the students graduated from the Faculty of Geography.

The first year students (undergraduate level) had to solve the task and accomplished it a month after the academic year started in the first semester. Even though this was their first contact with digital cartography by using GIS software, they already knew how to digitize in the computer-assisted cartographic program Phildigit (Osaci-Costache, 2011). On the other hand, most of the master students have used this software to a lesser extent before and had difficulties in establishing the attributes of digitalized elements.

In order to achieve the objectives of our research we included all students in this study, without selecting a sample. Because of the small number of subjects and of the differences in the level of preparation between the students, it is possible that the statistical results of this study are not representative for any type of statistical population, as it is in case of other researches of the same type (Cardoso Ferreira, 2012, Osaci-Costache et al. 2013a, 2013b) and therefore they cannot be generalized.

Procedure

To analyse the competence to elaborate a city tourist map, we detailed and presented the integrated knowledge of this competence (see Table 1) (according to Dulamă, 2009, 2010) and/or internal resources (Voiculescu, 2010) and the procedural approach. We obtained this information by analysing their own competence to elaborate a tourist streets plan and less based on bibliography (see Table 1).

Both undergraduate students and master students were involved in an activity of forming the competence to elaborate a tourist street plan that had the role of an independent variable. This activity was designed and organized according to the formation model presented before and consisted in the following stages:

a. Introducing the theoretical aspects. Throughout the course, we explained what a tourist street plan of a city was and its importance, how it should be used and how it should be elaborated by using the computer. We presented examples of such plans elaborated in Romania and in other countries. Based on all these elements, we conducted a heuristic conversation with the students.

b. Explaining the method of elaborating the tourist street plan. The seminars started by recalling previous pieces of knowledge necessary for the formation and development of this competence. Then, we explained step by step the way of elaboration the tourist landscape plan by using the computer and the Open Source Quantum GIS software (<http://qgis.org/en/site/>), whose qualities and advantages in didactic use have been demonstrated before in literature (Osaci-Costache, 2012a, 2012b; Podda, 2012). We used a map background taken from Google Maps and OpenStreetMap (OSM; (<http://www.openstreetmap.org>), loaded into the program with the help of the OpenLayers plug-in (<http://hub.qgis.org/projects/openlayers/wiki>). We chose this option for several reasons, such as: a) easiness in obtaining a raster map background for any settlement; (b) to get the first year students used with loading and using a raster digital map in a GIS software; (c) opportunity to demonstrate to the students that two such popular cartographic sources can render/provide different data for the same area and can contain mistakes. Although at present Google Maps is better known and used than OSM, in some countries OSM is in continuous development through participative cartography, which is different according to the economic level of each country, and depends on the internet access and to the level of participation of volunteers (Mauro, 2013).

The resources students needed and used as follows: laptop/computer, some free and open source software installed (latest version of Quantum GIS, GIMP – <http://www.gimp.org/>, Inkscape – <http://inkscape.org/>), OpenLayers plug-in installed in QGIS, internet connection (or raster maps downloaded and saved on memory stick).

Throughout practical work (formation activity), students were guided through the procedural approach of elaborating a tourist street plan of a city, as illustrated in Table 1. We should state that, in order to save space, we choose not to present all necessary details implied in working in Quantum GIS (stages of the second step).

Table 1. Structural elements of the competence to elaborate tourist street plans by using computer software

Declarative knowledge	<p><i>Concepts:</i> map background, city plan, tourist street plan, tourist map, graphic scale, map legend/tourist street plan legend, vector layers (point, line, polygon), thematic vector layer, the method of cartographic symbols</p> <p><i>Rules to elaborate a tourist street plan of the city by using the computer (also applicable for tourist map)</i></p> <p><i>R 1:</i> Choose and draw the tourist street plan background only by using maps/plans from trustworthy sources.</p> <p><i>R 2:</i> It is a must to specify the cartographic source based on which the tourist street plan was elaborated.</p> <p><i>R 3:</i> It is useful to use several trustworthy cartographic resources that can ultimately be compared.</p> <p><i>R 4:</i> It is a must to go in the field to verify, correct and complete the data that is going to be represented on the tourist street plan (tourist attractions, names, street names etc.)</p> <p><i>R 5:</i> The tourist street plan must have a graphic scale (with “rounded” values, for the tourist to more easily determine distances), if possible even a double one (with two measurements units for lengths).</p> <p><i>R 6:</i> In case of settlements, this type of cartographic thematic representation is elaborated at large scales transforming it into a tourist street plan.</p> <p><i>R 7:</i> The tourist street plan must have the geographic north indicated.</p> <p><i>R 8:</i> The content of the tourist street plan must be adapted to its purpose.</p> <p><i>R 9:</i> The attractions represented on the tourist street plan must be positioned as exactly as possible, by the geometric centre of the symbol used.</p> <p><i>R 10:</i> Colours should be pleasant, soft (not at all harsh).</p> <p><i>R 11:</i> Symbols used should be internationally accepted.</p> <p><i>R 12:</i> The tourist street plan must have a legend that needs to be structured, by classifying symbols according to their category (for example, for the elements related to transport the following have been included: airport, train station, bus station, subway station, urban lifts, urban escalators, taxi, parking, rent-a-car etc; it is not necessary that these sections of the map legend are named, only grouped so that they can be easily found by tourists).</p> <p><i>R 13:</i> Symbols/icons for attractions (point vector layer) are to be positioned on west-east direction, as not to overlay with other symbols or other signs and not create any ambiguities regarding the element they represent.</p> <p><i>R 14:</i> The names of the streets should be positioned along the street axis, following the orientation rules of cartographic writing with regard to cardinal directions.</p> <p><i>R 15:</i> The labels of the polygon shape elements (i.e. parks, lakes) are to be placed within the polygon borders, following the rules of cartographic writing.</p> <p><i>R 16:</i> The layout can be made in French-style (vertical, portrait) or in the Italian-style (horizontal, landscape), in a convenient format (A4, A3 etc.)</p> <p><i>R 17:</i> The title is to be positioned on the northern side of the plan and should indicate its content and localization.</p> <p><i>R 18:</i> Only Arial or similar fonts are to be used for any text on the map. Times New Roman font should not be used.</p> <p><i>R 19:</i> The plan layout should have an outline.</p>
Attitudinal knowledge	<p>Follow the requirements and rules on the elaboration of tourist street plans</p> <p>Elaborate the tourist street plans only through your/personal effort</p> <p>Finish the elaboration of the tourist street plan in the given work time</p>
Procedural knowledge	<p>Identify maps/plans that can be used as background for tourist maps</p> <p>Extract necessary data from general or theme maps/plans</p> <p>Create vector layers in GIS software</p>

	<p>Choose the suitable symbols and colouring for elaborating the digital plan in GIS software Write necessary signs (names, title, author etc.) in GIS software Elaborate and structure the legend in a GIS program Update and map data in field trips Finish the tourist street plans in GIS program (Quantum GIS), and then in a drawing program (GIMP, Inkscape), if necessary</p>
Procedure	<p>Stage 1. Identify the necessary cartographic data Step 1. Establish the purpose and the destination of the tourist street plan. Step 2. Establish the scale of the map/plan that will be used as background for the tourist street plan, according to the level of detail to be used in the mapping process. Step 3. Identify and compare the necessary cartographic and bibliographic resources.</p> <p>Stage 2. Process the cartographic data from the map/plan used as map background Step 1. Add the raster map (that you choose as background layer) in Open Source Quantum GIS software. Use maps from Google Maps or OpenStreetMap and be careful about the selected projection. Step 2. Digitize streets on a single line layer, establishing their importance through attributes (boulevards, streets, alleys etc.) and their names (Spring Street etc.). Step 3. Digitize on a single surface-type layer (polygon) the elements of this type in the field and differentiate them through attributes (parks, squares, lakes etc.) and names (the Central Park, etc.) Step 4. Digitize the tourist attractions and other objects on a single point-type layer and differentiate them through attributes (museums, accommodation units, restaurants etc.) and add names (National Museum of Art, The North Hotel etc.). Step 5. Create the tourist street plan while differentiating the digitized elements through colours/symbols according to their attributes. Step 6. Compare the map created with other cartographic resources and make the necessary adjustments.</p> <p>Stage 3. Check (in the field) the accuracy of data rendered in the tourist plan. Step 1. Print the final tourist street plan. Step 2. Make a field trip and update the data on the printed plan (erase the attractions that no longer exist, add the new ones, correct the street names and the localization of tourist attractions, etc.)</p> <p>Stage 4. Finalize the tourist street plan Step 1. Correct the shapefiles (.shp) according to the data collected in the field. Step 2. Choose the colouring and symbols according to the cartographic rules and the scale of the future plan by using the Quantum GIS program (QGIS). Step 3. Insert the signs. If the program does not place them according to the cartographic rules, insert them later in other free or open source software (GIMP or Inkscape). Step 4. Use the layout of QGIS software and elaborate the final tourist street plan, according to the rules that have been presented to you. Step 5. Insert the scale, legend, geographic north, title, write the source of the background map and, if necessary, the date of retrieving/updating the data. Step 8. Save the plan in .png format (at a resolution of at least 300 dpi) or .svg in order to be able to modify it using another software, print it or insert it where needed (tourist brochure, poster, PowerPoint presentation etc.) Step 9. After you print it, check if more adjustments of increasing letter size or symbols are necessary, or change of colours etc. (sometimes the image on the monitor can be slightly different from that on printed paper).</p>

c. Demonstrating the procedure. For demonstration purpose, we went through the stages of the procedural approach with the students as shown in Table 1 (except the updating of data in the field), working on the computer, on a small area around Cluj-Napoca, that we chose as sample and projected the images with the help of a video projector.

d. Practising the procedure. The students did this exercise at the same time with the professor.

e. Presenting and carrying out the work task. We announced the task to the students and we handed them papers with this procedural approach as described in Table 1, so they only had to make the additions considered necessary during the professor's explanations. The task for Cartography majors (first year students, undergraduate) was as follows:

In your hometown, an international cartography congress is going to take place. The venue of the proceedings is a central location chosen by you (university, school, conference hall of a hotel etc.). Make a polychromatic tourist street plan for the participants at the congress, marking all the elements you consider necessary (possible accommodation units, congress location, city visits etc.). Elaborate the plan in Romanian language. The working area has to be of at least 2.5 sq m, and the scale of the tourist street plan should be around 1:10,000 – 1:14,000 (at their choice, depending on complexity). The tourist street plan has to be presented for evaluation by a set date (the students are aware of the date; to be safe, the date has been also published on the page of the educational project OpenGIS, together with the working task), printed on paper.

The master students majoring in “Geomorphology and cartography with elements of cadastre” had to accomplish the same task as they did not go through this subject during the previous three years of study, but the area has been extended to at least 5 sq m. Each student was assigned a certain area upon which to practice the procedure and solve the task.

We assigned 4 hours for the practical work for master level and 3 hours for Cartography (undergraduate). While solving the task, we monitored the students' activity and offered group and individual feed-back. Master students were granted 30 days to finish the task whereas the Cartography undergraduate students only 15 days (time resulted from the discipline syllabus, in correlation with the analytic curriculum and study plan).

The students were also provided with a checklist in correlation with the evaluation grid, in order for them to self-assess the tourist street plan before handing it in. The list was uploaded on the OpenGis educational project website (<http://opengis.unibuc.ro/>) for them to be accessible for students any time.

f) Checking if the competence to elaborate a tourist street plan was achieved (tourist street plan – dependent variable). We performed this operation a month later (at master level) and 15 days later (1st year undergraduate students) after finishing the hours assigned for the formation of this competence during course, by evaluating the polychrome plan of each student (printed on paper). The maximum score was of 1.5 (expressed by the final grade at the disciplines mentioned above), and the elaboration of this plan in due time was considered a requirement to be allowed to take/access the exam.

In order to evaluate this competence, we operated with an assessment instrument (see Table 2), an analytical assessment grid with a dichotomous scale that comprises 13 evaluation criteria. Each criterion has one or several descriptors (noticeable elements or indicators) associated with it, established according to the essential characteristics of a tourist street plan.

Table 2. Analytical assessment grid with a dichotomous scale for tourist street plans

<i>Criteria</i>	<i>Abbreviation</i>	<i>Descriptors/Indicators/Noticeable elements</i>	<i>Score</i>
Accuracy of digitization	AC	The student correctly digitizes the linear and areal elements, without simplifying the geometry of lines/outlines, without overlapping areas etc.	0.2
Scale of the Plan	SP	The plan has a graphic scale. They choose rounded values to express distances in the field. They indicate the measurement units.	0.2
Aesthetics	Ae	The layout is correct and aesthetic. The plan elements are aesthetically positioned in relation to each other.	0.1

Title	T	The title indicates the area the map portrays and type of plan. The title is placed according to cartographic rules and Arial font is used (or a similar font type); Times New Roman font should not be used.	0.1
Legend	L	There is a legend. The symbols of the legend have the exact dimension and colour as displayed on the map. The legend is structured.	0.1
Orientation	O	Plans are laid out with true north indicated.	0.1
Plan (Map) symbology	LS	Line symbols for streets are correct and aesthetic Line symbols (streets, water network) are properly overlapped (water layer under the street layer; street layer under the attractions layer etc.).	0.1
	PS	The symbols for tourist attractions (point vector layer) are adequate (i.e. "H" for hospital etc.) Symbols are placed correctly (as localization in space and as succession of vector layers on the vertical)	0.1
Colouring	C	Colours used are soft, not harsh. Colours are selected according with the element they refer to (if the case).	0.1
Writing and positioning names and other symbols	WSN	Street names are put on the map correctly.	0.1
	WNA	Names of tourist attractions are put on correctly.	0.1
	W	All labels (text) are written correctly from the orthographic and grammar point of view. Romanian language letters are used.	0.1
Data source	DS	All cartographic resources used are mentioned.	0.1
			Total 1.5 points

In order to analyse the results of the students, we collected all the data and put them in a synthetic table in which we marked with X the cases in which students failed to accomplish the indicators (mistakes) for each of the criteria, since in the previous years we have noticed that the number of mistakes was smaller than that of accomplishments.

Table 3. Sample from the table with collected data regarding the results achieved by the students in making the tourist street plans

Group 113	<i>Criteria and scores for each criterion</i>													Total	
	DA	SP	Ae	T	L	O	LS	PS	C	WSN	WNA	W	DS		
	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.5
Student 1	X		X									X			1.1
Student 2		X	X							X					1.1
Student 3						X	X			X		X	X		1.0

Results

1) *Presentation and analysis of the competence to make tourist street plans.* In Table 1 we present the knowledge integrated in the competence to develop a tourist street plan of a city: three attitudinal knowledge, eight procedural knowledge, 12 concepts and 19 rules as declarative knowledge. In the same table we structured the computerized procedure for developing a tourist street plan in four stages (each with multiple steps).

2) *Mistakes made by students in creating tourist street plans.* We conducted the analysis and evaluation of tourist street plans by using an analytical grid with dichotomous scale (see Table 2). The mistakes registered at the Cartography specialization (undergraduate level) were classified by criteria

and represented in Figure 1. The mistakes registered at Master level were classified by criteria and represented in Figure 2. The comparative shares of mistakes registered both at graduate and undergraduate levels were represented in Figure 3.

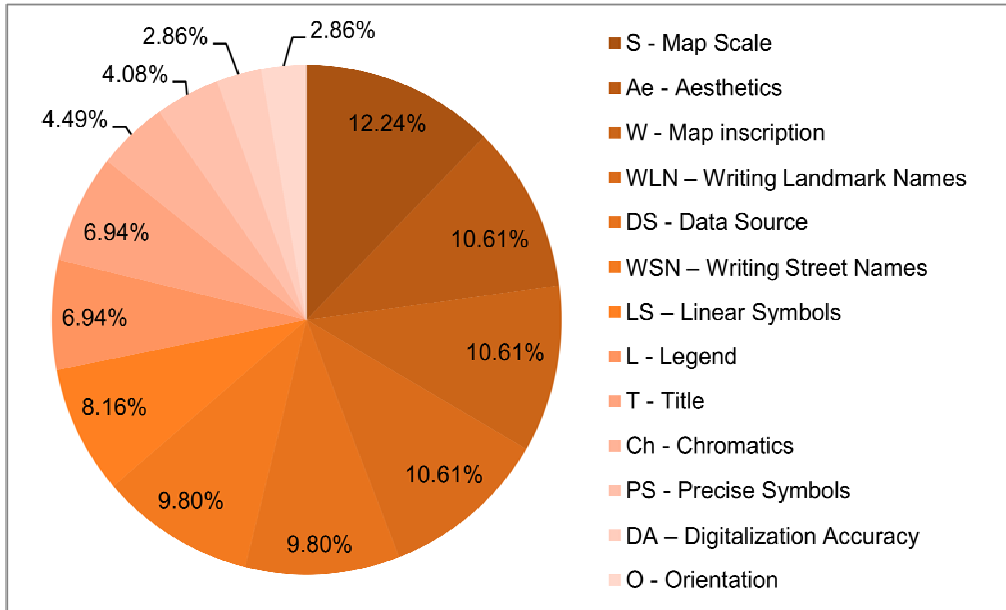


Figure 1. Frequency of mistakes at Cartography specialization (undergraduate), classified by criteria. For more details see Table 3.

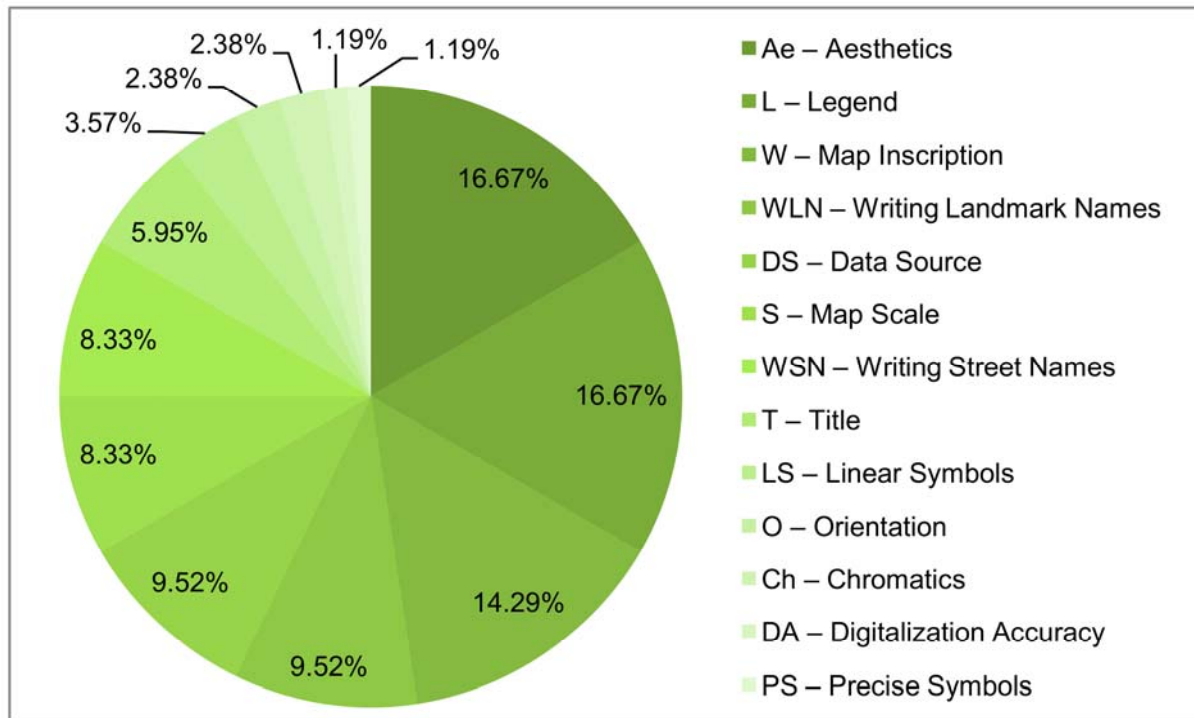


Figure 2. Rate of mistakes at Master level, classified by criteria. For more details see Table 3.

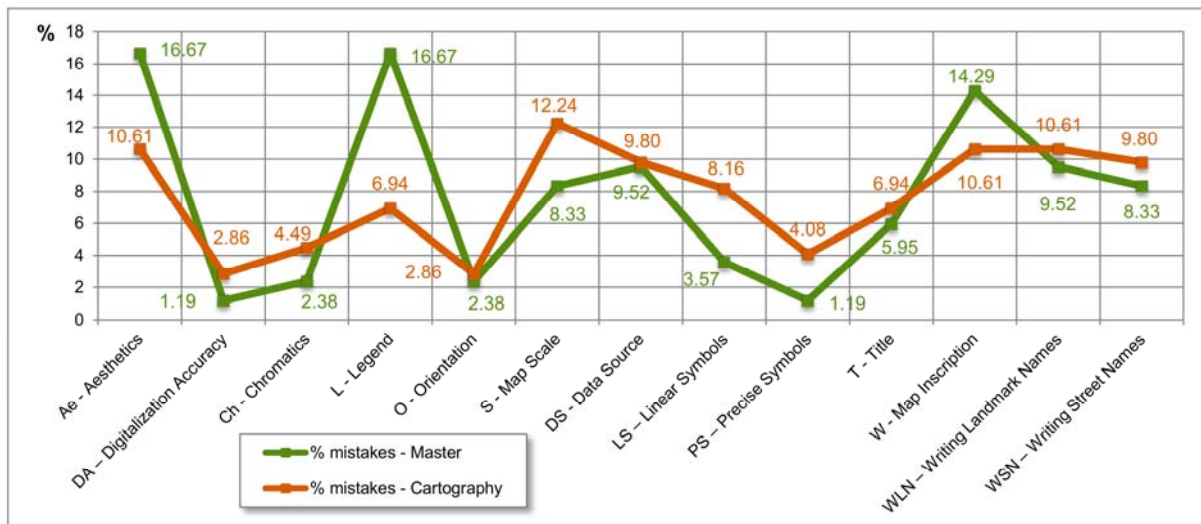


Figure 3. Comparative share of mistakes registered at undergraduate and Master levels. For more details see Table 3.

3) *Causes of mistakes occurred in elaborating the tourist street plans.* We have identified several causes for which students make mistakes in elaborating the tourist street plans.

(a) Some of the causes are related to the curriculum in secondary education and refer to the first year students at Cartography specialization: lack of high school drawing classes, lack of habit to follow rules or procedures.

(b) Other causes are related to the curriculum in higher education (level I, 3-year university studies, Bologna process: lack of cartographic drawing classes in college (for students who have graduated Cartography specialization) insufficient or complete lack of mapping classes at Cartography specialization or at other specializations in the same field (Geography, Environmental Geography, Geography of Tourism/Tourism Geography), insufficient number of hours allocated to the course *Methods and techniques of cartographic representation* (1 hour lecture and 1 hour practical work a week during one semester at Cartography specialization) and also placed too early in the curriculum (first year, first semester).

(c) Some causes are related to the organization of educational process: relatively large number of students in the study group (to which we add the students from other study groups coming to catch up on work); scheduling two hour practical work once a two weeks in case of courses with one hour a week, situation that breaks the rhythm of teaching and the correlation of course with practical work; lecturing sometimes in rooms without projector, insufficient number of computers in the classroom or the large number of computers that do not function properly, even occasionally (especially if there are many students in a group).

(d) Other causes are related to the students, some of which being noted in previous studies (G. Osaci-Costache *et al.*, 2013a,b): low level skills (ICT – they do not how to use the computer); current behaviour of students (missing classes and/or lectures that are directly related to the subject under analysis, presence at practical work classes without the requested materials such as programs/plugin installed on the laptops; attending lectures without taking notes, not paying attention to the teacher's explanations; not making correlations between the information received during lectures and that taught during practical work, non-compliance with requirements and rules; not giving much importance to rules and steps to follow, lack of interest, self-sufficiency, occasional level of fatigue, low aesthetic education, insufficient individual work.

4) *Level of competence in elaborating the tourist street plans.* Both for the master level (see Figure 4) and for the undergraduate level (see Figure 5) we established four levels of competence based on percentage thresholds between the previously established levels (G. Osaci-Costache *et al.*, 2013a), such as: incompetent level (score: 0-0.75 points, collecting below 50% of the total score); lower

level of competence (score: 0.76-1.05 points collecting between 51-70% of the total score); average level of competence (score: 1.06-1.39 points collecting between 71-94% of the total score), high level of competence (score: 1.4-1.5 points, collecting above/over 95% of score). The results of our analysis has shown that nearly three quarters of students from Master level (70%) registered average and high level of competence (mostly average, found in 43.33% of students). In case of the Cartography specialization, 34.09% of students proved average and high level of proficiency (see Figure 5).

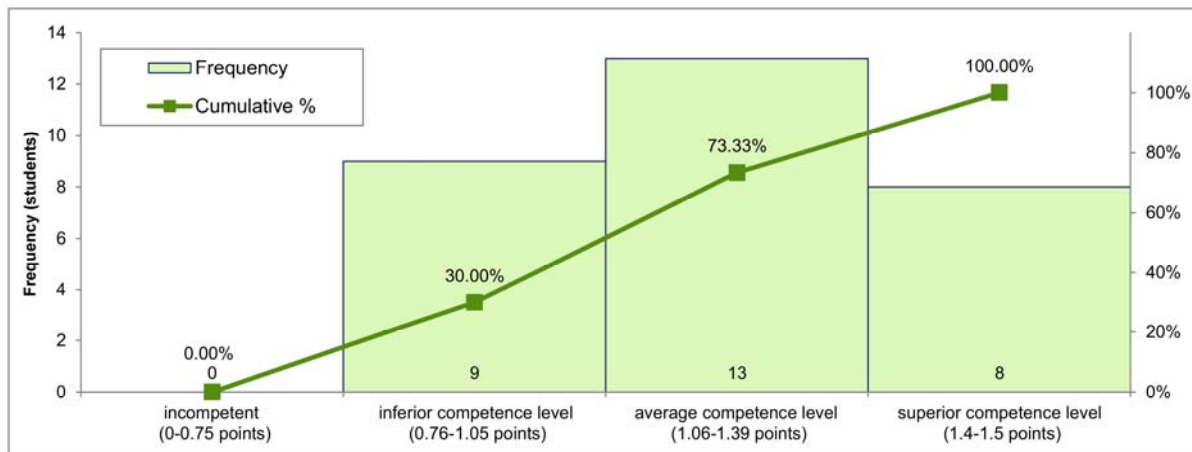


Figure 4. Level of competence and frequency of the four score classes at Master level

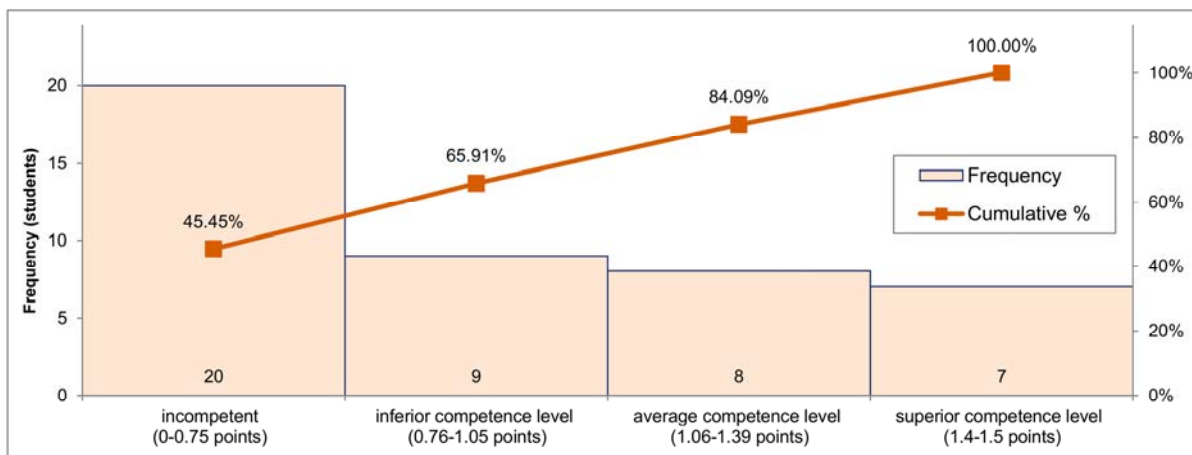


Figure 5. Level of competence and frequency of the four score classes at Cartography specialization (undergraduate)

5) *Suggestions to improve education and student achievements.* Based on the causes have identified we suggest two types of solutions for their elimination:

(a) Solutions to be put into practice by the teacher: to request all classes to be held in rooms with enough computers and video projector; to apply the regulation in case of student absentees at course and practical work classes; to ask students to take notes mandatorily, follow the rules and requirements; to discuss and analyse the aspects that caused most of the mistakes made; to analyze the evaluation grid with the students prior to the completion of tourist street plans; to assess tourist street plans primarily and finally in order to allow their correction or adjustment in accordance with their specifications in forming this competence (Dulamă 2011, 100).

(b) Options available to students: to focus attention on teacher's explanations and instructions and those from the textbook; to comply with all requirements, rules and steps; to study the theoretical aspects while creating/making the tourist street plans in order to know and follow all the rules of mapping; to use checklists in primary self-evaluation as an individual exercise, according to the course description.

Discussion

1) *Presentation and analysis of competence to elaborate tourist street plans.* When we detailed this competence, we found it difficult to name because in this training activity we in fact helped students to form and develop eight competences: (a) to identify maps/plans that can be used as resources in making city tourist street plans; (b) to extract the necessary data from the general and thematic maps or plans; (c) to create vector layers in GIS program; (d) to choose suitable colouring and symbology for achieving the digital plan in GIS; (e) to write the necessary details/data on the map in GIS (place names, title, author, etc.); (f) to develop and structure the map legend; (g) to update the data in the field and map them; (h) to complete the tourist street plans by using GIS and drawing programs (GIMP, Inkscape). From the analysis of these eight skills, we can note that they can be integrated into other skills specific to geography or other scientific fields. However, from the details in Table 1 we can deduce that this selected knowledge is integrated in a specific way into this competence, demonstrating that „a competence represents the ability to exploit their own knowledge to complete a task” (Dulamă, 2009, 246).

As in previous studies (Osaci-Costache et al., 2013a, 2013b) after the testing process we highlighted the advantages of presenting the procedural approach and the competence analytically (see Table 1). The identification of knowledge integrated into this competence through a reflective process and presenting it in a systematic, rigorous, pragmatic and technical manner, by using a table structure, has proved very useful in designing and organizing most efficiently the activity of forming this competence and creating the assessment tool for determining the levels of competence.

2) *Analysis of the mistakes that students make in the elaboration of tourist street plans.* In Figure 1 it is shown that out of the 245 mistakes made by the 42 first year undergraduate students (who have not met one or more criteria) the most common were the mistakes related to the scale of the plan (12.24%), aesthetics, map signs and names/labels (10.61%) and failing to name the streets (9.80%). The fewest mistakes (2.86%) were related to the accuracy of digitizing and marking the true north (orientation).

In case of the master students mistakes were less numerous (84 mistakes made by 26 students) and had a slightly different structure (see Figure 2). The most common were related to aesthetics and legend (16.67%), map symbols (14.29%), name writing/labels (tourist attractions) and failing to correctly name the data source (9.52%). Of all the mistakes, the most rarely occurred were related to the accuracy of digitization and symbols (point vector layer) (1.19 %).

A comparative analysis of the mistakes made by the first year college students at Cartography specialization (undergraduate) and master students (Geomorphology and cadastral mapping specialization) reveal several differences. It is interesting to compare the number of mistakes registered at each criterion, in case of the two groups of students because comparing the share of mistakes (see Figure 3) reveals some unexpected results. Regarding three criteria, out of the total number of mistakes the share was higher in case of Master students than the first year students: aesthetics (16.67% versus 10.61% at Cartography), legend (16.67% versus 6.94% at Cartography) and map signs/symbols (14.29% compared to 10.61% at Cartography).

Most of the mistakes made by the first year Cartography students were related to the scale of the plan (up to 12.24% of all mistakes), while only 8.33% of the first year Master students registered mistakes at the same criterion. All plans had the scale indicated even though most of them did not have the measure unit specified, which made the scale useless and therefore it was considered mistake (see Figure 6). Another mistake was to choose values that were not rounded (180 m, 640 m, etc.). The cartographic representation in Figure 6 contains other mistakes in addition to the scale: plan not showing blocks, squares, sections, unfinished plan, incorrect and unaesthetically placed titles, misspelling of street names (off-centred on the street axis, too large font), unaesthetic and incorrect intersection of lines indicating streets, wrong colouring, writing/text placed over symbols, legend with multiple mistakes, etc.

Aesthetics of plans was one of the features that determined many of the mistakes made by the students (10.61% of the total in Cartography and 16.67% at Master level). Mistakes regarding the

symbols/signs occupy the third place in the hierarchy of mistakes, both in case of Cartography undergraduate students (10.61%) and the Master students (14.29%). The most common mistake was not using the specific Romanian writing style. Labelling the map objects (point vector layer) caused problems to all students (10.61% of all mistakes in the Master and 9.52% in Cartography). The main mistakes were as follows: placing text/inscriptions/writing over symbols (see Figure 7); using too large or too small font, the wrong placement of writing, which led to not understanding to which of the symbols it referred. For example, the plan shown in Figure 7 reveals other mistakes, such as: text/inscriptions/writing placed over symbols and signs/symbols placed under the lines (road network), unstructured legend, unaesthetic framing in the page, incomplete title, etc.

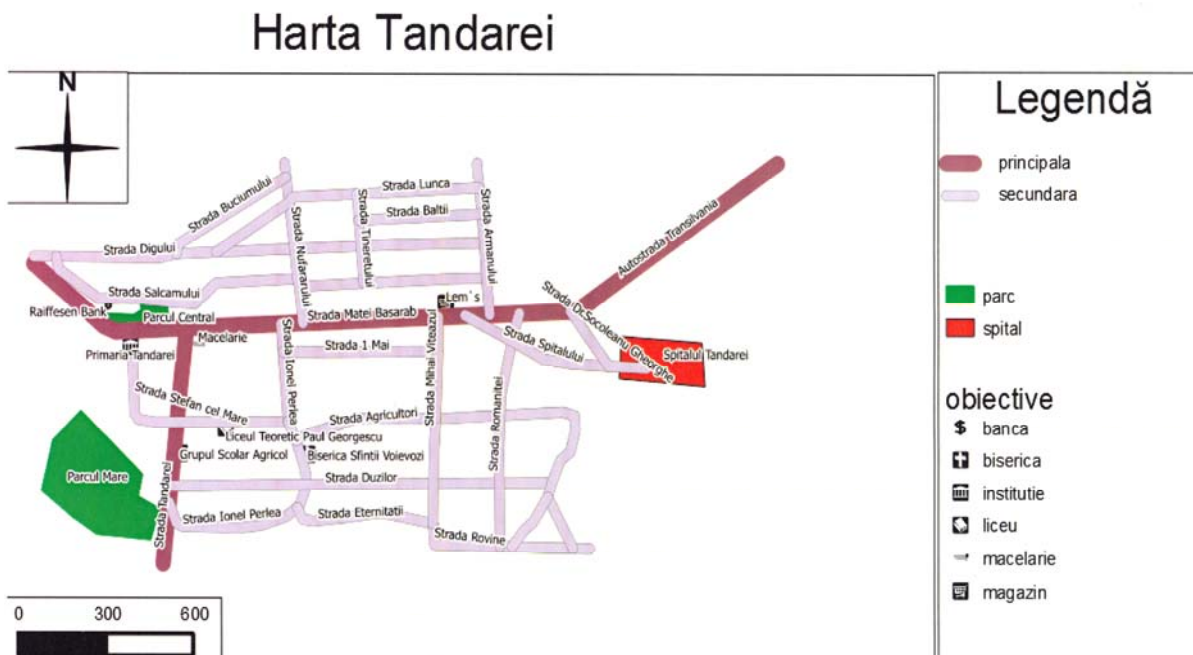


Figure 6. Tourist street plan elaborated by student 16, first year, Cartography (undergraduate level)



Figure 7. Tourist street plan elaborated by student 28, first year, Cartography (undergraduate level)

Failing to correctly name the cartographic data source based on which the tourist street plans have been completed was registered roughly equally in the two groups of students (9.80% of the total mistakes in Cartography and 9.52% at Master level). The most common mistake was that they wrote:

„Source: Google Maps” or „Map Source: Google Maps”, so it would be understood that the plan had been taken from that source. Some of the first year Cartography students mixed up the cartographic data source with the programs they used for making the maps, therefore writing: „Plan Fund Source: Quantum GIS”.

The most common mistakes in writing street names (9.80 % of the total mistakes in Cartography and 8.33 % at Master level) were as follows: lack of centring the name/label on the communication axis, using a too big or too small font compared to the line width which that street was represented by (see Figure 6), overlapping writing over other symbols on the map.

It proved to be difficult for the first year Cartography students to choose and represent the line symbols for the road and the river network (8.16% of all mistakes in Cartography and 3.57% at Master level) due to the lack of knowledge to operate in GIS program. The most frequent mistake was the unaesthetic street intersection (see Figure 6).

The legend brought up some problems because students needed both to have certain geographical knowledge and know how to create the layouts in Quantum GIS program. As a result, the number of mistakes at Cartography students (undergraduate) was much higher than at the Master level (6.94% of the total mistakes in Cartography and 2.38% at Master). The most common mistakes were: unstructured legend, using symbols larger or smaller than on the map, indicating/mentioning all locations of the same type in the legend, each one with its own name (e.g. Capitol Hotel, Astra Hotel, etc.) which is a mistake derived from the incorrect assigning of attributes when digitizing. Some of the first year Cartography students had difficulties to classify different tourist attractions, therefore they explained in the legend that a certain symbol would refer to „institution” or „art”. There was also a case in which the legend consisted of point symbols representing areas (a mistake arising from digitization, a first year student, who created two layers of the same element – a point vector layer and a polygon one).

The most common mistake regarding the title of the cartographic representation (6.94 % of the total mistakes in Cartography and 5.95 % at Master) was the incorrect formulation, such as: „Map of Braşov city plan”, „Map of Roman Municipality”, „The South Region of Craiova”, „The City Plan of Călăraşi”, „Plan of Buzău”. It should be noted that none of the students had to accomplish tourist street plans of the whole city, but of a certain part of it, and subsequently the title was not sufficiently clear regarding the exact localization.

Chromatics/Colouring is a criterion that registered quite a few mistakes (4.49 % of the total mistakes in Cartography and 2.38 % at Master). The mistakes were in the combination of colours giving an unpleasant aspect to the plan, such as: violet coloured blocks, main streets with brown borders and blue background, side streets coloured in red, electric green coloured blocks/sections and pink coloured streets.

The selection and placement of symbols for elements (point vector layer) did not cause such major problems as expected (4.08% of the total mistakes in Cartography and 1.19% at Master). The possible mistakes were mainly related to the incorrect choice of symbols (e.g. using a cross instead of „H” for the Hospital, the symbol of a locomotive instead of „U” for the subway), overlapping different symbols either because of using a too large symbol, or due to the small scale of the plan), overlapping line elements (streets) over symbols (see Figure 7) due to the wrong choice of vector layers (vertically) when completing the tourist plan.

The accuracy of digitization was a criterion with very few mistakes registered (2.86% of the total mistakes in Cartography and 1.19% at Master), students working correctly when digitizing items.

The representation of the true north was also a criterion met by most of the students (2.86% of the total mistakes at Cartography and 2.38% at Master).

In conclusion, the evaluation grid in Table 3 proved to be useful in assessing correctly, uniformly and objectively the tourist street plans made by the students and in the identification of mistakes. We would like to emphasize that the level of competence that the assessor has is essential in making and assessing the tourist street plans because only it is only in their own power to correctly identify the mistakes made by students.

3) *Analysis of the causes that determined students to make the mistakes in their tourist street plans* and also, the process of forming the competence can be improved by analyzing the different results achieved by the students.

We identified some of the causes by monitoring the learning process and observing the student behaviour (the subject variable): the absence from lectures or practical work on this topic; presence at the practical work classes without the necessary materials and without the necessary programs installed; lack of interest and motivation, self-sufficiency, fatigue, not paying attention to the teacher's explanations, attending courses without taking notes, not managing the workload until the last minute, subsequently not being able to get the feed-back from the teacher; taking over ideas or examples from other colleagues without verifying them with the theory and the checklist; failing to take the steps at the same pace with the teacher and other students; difficulty in using the computer/laptop (low level of competence in using the computer). Some master students consider that they have the desired or required level of competence therefore they involve less responsibly in learning and developing their skills.

We have also derived some of the causes by analysing the visible results, of the plans made: insufficient knowledge of the program used; blanks and misrepresentations (e.g. not choosing rounded values for distances in the field when they represent the graphical scale); lack of correlation between the information received during lectures and practical work; poor correlation of geography knowledge with that of using the software; not following the steps indicated by the teacher; non-compliance with the rules and requirements; lack of aesthetic sense or low-level education aesthetics. The explanation for the lack of habit to follow rules or steps (procedures) in solving a task and using the computer lies in the fact that Romanian pre-university education promotes a mostly theoretical curriculum, focused on memorization of information and too little on developing practical and intellectual skills and actual competence training.

Other causes were identified by analyzing the undergraduate curriculum for the specializations involved in this research: too few hours assigned to the courses of cartographic design and of cartographic representation methods and techniques at cartography specialization (undergraduate), with inadequate placement throughout the period of study; too few hours of cartography courses in all geographic specializations.

We have identified a series of causes by analyzing the context of forming the competence and which is part of the independent variable. These are: the relatively large number of students in a study group (about 30); scheduling two hour activities once a two weeks, which disrupts the rhythm of teaching and brings up difficulties in correlating the lectures with the practical work; teaching sometimes in rooms without video projector; insufficient number of computers in the room or the large number of computers that do not work, even occasionally. Since the activities were held every two weeks, there was a timeframe that could allow oblivion, as demonstrated in other situations (G. Osaci-Costache et al., 2013a, 2013b).

4) *Assessing the level of competence.* By using the grids in Table 2 and Table 3 we objectively evaluated the tourist street plans elaborated by the students and we put together the results. As shown, the maximum possible score was of 1.5 points (1.5 % of the final mark of the course, according to the course description), and the minimum of 0 points. In dividing the total score for each criterion, we considered the importance of indicators aimed by that criterion. As a result, the criteria „accuracy of digitization” and „scale plan” each received 0.2 points while the other criteria received 0.1 point each (see Table 2).

The percentage thresholds between the levels of competence and their names were those previously established for the competence to elaborate topographic profiles (G. Osaci-Costache et al., 2013) and were maintained for the competence to elaborate a city tourist street plan (see Figure 8). All the students who scored between 0 - 0.75 points, as in less 50 % of the total score, were included in the category of „incompetent”, thus respecting the rule of promotion in the Romanian education system that establishes that students getting grades lower than 5 (compared to the maximum score of 10) should fail de exam. In case of the other levels of competence, limits got even higher, so that a higher

level of proficiency involved scores ranging between 1.4 - 1.5 points (95% of the total score – see Figure 8).

Unlike master students, in which case no one has been classified as “incompetent”, about 45.45% of first year Cartography students were considered incompetent in elaborating tourist streets plans. The positive results of master students can be explained by the prior accumulation of knowledge, which was activated for this topic. The first year Cartography students could have obtained better results, as demonstrated in other cases of competence (Osaci-Costache et al., 2013), if the subject had been placed later in the curriculum, as other disciplines such as Cartography and GIS (not in the first semester of the first year) or if they were allocated a greater number of hours (not just 14 course lectures and 14 hours of practical work throughout the entire semester). For the same reasons, the share of average and high level competence students is higher at Master level (70%). Even under these circumstances, 34.09 % of first year students have achieved average and high level of competence (see Figure 8).

The results of Master students were different depending on the specialization graduated, observing that the highest average scores were achieved by the students who graduated from Faculty of Geography, Cartography specialization University of Bucharest (1.25 points), while the smallest average score (0.93 points) was achieved by students who graduated from „Land Measurements and Cadastre” of the University of Agricultural Sciences and Veterinary Medicine.

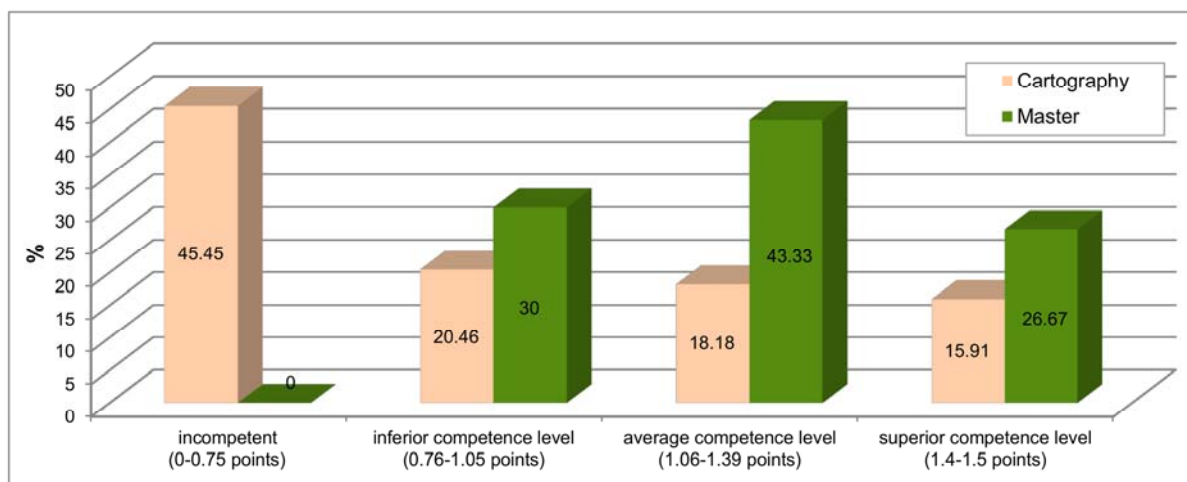


Figure 8. Frequency of competence levels and levels of competence in case of both student groups

5) *Analysis of solutions to improve education and students' achievements.* We should note that some of the solutions refer directly to the improvement of institutional management, such as: optimally schedule classes and practical work, comply with regulations regarding absenteeism from teaching classes, restructure the curriculum to allow geography students to better prepare for cartographic and GIS courses during the three years of study. Some of the solutions aim to improve the formation of this competence/skill, such as: discuss the mistakes and exemplify the way in which they can be corrected, monitor students during the training activity; convince students to take notes, follow the rules and requirements when solving the tasks; analyze the evaluation grid together with the students prior to the completion of tourist street plans, complete the primary and final assessment of tourist street plans.

Still, the work performed by the students is the most important for them to form this competence, therefore it is necessary for them to engage actively and consciously in this activity and change their behaviour by: focusing attention on the teacher's explanations and indications as well as on those written in the textbooks, comply with the rules, stages and steps in solving the tasks, use the checklists. However, there are some causes that cannot be

eliminated: lack of aesthetics, insufficient or lack in art/design classes during high school, low-level digital skills formed during high school.

Limits and conclusions

At the end of this study we came to several conclusions. We consider it useful to analytically present the knowledge integrated to this competence and the details of the procedure of making tourist street plans in a table, starting from the reflection of each own skills. It is useful to teachers because it helps them to design and organize their class activities in the formation and evaluation of this competence, and it is useful to students because it helps them in the formation of this competence by going through all stages and steps, without omitting any sequences. On the other hand, the assessment grid that we designed is useful to students to perform their self-evaluation and to the teachers because it facilitates the primary and final evaluation of the tourist street plans and make it fair, uniform and objective and also helps them identify the mistakes made by students. The results of our study show that it is useful also to categorize the causes for the mistakes made by the students in making the tourist street plans, and we concluded that they are as such: curriculum related – in terms of the background knowledge achieved during high school education; causes related to the organization of the educational process, and student – related causes. Anyhow, we consider that only some of these causes could be removed. And finally, we conclude that the most important solution we propose in order to improve the process of competence formation and improve student achievements would be to responsibly involve them in the learning process.

One of our study's objectives was to analyze the competence of elaborating tourist plans. One of the limits of our research is the fact that we tried to compare the level of competence of two student groups, first year undergraduate and first year master, even though there were great differences between them. Still, we proceeded this way in order to have as much case studies as we could since we were mainly interested in testing the method and assessment tools proposed.

Another limit of our study is the number of subjects and tourist plans that we evaluated. Having the specificity of the course, practical work and the task given to students we considered difficult to extend such a research and apply it to other courses and in more university centres. Also, we have to mention the fact that we identified many of the factors determining the frequency of mistakes by direct observation and we did not use statistical data to prove them (for example absenteeism, lack of motivation, etc.).

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