

THE COMPETENCE-BASED LEARNING ASSESSMENT FOR CLIMATE AND WEATHER IN PRE-UNIVERSITY SYSTEM A STUDY IN PHYSICAL GEOGRAPHY EDUCATION

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Abstract

The study aims to analyze the competence-based approach in pre-university education to develop students' skills in subject knowledge related to climate and weather. The research focuses on the field of physical geography education and employs a methodology centered on assessing key and subject competencies, as well as learning situations, highlighted in climate and weather topics found in textbooks. The learner-centered approach based on competencies is considered a bridge between mastering subject knowledge and practical student proficiency. The methodology utilized relies on textual analysis of three alternative geography textbooks, selected for 7th and 10th grades, which cover fundamental knowledge of physical geography. The development of these textbooks is based on the philosophy of competence-based learning. The findings of this research highlight the importance of the competence-based approach, revealing the complexity of both subject-specific and key competencies frequently used in weather and climate contexts. The study serves and helps various stakeholders operating in the field of education.

Key words: Competence-based learning, climate and weather, pre-university education, physical geography, geography textbook.

Përmbledhje:

Studimi ka për qëllim të analizojë qasjen arsimore e të nxënësve në bazë kompetencat në arsimin parauniversitar për të kuptuar zhvillimin e aftësive të nxënësve në njohuritë mbi klimën dhe motin. Kërkimi fokusohet në fushën e

edukimit të gjeografisë fizike dhe përdor një metodologji të përqendruar në vlerësimin e kompetencave kyce dhe lëndore, të synuara në temat e klimës dhe motit të përfshira në tekstet shkollore të gjeografisë. Qasja arsimore e bazuar në kompetenca, konsiderohet si një urë lidhëse midis zotërimit të njohurive të lëndës dhe aftësisë praktike të nxënësve. Metodologjia e përdorur mbështetet në analizën tekstuale të tre teksteve alternative të gjeografisë, të përzgjedhura fituese për klasat e 7-të dhe të 10-të, të cilat mbulojnë njohuritë themelore nga gjeografia fizike mbi klimën dhe motin. Hartimi i këtyre teksteve bazohet në filozofinë e të nxënësve të bazuar në kompetenca. Gjetjet e këtij studimi theksojnë rëndësinë e kësaj qasjeje, duke zbuluar kompleksitetin e kompetencave lëndore dhe atyre kyce që përdoren shpesh në kontekste të motit dhe klimës. Studimi shërben aktorëve të ndryshëm që operojnë në fushën e edukimit.

Fjalë kyçe: *Të nxënësve të bazuar në kompetenca, klima dhe moti, arsimi parauniversitar, gjeografia fizike, teksti shkollor i gjeografisë.*

Introduction

Competence-based learning in education is an educational approach that focuses on the development of specific skills, knowledge, and the ability to apply them in various contexts, as opposed to merely acquiring content knowledge. Competence consists of connected pieces of knowledge, skills and attitudes that can be used to adequately solve a problem. Mathe & Mfolwe (2017) highlighted that “Education is not the learning of facts, but the training of the mind to think,” Albert Einstein (1879- 1955) in which is more suitable when the four Cs (Collaboration, communication, critical thinking and creativity) are put into practice. Activities that can liberate learning are that a manual can be created where self-paced computer tutorials, video related to the unit being taught, experiments conducted, hands-on and mind on simulation related to the unit being studied. Such activities are known to have the power of allowing students to link past knowledge with the current knowledge. It also allows learners to apply what they have learnt to really life situations.

This approach entails active learning, practical application, and the integration of real-world tasks to develop the necessary competencies for students' future roles. In education, competence represents the combination of knowledge, skills, and attitudes that individuals possess and can effectively apply in various situations.

Competence-based learning focuses on clearly defined learning outcomes, ensuring that students develop the necessary competencies by the end of their educational program. This approach recognizes individual differences and allows for personalized learning pathways, enabling students to progress at their own pace and focus on areas where they need improvement. Assessment in competence-based learning focuses on evaluating students' ability to apply their knowledge and skills in authentic contexts.

Technology is often used to support competency-based learning, providing interactive resources, simulations, and online platforms for collaborative learning and practice. Regarding the preparation for the future by focusing on developing practical skills and competencies, competence-based learning prepares students for success in their future careers and roles in society.

The last education reform in Albania involved reforming in curricular documentation, organizing and evaluating students' learning, reforming of the initial teacher's education systems, and qualification and professional development of the human resources. The aim of the educational reform was the development of the European key competencies by making students able to problem-solving in personal, national, and global levels.

The key competences are 1. Expressing and Communicating Competence, 2. Thinking Competence, 3. Learning to Learn Competence, 4. Competence for life, enterprising and environment, 5. Personal competence, 6. Civil competence, 7. Digital Competence. Subject competences connected to geographical research are 1. Observation of geographical phenomena, 2. Gathering, evaluation, and communication of the information, 3. Decision-making based on obtained information

Curricula are structured in 6 scales, depending on the students' group ages, development periods and curricula requirements. Meanwhile the learning fields are a) Languages and communication, b) Math, c) Natural sciences (Biology, Physics, Chemistry), d) Society and environment (History, Geography, and Social Sciences), e) Arts, f) Physical education, sports, and health, g) ICT and Technology. Geography belongs to the society and environmental learning field.

Table 1. Level of the studies according to grades and thematic, recommended lessons' hours

Level of studies (Lower and Upper Secondary)	Grade	Thematic and recommended lessons' hours
Lower Secondary: Scale 3	VI	Interdependence between people, places, regions and environments (35 lessons)
Scale 3	VII	1. Natural and human processes (62), 2. Interdependence between people, places, regions and environments (8)
Scale 4	VIII	Interdependence between people, places, regions and environments (70)
Scale 4	IX	Interdependence between people, places, regions and environments (70)
Upper Secondary: Scale 5	X	Natural and human processes (72)
Scale 5	XI	Interdependence between people, places, regions and environments (70)
Scale 6	XII	Interdependence between people, places, regions and environments (70)

Source: Prepared by authors, based on pre-university geography curricula.

Based on Table 1, subject knowledge on weather and climate is covered in the 7th grade (scale 3, sub-thematic 1.2: Processes and natural phenomena on Earth, 54 lesson hours) and the 10th grade (scale 5, sub-thematic 1.3: The atmosphere, 15 lesson hours). This segment of the curriculum constitutes the focus of the study.

A noted limitation of this research is the identification of sporadic knowledge about weather and climate that appears in specific geography lessons throughout the curriculum. These programs aim to achieve learning outcomes related to the concepts of weather and climate, climate factors and their characteristics, and the manifestation of their spatial zonality, based on

horizontal zonality (geographical latitudes) and vertical zonality, throughout the competence-based learning.

Textbooks are essential didactic tools through which subject knowledge is transmitted and pedagogical frameworks are applied. When it comes to the implementation of new curricula, textbooks play a lead important role (Oelkers, 2008). From the view of teachers, textbooks are held to be more important than curricula (Oelkers, 2008), and serve as individual curriculum of the teacher in everyday school life (Vollstädt, et. al., 1999; Wiater, 2005; Kisser & Siegmund, 2018.). An important and interesting historical review on the research of textbooks was conducted by Norman Graves and Brendan Murphy, who argued that "despite the recent growth of access to multimedia and the Internet, the textbook remains the principal teaching resource used in the geography classroom" (Graves & Murphy, 2000).

According to Martinha, (2011) it is highlighted that "... it would be beneficial for researchers to alert and advise editors and authors of textbooks that their texts should contain more activities aimed at developing competencies in pupils and offer concrete examples of this approach to geographic education. Moreover, (in countries where available) governments that have commissions for textbook certification should also consider the recommendations from these kinds of textbook research. Finally, teachers should be trained and/or reminded of why it is important to choose and actively use textbooks that promote the development of competencies in their pupils".

Methodology

The methodology of this study begins with a comprehensive literature review on competence-based learning. The focus shifts to the competence-based learning approach in Albania's pre-university education, specifically within the context of geography. To explore how weather and climate topics are integrated into physical geography education, a *content analysis* (Widyastuti, et. al., 2024; Morote, & Hernández-Hernández, 2023; Sun, 2024) on weather and climate education issues was conducted to geography textbooks. This involved a detailed review of three geography textbooks approved by the Ministry of Education and Sports (MES) for grade VII and X, with particular attention to the topics on weather and climate.

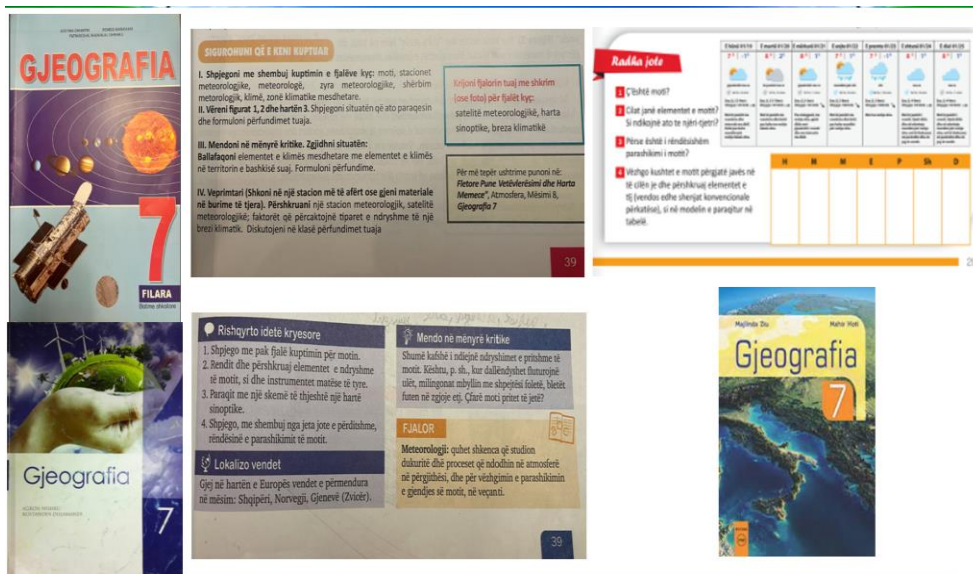


Figure 1. Geography textbooks for grade VII, Lower Secondary Education, included in the study. (Dhimitri, et al., 2018; Ziu & Hoti, 2022; Nishku & Dhjamandi, 2018)

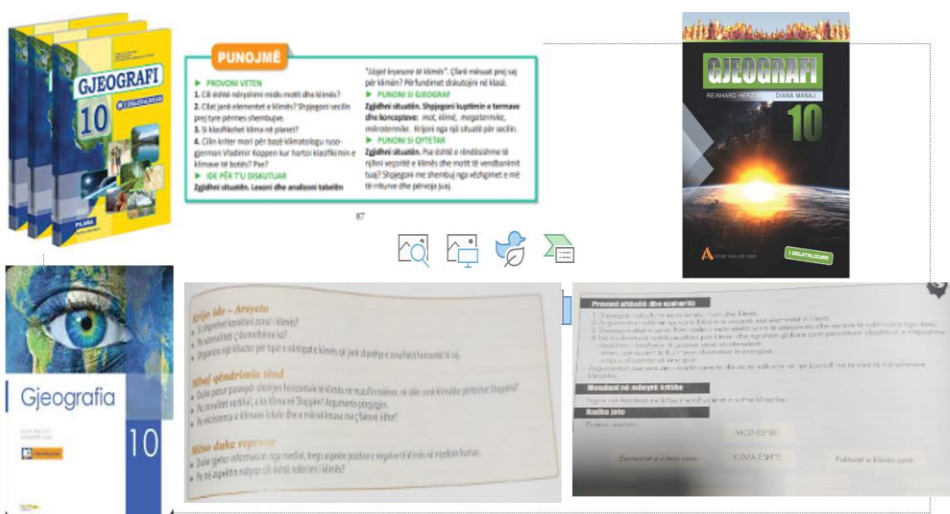


Figure 2. Geography textbooks for grade X, Upper Secondary Education, included in study (Herzig & Manaj, 2022; Kristo & Sala, 2022; Hanxhari, et al, 2022)

The study employed a competence-based learning approach to assess key and subject competences in geography only for these themes. It aimed to determine when and how competence-based learning is utilized to enhance geography knowledge, especially concerning weather and climate topics. The key competences and subject-specific skills were evaluated through textbook content analysis.

However, this study has certain limitations. It exclusively focused on new lessons related to weather and climate, omitting other typical lessons such as projects, practical work, and summaries, which could also be relevant to these themes and potentially impact students' learning outcomes.

Analysis and discussion

Based on the three geography textbooks and the intended learning outcomes for Geography 7 and Geography 10 programs, specifically regarding the topics of weather and climate, this research focused on the pedagogical framework, question and didactic activities. The aim was to understand what students have learned and what competencies have been applied.

To achieve this, all types of questions and didactic activities targeting these topics in the geography textbooks were analyzed. These were tabulated to identify the competencies they aimed to develop in students. The study did not focus on distinguishing between different textbooks but on highlighting the content focus and the targeted competencies (Table 2).

Table 2. Example of questions and didactic activities matrix prepared from three geography textbooks in Lower Secondary Education

Nr	Perforcimi i njohurive në tekst:	Kompetenca qytetare	Kompetenca e komunikimit dhe të shprehurit	Kompetenca e të menduarit	Kompetenca e të axënit	Kompetenca për jetën, sipërfaqen dhe mjedisin	Kompetenca personale	Kompetenca digjitale	Kompetenca Vezhimi dhe hetimi i dukurive gjeografike	Kompetenca Personimi i informacionit gjeografik	Kompetenca Matria e vendimeve mbi baza të informacionit të mbedhur
1	Shpjego me pak fjale kuptimin mbi motin. (M.A.9, Eq 39)		x		x					x	
2	Rendit dhe përshkruaj elementet e ndryshme të motit dhe instrumentat matës. (M.A.9, Eq 39)		x		x				x	x	
3	Paragjit me një skemë të thjeshtë një hartë simpatike (M.A.9, Eq 39)		x	x			x	x	x	x	x
4	Shpjego me shembuj nga jeta e përditshme, rëndësia e parashikimit të motit. (M.A.9, Eq 39)	x	x	x	x	x	x	x	x	x	x
5	Shkruaj lehtësisht ndryshimet e prishme të motit, dallendryshet futurore në jetë, bletët, futen në zënie etj. Çfarë moti pritet të jetë? (M.A.9, Eq 39)			x	x		x		x	x	x
6	Shpjego kuptimin për klimën dhe rëndësia e saj në Tokë (M.A.10, Eq 41)	x		x	x	x	x		x	x	x
7	Përshkruaj me shembuj faktorët e formimit të klimës së një vendi duke u ndalur tek o dhe lartësia mbi nivelin e detit (M.A.10, Eq 41)		x	x	x		x		x	x	x
8	Shpjego me skemë ndikimin e masave ajrore dhe lartësitë nga detin në klimën e vendeve (M.A.10, Eq 41)		x	x	x				x	x	X
9	Përse dhe si ndikon vëzhgimi i mjedisit për ndryshimin e	x	x	x	x	x	x		x	x	x

Source: Authors

The three geography textbooks in Lower Secondary Education contained 48 questions and didactic activities, which were correlated with the key and subject competencies they aimed to develop. The study showed that most subject competencies were fulfilled.

The most intended key competencies to be realized were learning competence (97%), thinking competence (75%), and expression and communication competence (72%). Meanwhile, less intended competencies were digital competence (10%) and civic competence (27%).

Table 3. Number of intended competences in questions or didactic activities, from geography textbooks in Lower Secondary Education.

Number of competence in a question	≤ 1	2	3	4	5	6	7	8	9	10
Number of questions in three textbooks	0	2	2	4	7	11	6	5	8	2
% of questions in three textbooks	0 %	4 %	4 %	8 %	14.5 %	23 %	12.5 %	12.5 %	17 %	4 %

Source: Authors

Regarding the competences targeted at text questions and didactic activities, the results are presented in table 3. The findings indicate that 2 questions aimed at 2 competencies (4%). Dominant questions are those challenging learners with more than 5-7 competencies, encompassing knowledge, skills, and values, amounting to 50% of the questions. Questions targeting the maximum number of competencies aimed at 6 competencies (11 questions or 23% of the total observed questions) and 8 competencies (8 questions or 17% of the total observed questions).

Based on the content, some questions targeting high-level knowledge, skills, and values include:

- Describe how the weather is presented in Northern, Eastern, Southern, and Western Albania based on the synoptic map (M2.5, page 29) - 6 competencies (3 scale).
- Monitor the weekly weather patterns in your location and detail its elements using conventional symbols, following the model outlined in the table (M2.5, page 29) - 8 competencies (4 scale).
- Why is weather prediction important (M2.5, page 29) - 8 competencies (4 and higher scale)
- Activity: Conduct research on the utilization of solar panels in Albania and articulate your findings (M9, page 41) - 10 competencies (4 and higher scale).
- Explore how climate change impacts global warming through the provided website link (M2.8, page 41) - 9 competencies (4 and higher scale).

Based on content, some questions targeting low-level knowledge, skills, and values are:

- What is the percentage of CO₂ in the atmosphere? (M2.8, page 41) - 2 competencies (1 scale)
- What is climate? (M2.6, page 37) - 4 competencies (1 scale)
- List the main factors contributing to the formation of climate on Earth (M A.11, page 43) - 4 competencies (2 scale)
- Describe the characteristics of equatorial, tropical, and desert climates (M A.11, page 43) – 4 competencies (3 scale)

In the Upper Secondary geography textbooks, findings revealed a total of 38 observed questions and didactic activities related to weather and climate topics. The findings indicated that nearly all subject competencies were achieved. The primary intended key competencies to be achieved were learning competences (84%), thinking competences (94.7%), and expression and communication competences (24%). However, fewer competencies were intended for personal (21%) and civic competences (23.7%).

Table 4. Number of intended competencies in questions or didactic activities, from geography textbooks in Upper Secondary Education.

Number of competences in a question	<u>≤1</u>	2	3	4	5	6	7	8	9	10
Number of questions in three textbooks	0	1	2	7	9	7	3	1	1	5
% of questions in three textbooks	0 %	2 %	5 %	18.4 %	23.7 %	18.4 %	7.9 %	2 %	2 %	13.2 %

Source: Authors

Regarding the competencies targeted in questions from three geography textbooks, the results are presented in Table 4. (2 questions with 2 competencies out of 38 total questions and didactic activities (4%). There are

prevalent questions and didactic activities designed to challenge learners with more than 4-6 and up to 10 competencies: knowledge, skills, and values, constituting 60.5% of the questions. Questions aiming for the maximum number of competencies target 5 competencies (9 questions, 23.7% of the total observed questions) and 4-6 competencies (7 questions, 18.4% of the total observed questions).

Based on content, some questions targeting high-level knowledge, skills, and values are:

- Formulate a hypothesis regarding nowadays climate changes (M8, page 64) - 10 competencies (4 and up scale)
- Classify factors influencing climate formation into clusters, explaining the impact of each (M 3.12, page 76 Ideart) - 7 competencies (4 and up scale)
- Using media sources, analyze the positive and negative impacts of climate on the human environment (M 3.13, page 79 Ideart) - 10 competencies (4 and up scale)
- Why is it important to understand the characteristics of the climate and weather in your place of residence? Support your explanation with examples from adult observations and your own experiences (M 11, page 87) - 10 competencies (4 and up scale)
- Based on content, some questions targeting low-level knowledge, skills, and values are:
 - Considering the horizontal extension of climate on the Earth's surface, in which climatic zone is Albania located? - 3 competencies (3 scale)
 - Complete the diagram (M8, page 64) - 2 competencies (2 scale)
 - How does the geographical position of Albania influence its climate, and in what aspects? (M 3.12, page 76 Ideart) - 4 competencies (3-4 scale)
 - What are the differences between maritime and continental climates? (M 3.12, page 76 Ideart) - 4 competencies (2 scale)

Conclusions

The education reform, of competence-based learning, was initiated in 2014 and according to Salijanji (2017), can be said to constitute a revolution in the education of students. It lives the transition from curriculum aimed at teaching and learning of subject content, in a curriculum that creates conditions and supports the development of the competencies. The study showed that weather and climate issues are well addressed in geography textbooks at both Lower Secondary (LS) and Upper Secondary (US) levels. They are primarily

expressed through 2-4 thematic units. Specifically, 48 questions and didactic activities were identified in LS, while 38 such questions and didactic activities were evident in US. These activities vary widely in the competencies they target, with LS predominated by questions attempting to cover 5-7 competencies (50% of total questions), while in US, questions aiming for 4-6 and up to 10 competencies dominate with 60.5% of total questions.

Regarding the content of questions and didactic activities, as well as the learning outcomes of geography curricula in Grades VII and X, it is generally observed that they are fulfilled regardless of the competencies they aim for. However, the study recommends:

- Provide additional training or resources for educators to effectively integrate digital and civic competencies (LS) and personal and civic competences (US) into lesson teaching and learning process, while emphasizing climate and weather understanding.
- Encourage interdisciplinary collaboration among educators to incorporate diverse competencies, including those related to climate and weather, into teaching materials and assessments.
- Regularly assess and adjust teaching strategies to address any gaps in competence-based learning, with a specific focus on climate and weather concepts, ensuring comprehensive student learning.
- Emphasize the importance of critical thinking and expression in classroom discussions and assignments to strengthen expression and communication competencies, with a focus on climate and weather-related topics.
- Integrate more hands-on activities or real-world applications to deepen students' understanding of key competencies, particularly those related to climate and weather.
- Provide additional support for students to develop higher-order thinking skills, such as analysis and synthesis, to enhance learning outcomes in all competency areas, with specific attention to climate and weather understanding.

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