

spring2018.upol.cz

Viktor Cap Photography

PRESENTATION
FROM THE

ICA JOINT WORKSHOP



Olomouc
Czech Republic
April 27–30, 2018

Atlases & Cognition & Usability



Expert Assessment of Maps in Regional-geographic Textbooks in Terms of Their Usability

Petr Trahorsch, Jan D. Bláha

JE Purkyně University in Ústí nad Labem, Czechia



UNIVERZITA J. E. PURKYNĚ V ÚSTÍ NAD LABEM

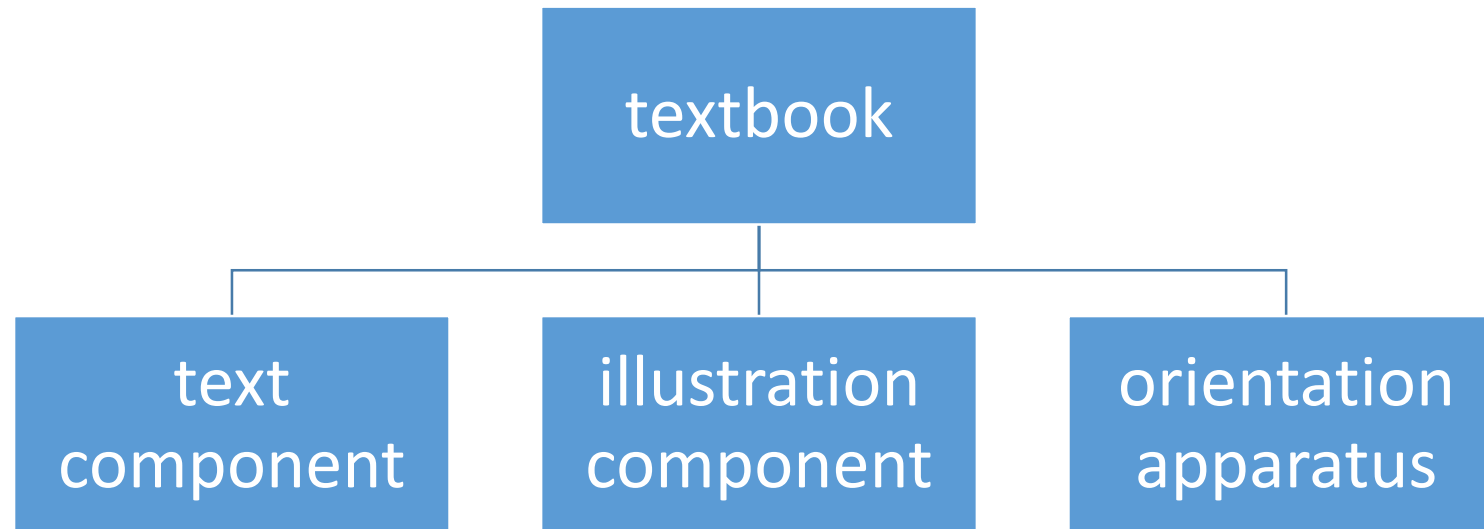


The aim

- The aim of this presentation is to present the results of quantitative analysis of maps in Czech geography textbooks for elementary school pupils
 - Identification of textbook structure in relation to maps
 - Usability assessment of selected maps

Maps in structure of textbooks

- Textbooks as material geographic didactic aid
- Textbooks as structural system – relationships between components



Source: Průcha (1998)

Map quality as a assumption for effective learning

- Other requirements for the quality of maps in textbooks than at atlases (Behnke, 2017)
 - Relationship to other structural components of the textbook - title, explanatory text, subtitles
- With proper use of maps - learning efficiency is higher (Verdi & Kulhavy, 2002)
- Maps concretize and visualize the information contained in the text
 - Use in difficult and abstract curriculum
- Clarity of maps an their means of expression – effective solution cognitively demanding tasks (Canham & Hegarty, 2010)
- Inappropriate concept or position of maps - the cause of misconceptions (Wiegand, 2002)

Assessment methodology

- Expert assessment of the maps (Bláha, 2010)
- Quantitative content analysis
 - Structure of textbooks
 - Selected maps (physical, hydrological, agricultural)
- Materials
 - Regional-geographic textbooks for ISCED 1 (11 years old pupils) and ISCED 2 (14 years old pupils) levels of education
 - Ministry clause

Methodology - two assessment phases

- First phase of assessment (analysis)
 - Analysis of the textbook as a whole
 - Categorization of maps according to different criteria - number, share, geographical name
- Second phase of the assessment
 - Scaling based on predefined criteria
 - Selected maps – physical, hydrological and agricultural

- Two groups of criteria assessment

General criteria	Examples of studies that demonstrate the impact of the learning criterion
position on the page	Veriki (2002); Peterson (2016)
relationship to the text	Levin et al. (1987); Kim et al. (2016)
title	Mayer & Gallini (1990); Coleman et al. (2012)
attractiveness	Dove (1997); Ysar & Seremet (2007)
aesthetic function	Trend et al. (2000); Hollman (2014)
adequacy	Sian (1998); Michaelidou et al. (2004)

Specific criteria	Examples of studies that demonstrate the impact of the learning criterion
clarity	Swienty et al. (2008); Ozcelik et al. (2009)
distinctiveness	Michaelidou et al. (2004); Cromley et al. (2013)
clear arrangement	Červený (2001); Behnke (2017)
legibility	Melbo & Waterman (1936); Metallinost et al. (1990)
balance	Ainsworth (2006); Brasciani & Eppler, (2015)
expertise	Meijer (1997); Buchter (2006)

The importance (weight) of criteria assessment

critterion	number of options (o)	order of the criteria	weighting coefficient (w)
position on the page	26	6	0,0959
relationship to the text	68	2	0,2509
title	32	4	0,1181
attractiveness	40	3	0,1476
aesthetic function	27	5	0,0996
adequacy	78	1	0,2878

critterion	number of options (o)	order of the criteria	weighting coefficient (w)
clarity	58	2	0,2140
distinctiveness	28	5	0,1033
clear arrangement	65	1	0,2399
legibility	55	3	0,2030
balance	21	6	0,0775
expertise	44	4	0,1624

$$w = \frac{1}{\sum o : o_i}$$

Statistical analysis of results

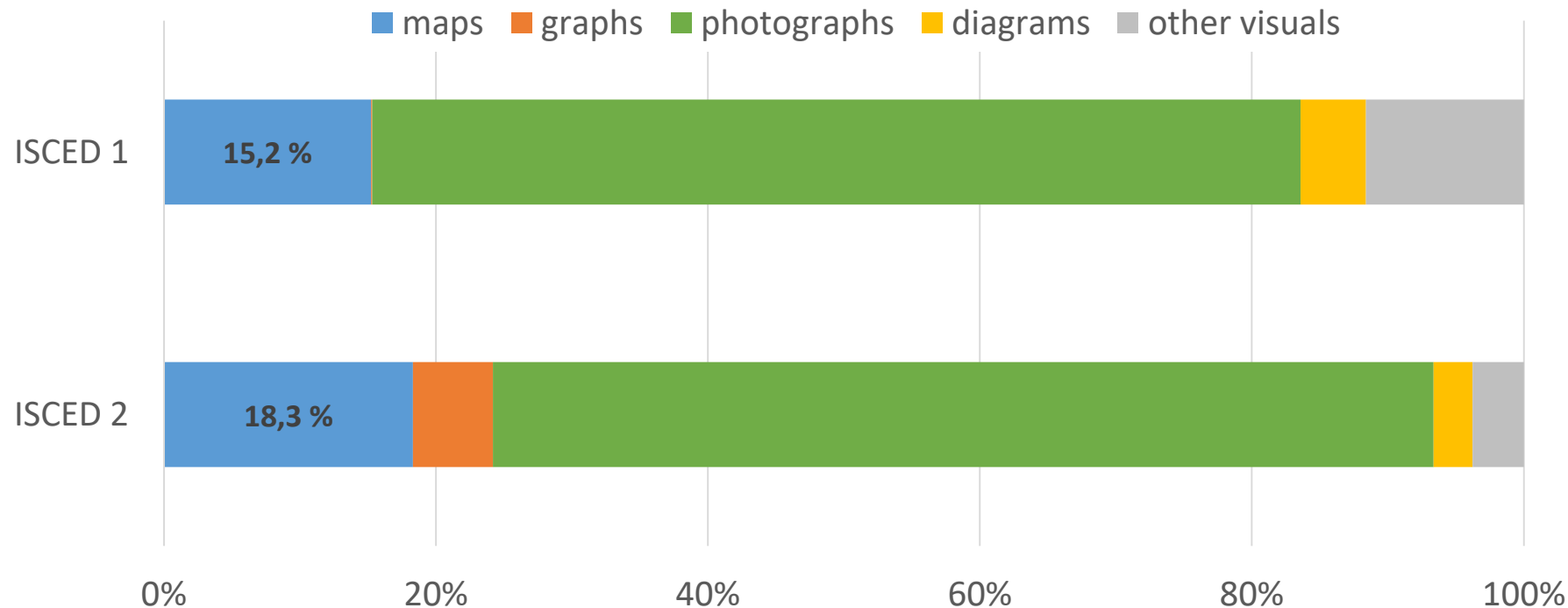
- Text structure analysis: chi-square test (p-level = 0,05)
- Conversion to a uniform rating scale:

$$med_i^c = n \cdot k_i^u \cdot w_i^c,$$

- med_i^c = the median rate,
 - n = total number of criteria,
 - k_i^u = rate of fulfillment of each i-th criterion without taking account of weights (weighting coefficient)
 - k_i^c = the total weighting coefficient of each i-th criterion.
- The median rate
 - $\langle 0; 100 \rangle$

Results of the analysis – the position of maps in textbooks

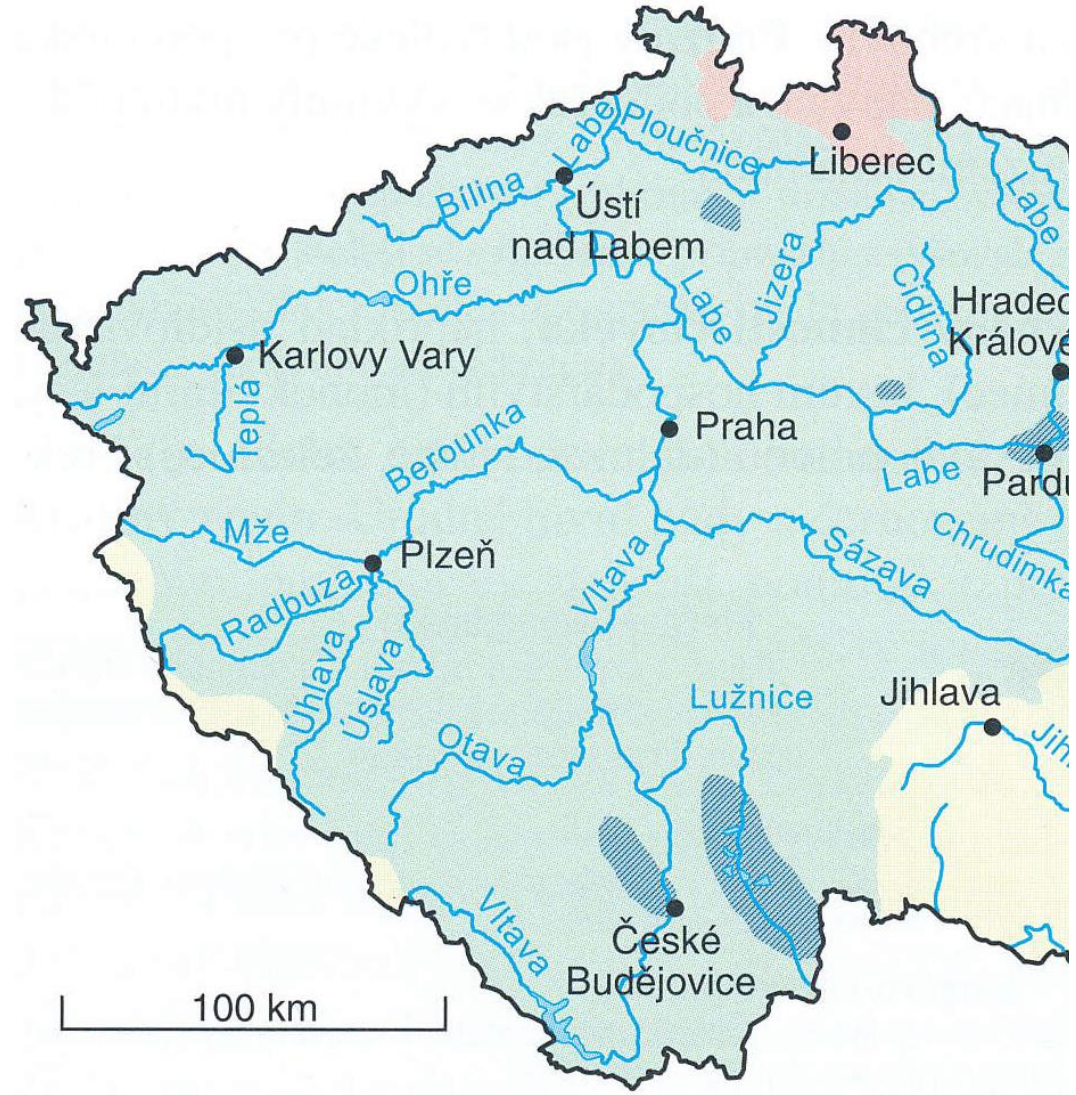
- The share of maps to other types of visuals is relatively low
 - A higher proportion of maps in textbooks for older pupils
 - The result is statistically significant ($p = 0,01$)



- The filling of the maps with the description increases with the age of the pupils
 - ISCED 1: 13,6 vs. ISCED 2: 15,2 geographic objects are described



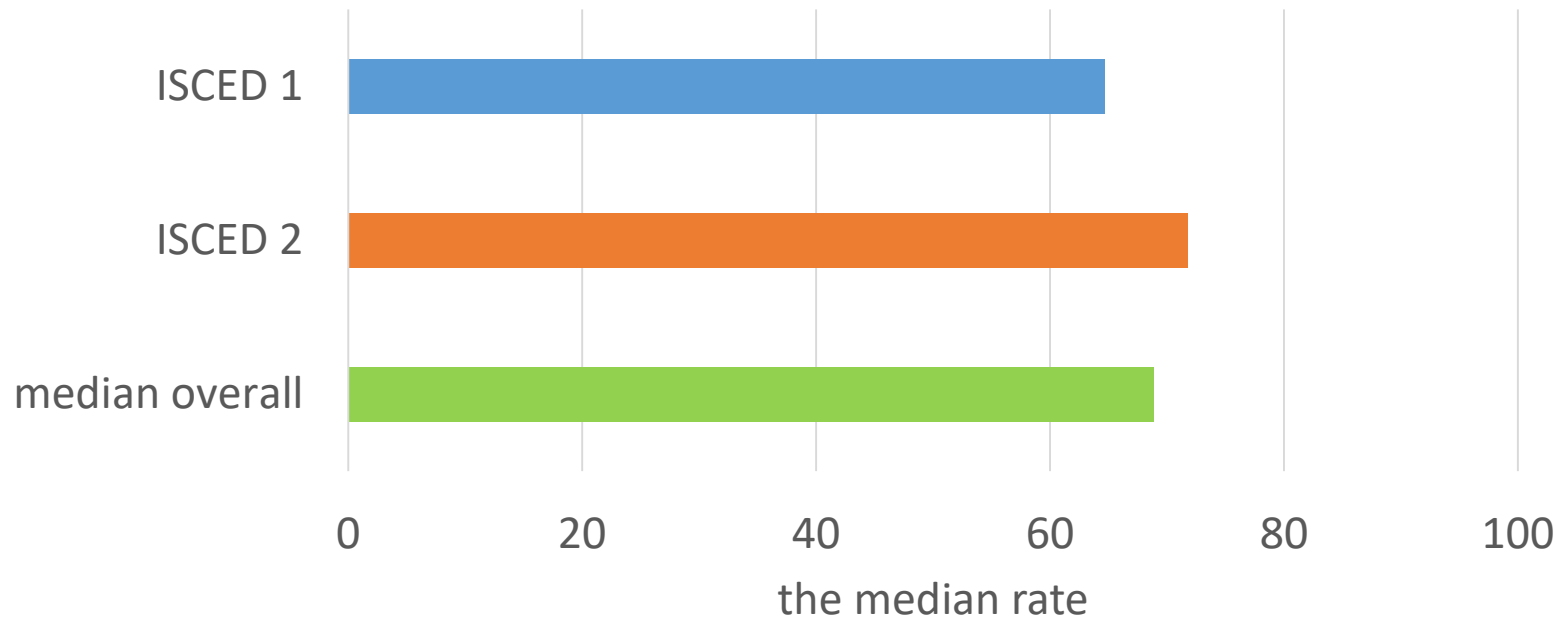
Source: Taktik (2016)



Source: Prodos (2015)

Results of the analysis – a comparison textbooks by age

- Maps have a lower quality than other visuals
 - Overcrowding, unreadability
- Maps for older age category have higher quality



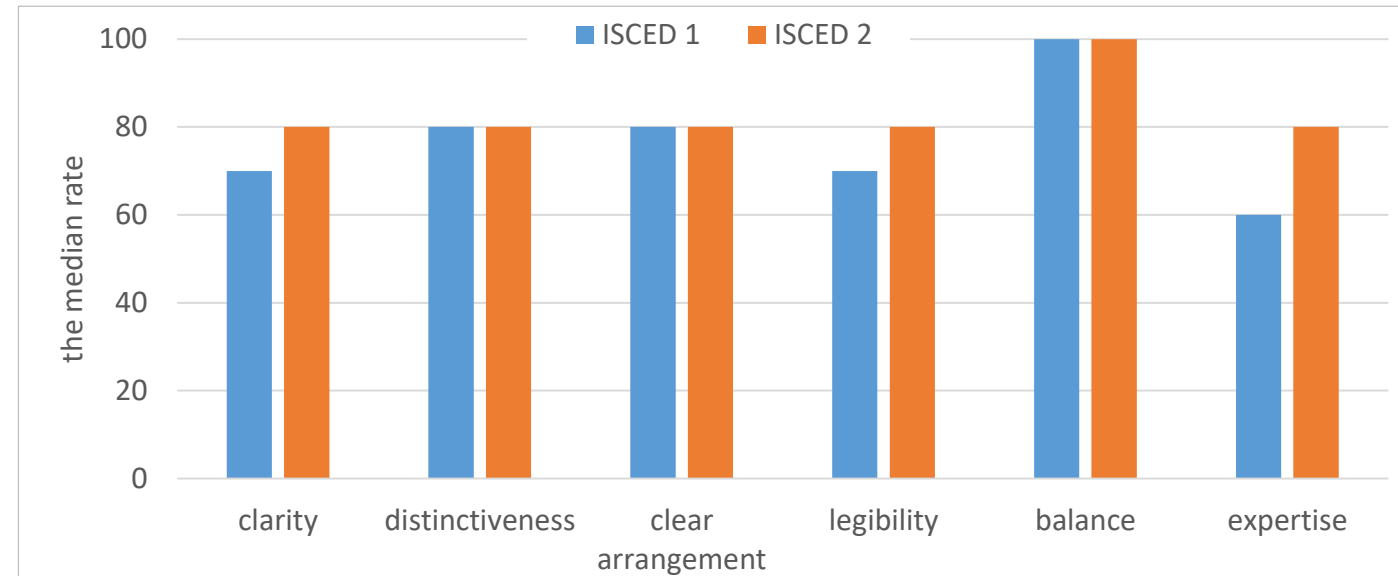
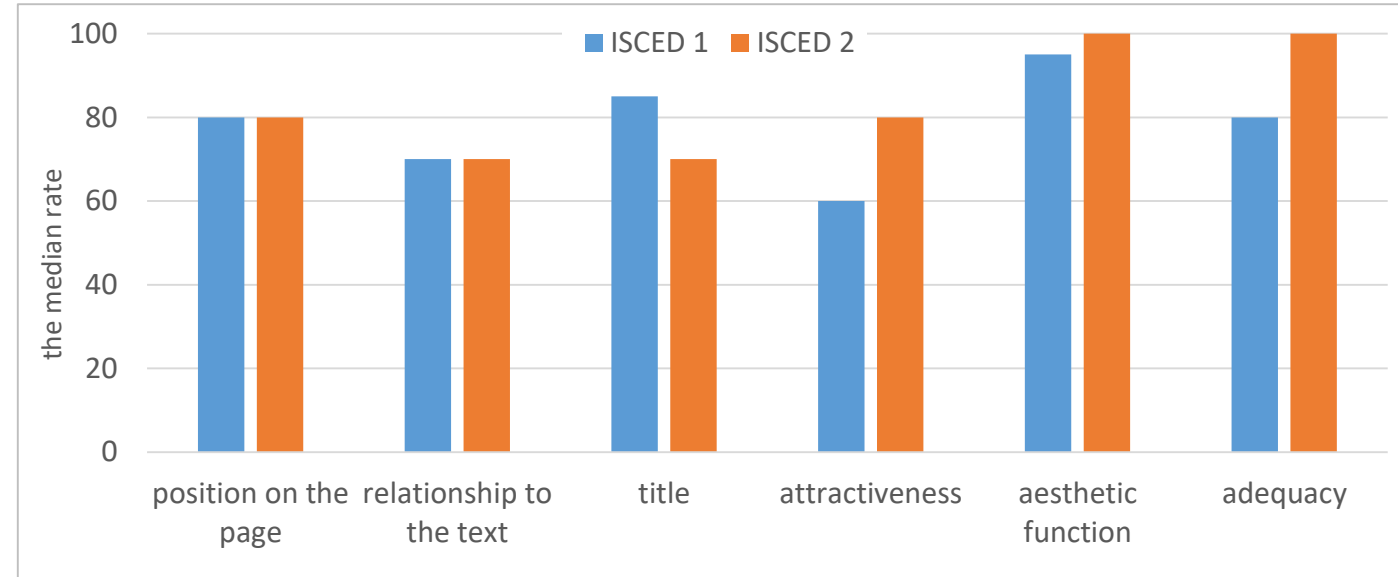
Results of the analysis – differences between publishers

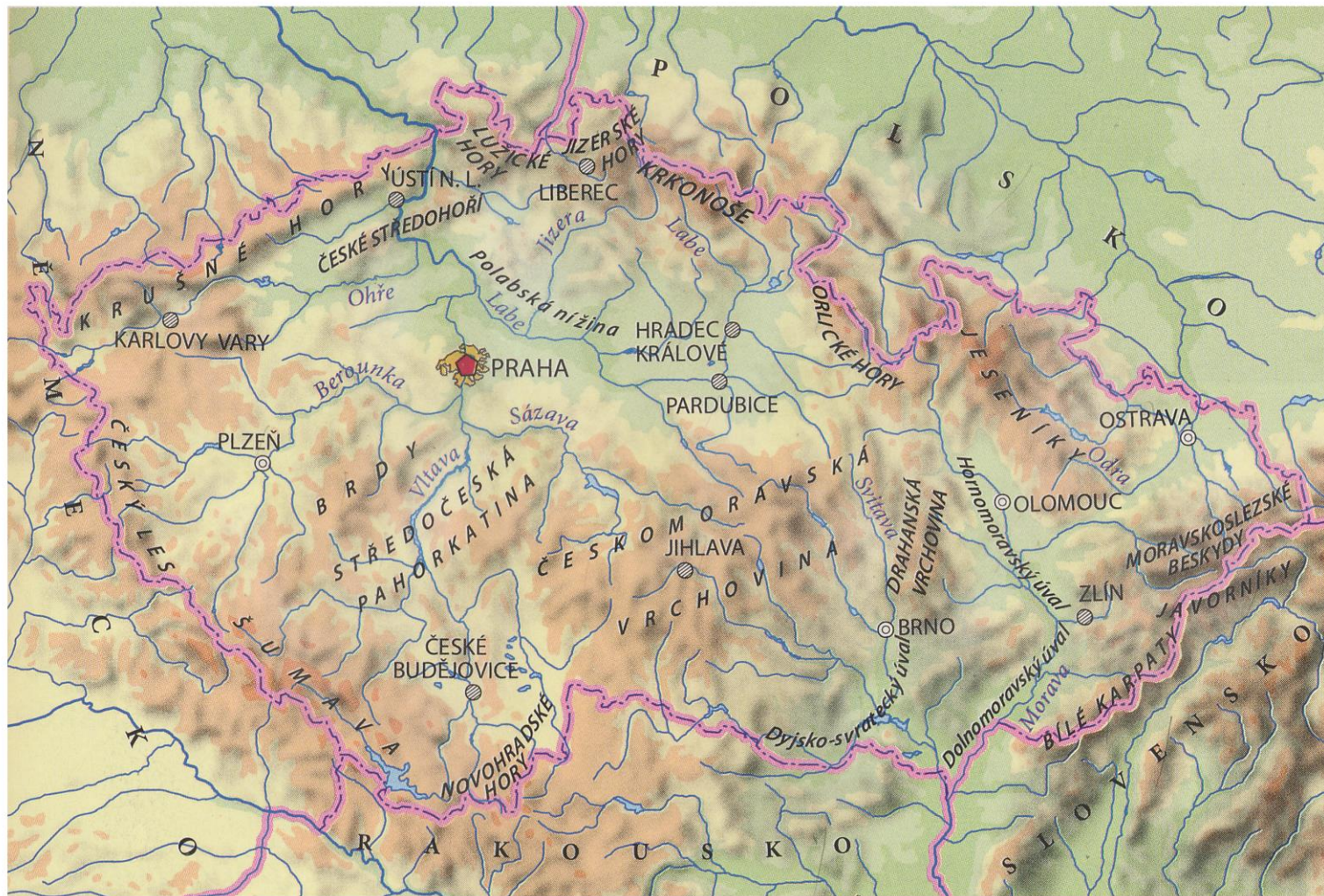
- Lower quality maps in textbooks by relatively new publishers, which haven't a long tradition

Publisher	ISCED 1	ISCED 2
Alter	66,8	
ČGS	63,9	80,9
Dialog	52,3	
Didaktis	83,2	
Fraus		73,3
Nová škola	61,1	68,9
Nová škola (Duha)	74,4	
Prodos	63,2	73,1
Septima	60,3	
SPN	72,0	65,3
Taktik	64,6	

Results of the analysis - a comparison of assessment criteria

- Low level of expertise
 - Absence of compositional elements
- Low level of innovation
 - Copy a similar map concept
- Low relationship of maps to text
 - Fill the free space on the page
- Emphasis on aesthetic function

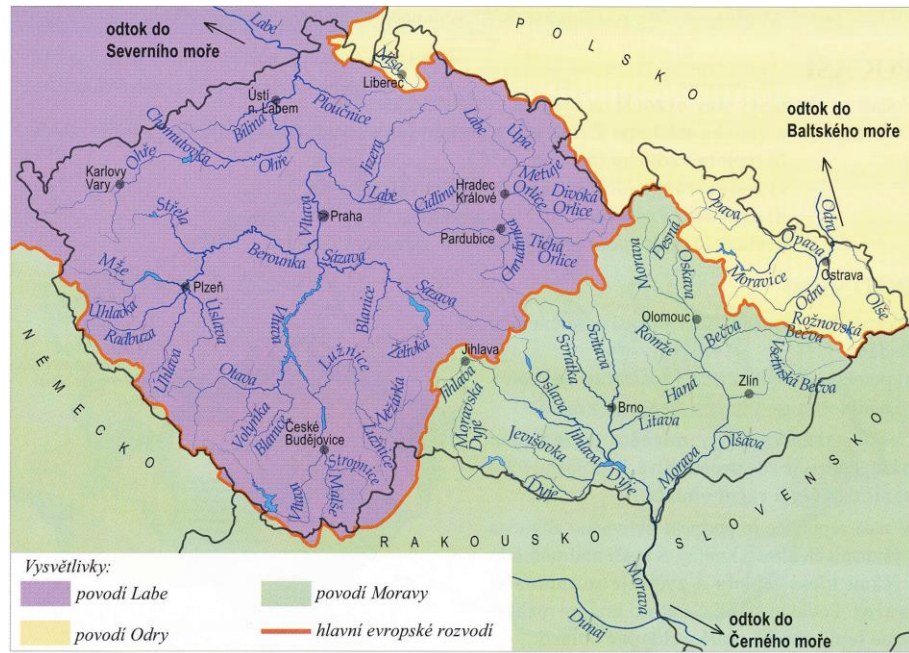




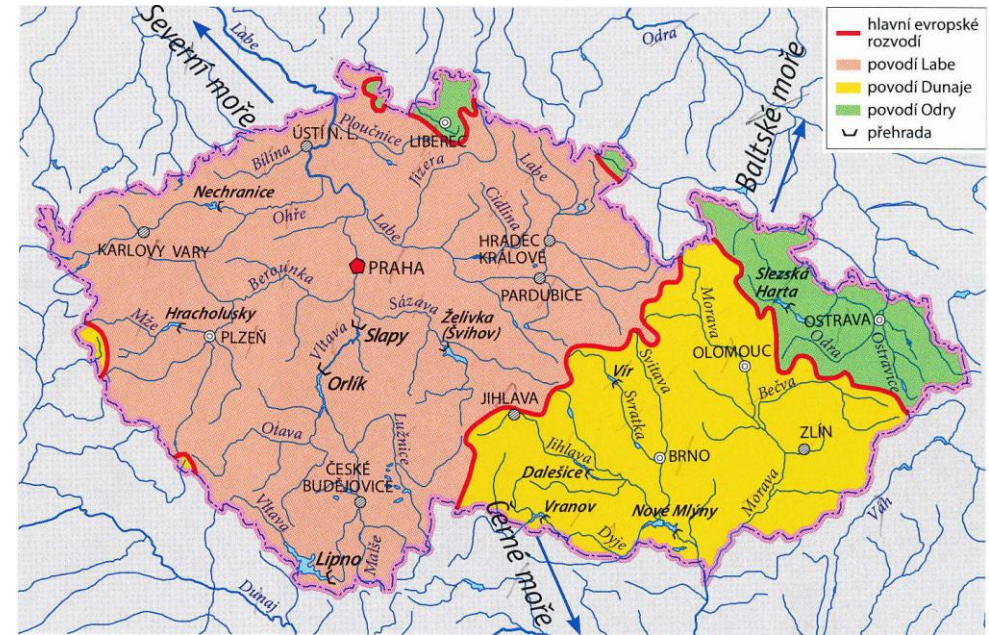
Povrch České republiky

Source: SPN (2016)

Source:
Nová škola
(2012)



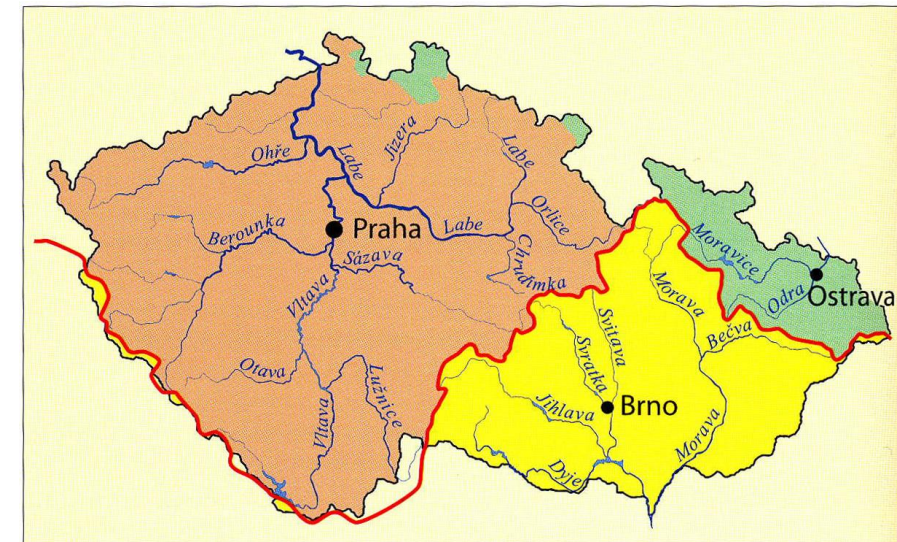
mapa – povodí řek a evropská úmoří



Hlavní říční síť České republiky

Source:
SPN (2016)

Source:
Taktik (2016)



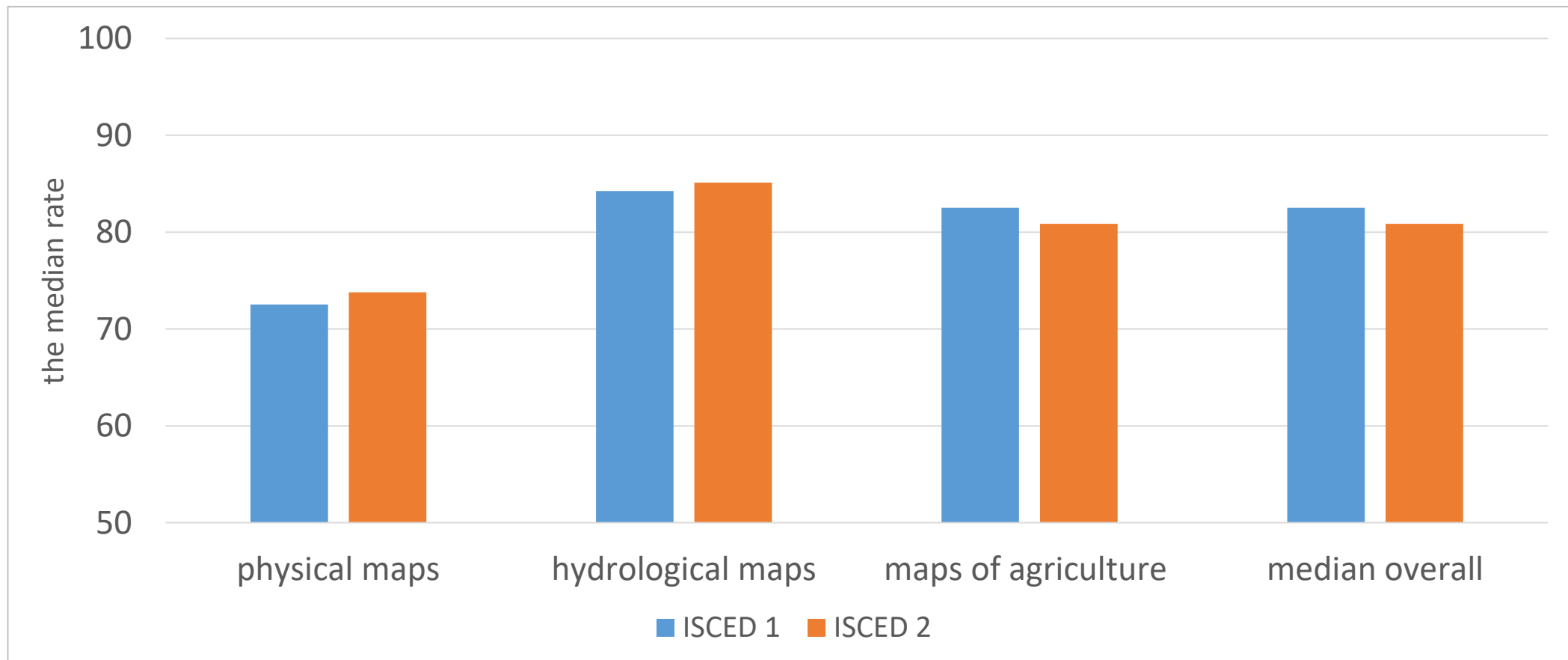
hlavní řeky ČR, hranice úmoří a hlavního evropského rozvodí

— hlavní evropské rozvodí,
 ■ povodí Labe, ■ povodí Moravy (Dunaje), ■ povodí Odry

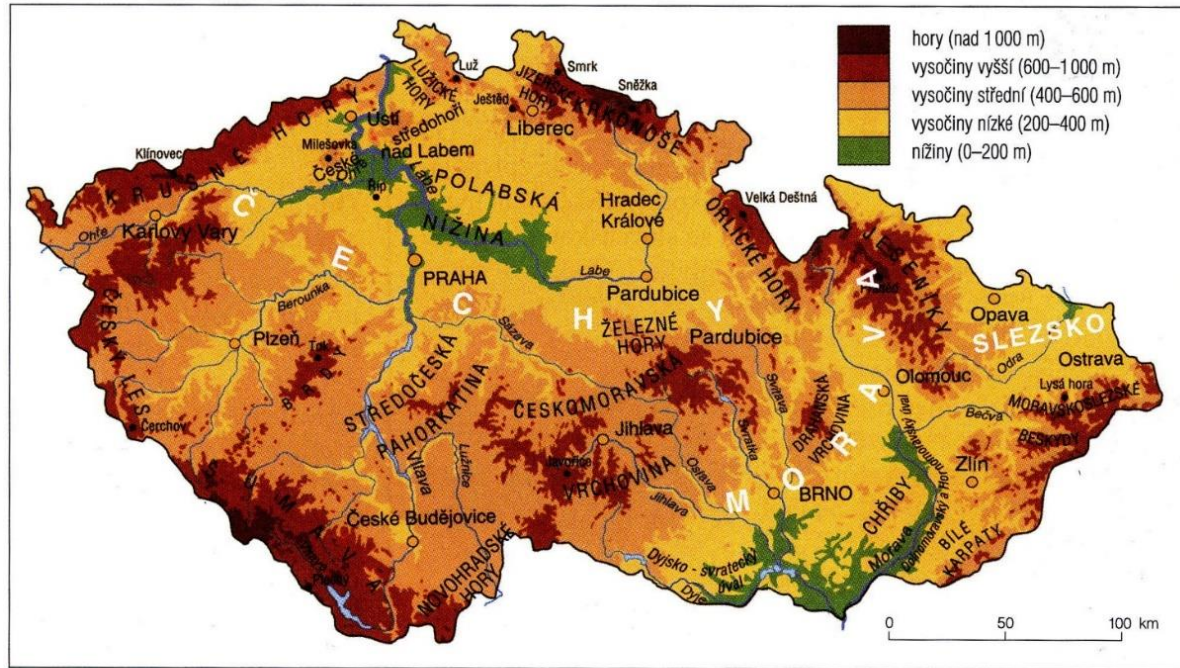
Source:
Nová škola
(2013)

Results of the analysis - a comparison of maps

- The lowest quality have physical maps
 - Using inappropriate cartographic expressions

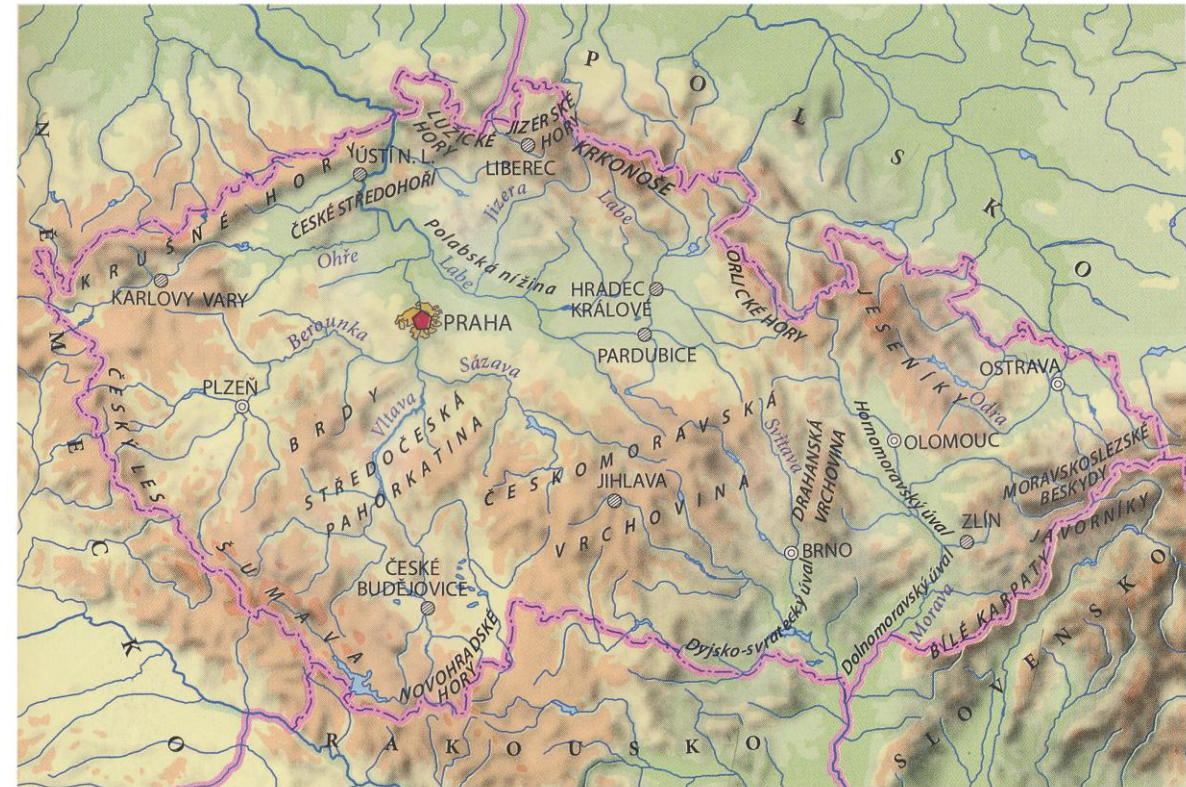


Physical maps



Zjednodušená obecně zeměpisná mapa České republiky s vyznačenými nejdůležitějšími horskými celky, nížinami a řekami.

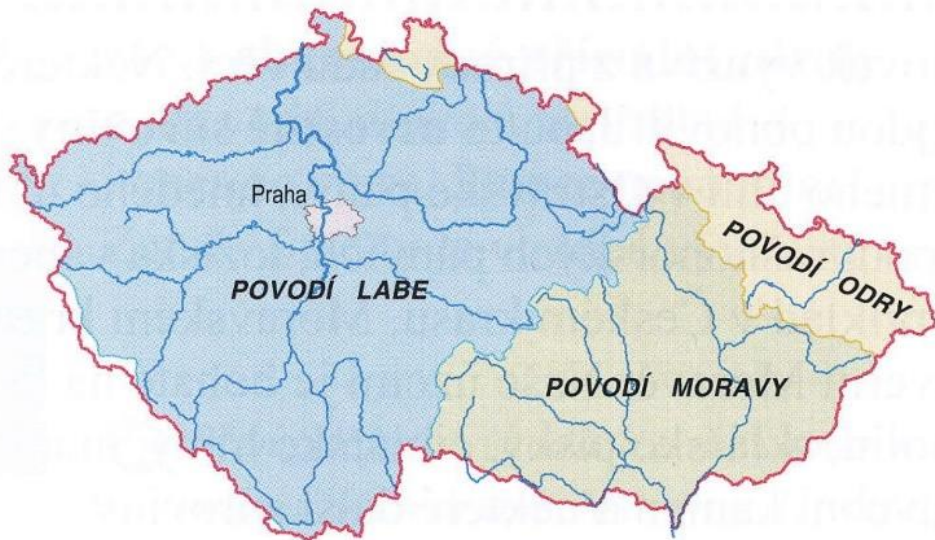
Source: Dialog (2007)



Povrch České republiky

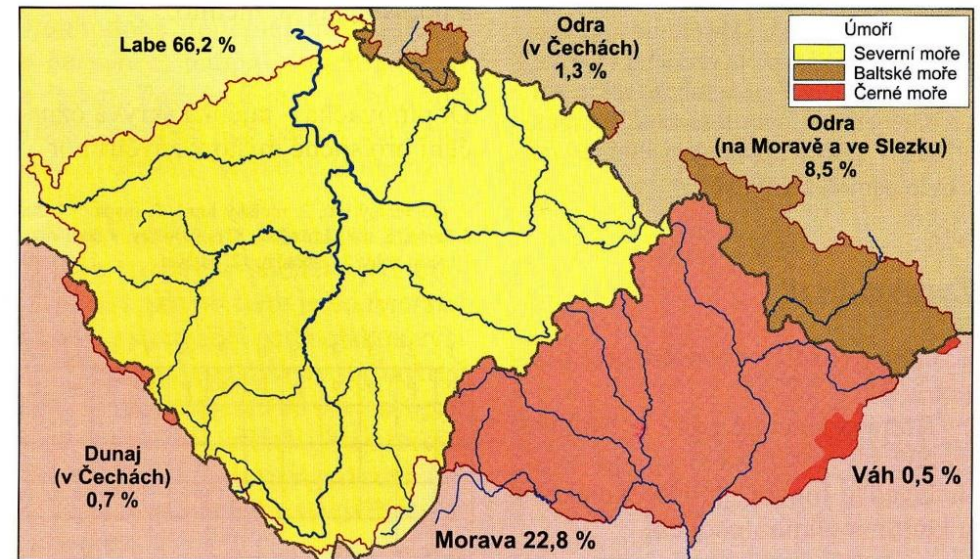
Source: SPN (2016)

Hydrological maps



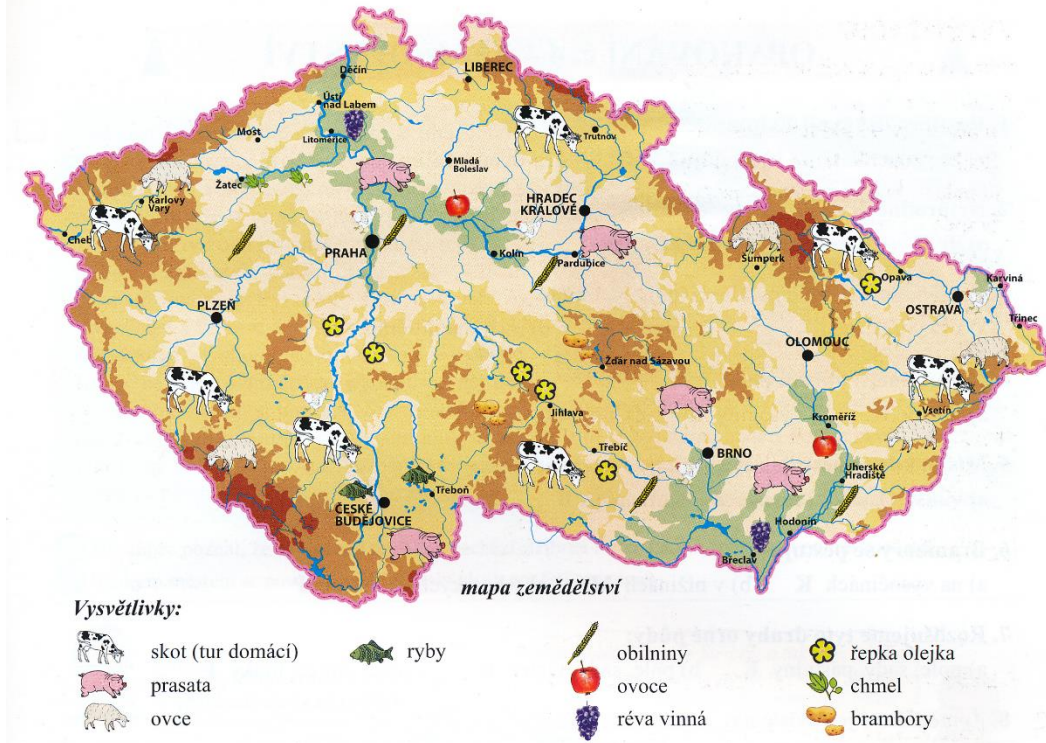
Source: Czech Geographical Society (2010)

Rozdělení odtoku z území České republiky s vyznačením podílu plochy odvodňované jednotlivými řekami



Source: Czech Geographical Society (2016)

Maps of agriculture



Source: Nová škola (2016)



Source: Didaktis (2009)

Conclusion: implications for textbooks publisher

- Involve professional cartographers in creating maps
- Consultation of map content with didactics, pedagogues and psychologists
- Greater collaboration of authors, editors, graphic editors on textbook creation - logical connection and continuity
 - The higher usability of maps in textbooks – potentially higher learning efficiency

*Petr Trahorsch, Faculty of Education, UJEP, Ústí n. Labem,
petr.trahorsch@seznam.cz*

*Jan D. Bláha, Faculty of Science, UJEP, Ústí n. Labem
jd@jackdaniel.cz*

<http://www.jackdaniel.cz/geovisinfo/>