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Geographical and geospatial competences from school education to higher education: the contribution of international journals and EUROGEO in the international projects

Rafael de Miguel González[a]
[a] President of EUROGEO, the European Association of Geographers
Email: rafaelmg@unizar.es

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Abstract

The World is changing in such a rapid way and a more complex society makes geographical education essential for global understanding in a sustainable Earth's future. Besides this, Europe must face its own geopolitical, economic, social and environmental challenges, but geography is placed in the center of the knowledge, skills and values that 21st century European citizens must acquire through a process of lifelong learning in order to reinforce democracy, human rights and European values. In a world of rivalry between the United States and China, the emergence of the Middle East, the increase of fragmenting and disrupting populism, fast news and social media, or the unequal engagement to climate change mitigation or Sustainable Development Goals achievement, geographical competences must be part of the core competences for any literate, educated and informed person. Citizens across the world must be able to understand and interact with the physical and human environment, from global to national to local scale. Thus, international geography education – mainly by means of the international projects like the ones EUROGEO runs – contribute decisively to expanding the picture and to thinking bigger through the exchanges of national curriculum cultures, best experiences and cooperation in order to enhance geography education itself, from school education to higher education.

Keywords: Competences, Digital Education, EUROGEO, Geographical Education

1. The European tradition for geographical education

We live in a time for geography and geographers. And we also live in a time for celebrating some geographical milestones. In 2019 EUROGEO celebrated its 40th anniversary. In 2020 geographers remembered the bicentennial of the foundation of the first Chair of Geography at the University of Berlin. 2021 is the bicentennial of the first geographical society ever (*Societé de Geographie de Paris*), but also the ten years of

this international journal of the Italian Association of Geography Teachers J-READING. But 2022 is going to be a very special year because geographers worldwide celebrate the centennial of the establishment of the International Geographical Union. From the very beginning, European geographical societies have led international collaboration in geographical research, and particularly two out of twenty-two IGU founding delegates in the 1922 Brussels meeting – Odón de Buen, from Spain; Emmanuel de Martonne from France – usually advocated for geography education (De Miguel and Donert, in press).

Geography is usually known as a school subject and field in the sciences that study the Earth's surface, the spaces and places where relationships between people and environment happen. Geography explores the interactions between physical environment and human societies producing landscapes, distributions, impacts, and spatial patterns from the local and regional to the national and global scale. Geography is the science of "where," and guides the inquiry process to acquire knowledge about how and why place, space, and environment matter. Geography contributes to raising awareness about the human and cultural diversity on the Earth. Geography studies locations, but also how these develop and change over time. Geography is a scientific discipline that deals with the teaching and learning of the processes of spatial organization of human societies. And Geography is able to face the complexity and diversity of processes, systems, and interconnections between human and natural environments by developing analytical thinking (data, visualization), critical thinking (judgment, assessment) and lateral thinking (creative, problem-solving).

This tradition of geography is particularly evident in European countries, despite some differences in national school curricula, teacher training, professional development, inquiry-based learning pedagogies or the use of geospatial technologies in the classroom. Furthermore, in some countries geography is taught with history and civic education, like in the French, Spanish or Italian school education systems. Moreover, in higher education geography approaches the social sciences or natural sciences, according to different countries or even University Departments. One way or another, European geographers have decisively contributed for decades to the advancement of geographical education, as expressed in this same journal J-READING (Droogleever, Kovács et al., 2020; Droogleever, Gavinelli and Puttilli, 2020, Ottens, 2013; Van der Schee, 2014), or in previous EUGEO initiative (Vandermotten, 2004), or in EUROGEO publications (De Miguel and Donert, 2014; De Miguel, Koutsopoulos and Donert, 2019; De Miguel, 2017, 2019; Donert and Wall, 2008; Donert, Charnzynski and Podgorski, 2007; Donert and Charnzynski, 2005; Donert, 2005, Donert, 2009, Donert, 2010), or as members of the Commission on Geographical Education of the International Geographical Union (De Miguel, 2021), or even in the *Rome Declaration on Geographical Education in Europe* (2013) signed by AAIG, IGU, IGU-CGE, EUROGEO, and EUGEO.

2. Key competences for lifelong learning

In a complementary way to national policies on education, the European Commission and the European Member States have agreed on the implementation of the *European Education Area* to a large extent, comprising school education, vocational training, higher education and adult education. The European Education Area seeks to foster cooperation between the European Union Member States to further enrich the quality and inclusiveness of national education and training systems. It aims to develop a holistic approach to EU action in education and training in order to create a genuine European space of learning, which benefits all learners, teachers and institutions, based on six dimensions: quality, inclusion, green and digital transitions, teachers and trainers, higher education and the geopolitical dimension of European education.

Europe plays an important role in the global context, and in particular in the European Union as the biggest transnational institution. Two of the main challenges of the European Union to become a one and only voice in the world – as are the United States, China or Russia – is the political cohesion among the Member States and the reinforcement of European citizenship. For this, the European Commission has defined six

top priorities for the 2019-2024 period, a stronger Europe in the world, a push for European democracy and citizenship, a European Green Deal, an economy that works for people, an action for the digital age and the protection of the European way of life. Education is attached to all six priorities as one key transversal factor for reinforcing European citizenship and cooperation. At this point, geography education can play an increasingly important role in enabling spatial analysis and spatial citizenship, empowering governments, companies, individuals and stakeholders to decision making about European challenges from the local to global scale issues.

Nevertheless, geography is not well considered in the several instruments and references of the European Education Area, and particularly in the *Council Recommendation on Key Competences for Lifelong Learning*. In its first version (2006), geography was not explicitly included, but spatial thinking was in mathematical competence and basic competences in science and technology. Essential knowledge, skills and attitudes conforming social and civic competences were related with usual geographical contents in geographical education, like environment, or the multi-cultural and socio-economic dimensions of European societies. In the new version of the Recommendation (2018), spatial thinking reference has disappeared, but competence in science, technology and engineering involves an understanding of the changes caused by human activity and responsibility as an individual citizen, but also an attitude concerning sustainable development and global issues. Citizenship competence demands skills to engage effectively with others in the common or public interest, including the sustainable development of society, in particular climate and demographic change at the global level and their underlying causes, as well as decision-making at all levels, from local and national to the European and international level.

This recommendation on key competences has strong connections with Gardner's theory on multiple intelligences (Table 1), where instrumental school subjects like languages and mathematics are usually more relevant than others in terms of teaching hours per week, or better valued by pupils and parents.

In this context, geography (and spatial thinking) has not been considered very well by the European recommendation, which has been very influential in many national curricula of school education, particularly at secondary school level, despite two indisputable facts:

- Geography is the most interdisciplinary subject in school, allowing students to learn physical and social environment vocabulary, processing meaningful statistics, implement scientific methods, acquire personal and social (territorial) identity and citizenship, develop cultural awareness from natural and human landscapes, etc. Consequently, geography is the best subject to promote sustainable development (goals) education from a comprehensive approach: economic, social and environmental.
- Geography is probably the subject where the technologies (in particular geospatial technologies, GIS, digital Atlases, remote sensing, geolocation-based mobile apps...) have had a greater impact on innovative learning and educational benefits (Kerski, 2021): instructional resources, pedagogies, inquiry and problem-based learning, etc.

Despite these disarrangements between competences, intelligences and subjects, or despite geography being a subject that does not have an international standard for the purpose of measuring learning, as PISA and TIMMS do not include geography assessment (Chang et al., 2019), geography is still a compulsory subject in school education. So, EUROGEO geography educators have defined, experimented and agreed on (De Miguel and De Lázaro, 2020) three key geographical competences (in the European meaning of combination of knowledge, skills and attitudes), as later described in the projects section: spatial thinking, geographical knowledge, spatial citizenship, but disaggregated into seven cognitive domains (De Miguel, 2018) (Table 2).

EU Key Competences	Multiple intelligences	School subjects
Literacy competence	Linguistic-verbal	Mother language
Multilingual competence	Linguistic-verbal	Foreign language
Mathematical competence and competence in science, technology and engineering	Logical-mathematical Naturalistic	Mathematics Science Technology
Digital competence		ICT Computing
Personal, social and learning to learn competence	Intrapersonal	
Citizenship competence	Interpersonal	Civic education, History, Geography
Entrepreneurship competence		Economy
Cultural awareness and expression competence	Musical Bodily-Kinesthetic Visual	Music Arts Physical Education
	Spatial	Geography

Table 1. Connection between competences, intelligences and subjects. Source: Authors' elaboration.

1. SPATIAL THINKING I. LOCATE Orientation, location, projections, scales
2. SPATIAL THINKING II. PROCESS Obtaining, processing geographical information (quanti/qualitative), fieldwork, Geospatial technologies
3. SPATIAL THINKING I. REPRESENT Spatial visualization: text, figures, statistical, cartographical
4. GEOGRAPHICAL THINKING AND UNDERSTANDING I. DESCRIBE Spatial description, geographical patterns and structures in the territory
5. GEOGRAPHICAL THINKING AND UNDERSTANDING II. EXPLAIN Physical and human systems. Human-environment interactions Social and economic processes. Geographical organization and settlements
6. SPATIAL CITIZENSHIP I. INTERPRET Critical thinking, global understanding, spatial imbalances, social justice
7. SPATIAL CITIZENSHIP I. ACT Intervention, engagement, youth empowerment, social participation, SDGs

Table 2. Key geographical competences. Source: Authors' elaboration.

3. New frameworks for post-Covid and sustainable development challenges in European education

Particularly in the light of the Covid-19 pandemic, it is essential to prevent structural barriers to learning and skills development from impacting citizens' employment prospects and participation in society. The European Education Area, therefore, ties in with Next Generation EU, the EU's Covid-19 recovery plan to lead the Union out of the crisis and towards a modern and more sustainable Europe fit to face the digital and green transitions. One more time, geography is the subject able to provide better solutions to integrate digital and green approaches in education, especially relevant in the post-Covid and climate change context. The extension of the pandemic has not only changed our lives, but also regular attendance to classes in school and higher education.

While education institutions before the pandemic unequally developed distance and blended

learning, in 2020 it has become the normal teaching and learning basis everywhere, as well as working from home. Suddenly, social and spatial distances were the rule of our daily lives. Virtual life and confinement reinforced digital education, but also Covid-19 mapping, web-based maps and dashboards like Johns Hopkins University Covid-19 provided by Esri, contributed to the dissemination of a new "geospatial infodemic". Therefore, place, space, environment –the key concepts in any geographical curriculum – matter more than ever. The power of information is overall spatial: the figures and rates of people infected by Covid-19 matter, but even more where the countries or regions of increasing or decreasing rates are, what the spatial patterns of infection are, where the countries are listed in red and amber lights, what the impact is on global transportation or tourism and global trade by aircraft or ship cargo, etc.

UNESCO has estimated that more than 1.5 billion learners were affected by school closures, more than 90% of the world, in more than 190 countries. The impact of Covid-19 on education will be one of the defining features of a whole generation of children who have faced many difficulties in the digital transition. Educators must understand the value of technology and the impact on learning that can come from putting this into teachers' hands and the hands of each student equally, in order to reduce the digital divide (Edge, 2020). The impact of this crisis on schools has brought into sharp focus the importance of access to digital technology and connectivity to support all young people's learning.

Teaching and learning geography in pandemic and post-pandemic time has its own particularities (Chang, 2020), but it is clear that geospatial technologies, online maps, virtual globe viewers have been useful instructional resources for distance learning, for involving inquiry-based practices or for obtaining powerful disciplinary geographical knowledge.

In this context, building digital capabilities for new digital teachers' leadership based on ICT proficiency is essential to thrive in a digital environment. In geography education it implies many aspects: teacher training, curriculum approaches, pedagogies, instructional resources, raising of spatial awareness, sustainable development goals, geospatial technologies and contextualized knowledge for local and global understanding. Besides this, it is important to define frameworks that exceed a comprehensive approach like Technological-Pedagogical-Content Knowledge (TPACK) or like its modified GIS version (Rickles et al., 2017), but a competence-based framework.

The European Commission's *European Digital Competence Framework for Citizens* (Carretero et al., 2017), also known as DigComp 2.1, offers a tool to improve citizens' digital competence and presents eight proficiency levels for each one of the five competence areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving. DigComp 2.1. presents a wider and more detailed range of proficiency levels supporting the development of learning and training materials. It also helps in the design of instruments for assessing the development of citizens' competence, career guidance and promotion at work, according to the principle of lifelong learning. Just as Recommendation Key Competences does, DigComp 2.1. contains knowledge, skills and attitudes (Dimension 4), described in one single descriptor for each level of each competence. DigComp 2.1. does not quote geography, but the first competence deals with browsing, searching and evaluating data and digital databases like socio-economic statistics as usual classroom resources for learning human geography.

Moreover, a *European Framework for the Digital Competence of Educators*, known as DigCompEdu (Redecker, 2017) complements DigComp 2.1. in order to provide a broader and more sophisticated set of competences, due to the duty to help students become digitally competent, which requires educators to develop their own digital competence. DigCompEdu defines a progression model to help educators understand their personal strengths and weaknesses, by describing different stages or levels of digital competence development. For ease of reference, these competence stages are linked to the six proficiency levels used by the Common European Framework of Reference for Languages (CEFR), ranging from A1 (newcomer) to C2 (pioneer), and referred to the six competences (Figure 1).

4. EUROGEO contribution: the international projects

All these new frameworks from the European Commission are very useful to support innovative approaches in education, to implement processes of recognition and validation of competences, to use new ICT-based teaching methodologies, and to promote international collaboration for the exchange and dissemination of good practices. The experimentation of these principles in geography education has been put in practice through the European Union funded projects run by EUROGEO, where also other horizontal priorities for the European Commission have been taken into account: acquisition of key competences, employability, personal development, participation in civic and social life, social inclusion, and particularly digital learning and the use of geospatial technologies, environmental issues and European citizenship.

EUROGEO's initial projects like HERODOT (2003-2009) promoted the transition to the European Higher Education Area, but later our scope was open to developing projects in any category of lifelong learning, but especially school education. Thus, EUROGEO has deployed a comprehensive program of research, development, awareness and networking set of projects (42 in total, so far, which can be consulted in detail at https://www.eurogeography.eu/projects/) focused on the different levels of geographical education:

- Geography higher education: HERODOT, MYGEO, GEOLAND...
- Geography school education: SPACIT, I-GUESS, DIGITAL-EARTH.EU, SCHOOL ON THE CLOUD, GI-LEARNER, GI-PEDAGOGY, D3, GEOCAPABILITIES, EVALUE, BIOMAPS, GEODEM...
- Geography for employability, vocational training, adult education, non-formal education: GEOSKILLS+, YOUTHMETRE, GO-DIGITAL, SEED...

EUROGEO has defined and developed research practices, and promoted six key cutting-edge concepts in geographical education, through these projects:

- International and European education: EURO.GEO, HERODOT, GEODEM, EVALUE.
- Digital education and geospatial education: iGuess, digital-earth.eu, i-USE, My Story Map, School on the cloud, L-Cloud, D3, Go-Digital, BioMaps, Human, MYGEO.
- Spatial thinking: GI-Learner, GI Pedagogy.
- Geocapabilities: Geocapabilites 1, 2 &3, EAT.
- Spatial citizenship, empowerment: SPACIT, YouthMetre,
- Geographical education for sustainable development: SeaChange, SEED, Ride&Smile, Onlife, Geoland, Smart Village, Teaching the Future.

Regarding the audience of this J-READING Journal, some selected projects are described below for a better understanding of the EUROGEO contribution to the definition and implementation of geographical and geospatial competences:

- *Digital-Earth.eu* promoted innovation and best practices in the implementation and use of geo-media as a digital learning environment for school learning and teaching. The project encouraged the sharing of innovative practices and published guidance for curriculum and training. One of the most important outcomes of this project was the creation of a network of sixteen digital-earth.eu Centres of Excellence in sixteen different European countries.
- *Spatial Citizenship* (SPACIT) has defined the competences necessary for every citizen to fully participate in society, as a spatially literate person should be able to critically reflect on spatial representations, communicate with the aid of maps and other geospatial representations.
- *Geo Skills Plus* was a project aiming to match the labor market needs in European countries with geospatial qualifications and education offers.
- *GeoCapabilities* aims to help teachers establish what is powerful geographical knowledge to develop it as curriculum leaders who can apply powerful pedagogies in the classroom and support other geography teachers in similar contexts in their countries to use GeoCapabilities to enhance their geography teaching.
- *GI-Learner, Developing a learning line on GIScience in education*, developed a geospa-

tial thinking learning line and teaching resources for secondary schools, so that the integration of geospatial thinking can take place.
- *YouthMetre*, has established an innovative geospatial data tool, to support the engagement of young people in developing relevant youth initiatives, using e-participation as an instrument to foster young people's empowerment and active participation in democratic life.
- *MYGEO, Geotools for modernization and youth employment* has defined transversal and geospatial competences (GIS) to train young people to foster employability.
- D3, *Developing Digital Data literacy* relates to the need for digital literacy to acquire digital citizenship, replicating DiComp 2.1. and DigCompEdu in geography secondary education.

Last but not least, the GEODEM project, *Geography, democracy, European citizenship and the digital age*, a Jean Monnet Award, is a summary of all these efforts to raise geography to a higher level as a school subject, scientific discipline, and as basic knowledge of geospatial technologies. Geography must be taken into consideration for the implementation of the *European Education Area* and for the enhancement and cohesion of European geographical education research, innovation, good practices and dissemination, guided by five principles (the five Es):

- Employability;
- Enhancing personal development and social inclusion;
- Empowering young people though participation;
- Enabling for digital skills;
- Engagement with democracy and European citizenship.

5. Conclusions: a road map for geographical competences in education

Geography is an old scientific discipline and a traditional school subject with an established body of knowledge, but it faces the challenges of a changing world, a technological revolution and the teaching of rapid political, economic, social and cultural transformations that have an impact on the space, countries and regions of the world. Some of this body of knowledge and the means to teach it will remain invariant, as we have known in previous decades, as a common legacy and heritage of geography educators. But geographical education, and particularly European geographical education, is committed to innovation and practices responding to the 21st century.

An international roadmap on geographic education would be advisable, focusing on the two most important aspects of our mission: curriculum and evaluation, in the three aforementioned dimensions: geographical knowledge, geographical skills and geographical practices (objectives, so much better than subjective geographical values, impossible to evaluate in students). In this way a shared framework would be available to geography educators worldwide to teach geography (Chang et al., 2019) and to assess cognitive domains (Solem et al., 2018) related to know, apply and reason and to the acquisition of spatial thinking, geographical thinking and spatial citizenship by the students, in order to develop analytical, critical and lateral thinking and to improve geography achievement results (Table 3).

The constant evolution of contemporary societies, their needs and their impact on the planet earth and the natural and human landscape, the growing human interactions with the environment, the challenge of global sustainability, etc., are reasons leading the drive towards a greater and more complex geographic education, also involved in geoethics. In the 21st century we need to teach more and better geography, so an international framework for curriculum and assessment is vital. Other aspects of geographic education are no less important: instructional materials, geospatial technologies, pedagogies, teaching and learning strategies, fieldwork, teacher training and professional development... For this reason, the European contribution of geographic competences is comprehensive, encompassing all approaches and all cycles of lifelong learning, making geography meaningful for people's lives. The experimentation of geographic competences through innovation and research projects, such as those carried out by EUROGEO, must provide us with empirical evidence to confirm that this roadmap leads to the appropriate action for the improvement of geography teaching, and of education in a broad sense.

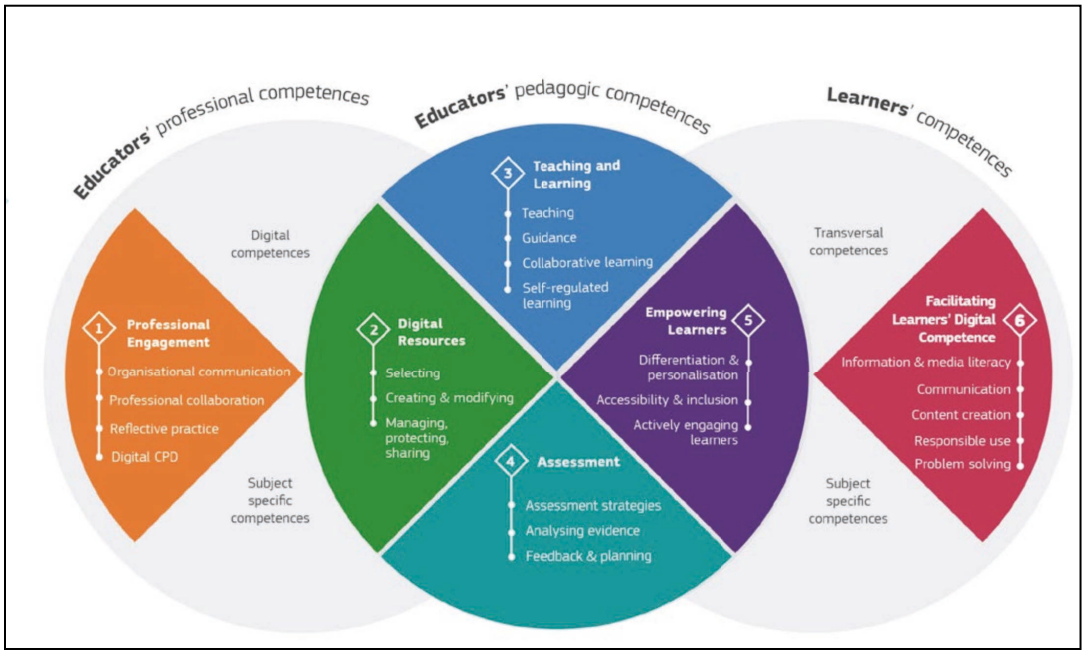

Figure 1. Synthesis of the DigCompEdu framework. Source: DigCompEdu (Redecker, 2017).

geographical knowledge	⟷ knowing/reasoning	⟷ geographical thinking/knowledge	⟷ critical thinking
geographical skills	⟷ applying	⟷ spatial thinking	⟷ analytical thinking
geographical practices	⟷ practicing	⟷ spatial citizenship	⟷ lateral thinking

Table 3. Integrated framework of geographical competences for curriculum and assessment. Source: Authors' elaboration.

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