Empowering Youth through Open Data: Map-Based Storytelling of Croatian vs. European Youth

Andrea Miletić [1], Ana Kuveždić Divjak [1]

[1] University of Zagreb Faculty of Geodesy, Kačićeva 26, Zagreb, Croatia
(andrea.miletic@geof.unizg.hr, ana.kuvezdic.divjak@geof.unizg.hr)

Key words: Open data, Open government data, Open data engagement, Data literacy, Data visualization, Map-based storytelling.

Abstract:

In the digital age, open data has become a critical asset for fostering transparency, accountability, and civic engagement. However, the widespread availability of data has outpaced citizens' ability to effectively utilize it, underscoring the need for data literacy skills, especially among youth. This paper addresses the gap in data literacy by proposing an innovative teaching approach that leverages map-based storytelling to engage young people and enhance their data literacy. By integrating real-world open datasets into interactive visual narratives, this approach aims to captivate young audiences, develop critical thinking skills, and foster a deeper understanding of socio-economic issues. Through a case study of a Datathon project titled “Croatian Youth vs. EU: Who has it better?”, this research demonstrates the efficacy of combining data visualization and storytelling to promote data literacy and civic engagement. The findings highlight the potential of open data initiatives and open-source technologies in empowering youth and enhancing their participation in open government initiatives and policy-making processes.

1. Introduction

In the digital age, where large amounts of information and technology have become accessible to many people, data is proving to be the critical asset that enables informed decision-making and innovation, improves work efficiency, enables better understanding, etc. Thanks to open data initiatives and open-source technologies, data has become widely accessible and available free of charge to citizens. However, the widespread accessibility of data has outpaced citizens' ability to effectively utilize it, highlighting the critical need for data literacy skills. This research addresses the gap in data literacy among youth and aims to foster their engagement through innovative teaching methods and open data initiatives.

Open data and open technologies can significantly contribute to greater government transparency and accountability, improve the quality and efficiency of public services, benefit the economy, increase citizen participation and engagement, and improve data literacy by enabling individuals to explore, analyse and interpret different datasets. Engagement with open data facilitates the development of critical thinking, analytical and problem-solving skills that are essential for data literacy.

Visualisation techniques such as map-based visualisation and data-driven storytelling offer promising ways to improve data literacy and promote the reuse of open data. Boham (2015) highlights the potential of data visualisations to promote civic engagement. Through visualization, complex datasets can be presented in a way that is easily understandable and accessible to citizens, making it easier to identify patterns, raise awareness, inspire action and promote impact on important social issues. While the use of visualizations can contribute to a better understanding of the data, the use of a meaningful narrative can help make the data more engaging. Map-based storytelling can therefore be a highly effective tool to engage citizens and promote data literacy among young audiences.

The main goal of this paper is to propose an innovative teaching approach that utilizes map-based storytelling to enhance data literacy skills and engage youth. By integrating real-world open datasets into interactive visual narratives, we aim to captivate young audiences, develop critical thinking skills, and foster a deeper understanding of socio-economic issues.

In line with the goals of the ISPRS Technical Commission V 'Education and Outreach', which focuses on strategies in the areas of education and engagement, this research seeks to: (1) propose a novel approach to teaching data literacy focusing on engaging youth through map-based storytelling; (2) highlight the importance of open data initiatives in fostering transparency, accountability, and civic participation and (3) explore the potential impact of data literacy on youth engagement in open government initiatives and policy-making processes.

With this approach, we aim to help maintain the relevance, effectiveness and adaptability of geospatial technologies in education. By empowering youth to effectively navigate and utilize these technologies, we seek to promote their active participation in open government initiatives, policy-making processes, and social advocacy.

2. Background

This section explores the development and impact of Open Government Data (OGD) initiatives, focusing on their role in promoting transparency, accountability, and citizen engagement. It highlights the importance of open data for youth empowerment, the necessity of data literacy for effective reuse of these resources, and innovative educational approaches such as data visualization and map-based storytelling to enhance data literacy among young people.

2.1 Open Government Data Initiatives

In recent years, there have been many open data initiatives and policies representing governments and organizations' efforts to make data available to the public in formats that can be freely used, modified, and shared by anyone and for any purpose. Even though the origins and development of open data initiatives are documented before, the 2009 Obama memorandum and launch of Data.gov, a centralized platform for US government data, has played a significant part in accelerating the open data movement (Hossain et al, 2016). The Obama memorandum was a pivotal moment that greatly boosted the open data movement worldwide. It has set an example and encouraged other countries to follow suit by opening up government data to promote data transparency and accessibility. Following United States example, United Kingdom also launched its own data portal data.gov.uk in 2010 (Simpson, 2011), providing a wide range of datasets from various public authorities.

In the European Union (EU), the aim of making data more available has begun even earlier, in 2003, with the Public Sector Information (PSI) Directive, which aimed to facilitate the reuse of public sector information across member states. The PSI Directive, that was later revised in 2013, set the legal framework for opening of public sector data in all EU Member States. The rules that were originally set in 2003 PSI Directive, and later in 2013, no longer keep up with rapid increase of public data and technological evolution. Also, the PSI Directive was mainly focused on the economic aspects of the re-use of information rather than on citizens' access to information (URL1). In order to adapt to ever changing technological and social needs, achieve greater openness and maximize the benefits of open data, the PSI Directive was replaced with the 2019 Open data directive. The 2019 Open Data Directive extended the scope of the PSI Directive, by promoting the use of machine-readable formats, emphasizing the importance of providing access to dynamic data (real-time data) through application programming interfaces (APIs), introducing categories of high value datasets that have the potential to generate economic and social benefits etc. All EU member states were obligated to implement the Open Data Directive to their into their national law. Overall, the goal of the new Directive is to create a more dynamic and transparent open data ecosystem that will result in improved public services and enhanced citizen participation and engagement across the European Union.

2.2 Open Data for Youth Empowerment and Participation

The evolution of open data initiatives has shown that government agencies, both nationally and regionally, recognize open data as a strategy to improve transparency, accountability and economic development. Consequently, a large amount of open data is now available to all interested citizens to use it freely.

Open data not only improves public access to various datasets, but also enables dynamic collaboration between government and citizens (Ruijer et al., 2024), benefiting both sides. For example, citizens can better understand the local problems of their community and propose solutions that meet their needs. Governments can use citizens' insights and feedback to tailor policies to the needs of the community, increasing public trust and accountability of government institutions. This citizen participation i.e., citizen involvement in the decision-making process, is seen as one of the key pillars of open government (Kempeneer and Johan, 2023).

However, to maximize the benefits of open government, it is important to ensure that these initiatives are inclusive and engage all parts of society. The ultimate aim of Open Government is to transcend transparency and accountability, empowering citizens by providing data in a meaningful context (Szukalski, 2016). Citizen engagement goes beyond citizen participation, encompassing active involvement of citizens in using and interpreting open data, which can provide new insights for addressing social issues (Susha et al., 2015). Efforts in open government initiatives should, however, particularly target important and underrepresented groups in society, with young people at the centre of these initiatives. Active and engaged youth participating in open government initiatives can have a positive impact on overall economic and social development. They can provide governments with new ideas and solutions and ensure that new policies consider the needs and concerns of youth (OECD, 2018).

Although governments around the world have shown great interest and provided policies to facilitate the discovery and use of open data by making it available on open government data portals, the practical application of open data has not lived up to expectations (Welle Donker & van Loenen, 2017), nor has citizen participation (Kempeneer and Johan, 2023). This shortfall is largely due to the low data literacy among citizens (Montes et al., 2019). Given the potential of open data to drive positive social impact and civic engagement, nurturing data literacy skills among young people becomes imperative.

2.3 Data Literacy and its Impact on the use of Open data

As data has become a strategic asset for individuals, the economy and society in general, the development of data literacy skills for the effective use of this data has become imperative (Cagri, 2024). McAuley et al. (2014) have defined data literacy as “the ability to identify, retrieve, evaluate and use information to both ask and answer meaning question”. Another definition of data literacy, that was synthetized by Ridsdale et al. (2015), describes data literacy as “the ability to collect, manage, evaluate, and apply data, in a critical manner.” Although there are a variety of other definitions of data literacy, researchers argue that data literacy is an essential skill to have in the 21st century to build knowledge (McDowell et al, 2024) and ultimately unlock the true potential of data. Individuals that have strong data literacy skills are those who can draw valuable conclusion from data through critical thinking.

As these definitions suggest, data literacy is not just one component, but encompasses a wide range of skills such as data acquisition, calculation, analysis and interpretation, communication, etc. (Ologbosere, 2023). In examining the research literature on data literacy, Wolf et al. (2016) categorized four types of data-literate citizens based on the roles they take in using data to solve real-world problems: (1) readers, (2) communicators, (3) makers and (4) scientists. They argue that the complexity of data skills required in each category increases from the role of reader to the role of scientist. Readers need the skills to interpret data, communicators need to make sense of data and tell stories, makers need data literacy skills to integrate data into strategies to solve real-world problems, and scientists need strong technical and communication skills. However, citizens can expand their knowledge within each of these roles, so the skills required for each role will depend on the role itself and the goals of the individual. This means that citizens need a solid foundation of basic data skills and that each individual’s goals will determine what additional skills they need to learn.

An effective way to develop these different data literacy skills is through access to open data and open data technologies. Access to open data and open data technologies can significantly contribute to enhancing data literacy by providing individuals with opportunities to explore, analyse, and interpret different datasets. Engagement with open data facilitates the development of critical thinking, analytical, and problem-solving skills essential for data literacy.

Furthermore, the importance of data literacy goes beyond individual skills, it has profound implications for social engagement and the effective use of open data. Research (e.g. Santos Hermosa et al. (2023)) has shown the importance of data literacy for realising the potential of open data. A data literate society leads to greater reuse of open data and civic engagement as individuals possess the necessary skills to access and analyse the data. For example, when individuals can effectively analyse and interpret the data, they can access the data that is of interest to them, identify opportunities for improvement, make evidence-based recommendations and advocate for policy change.

2.4 Teaching Data Literacy Trough Data Visualization and Map-Based Storytelling

Given the crucial role that data literacy play, like the development of critical thinking skills and increased citizen engagement, it is important to focus on effective teaching methods that can foster these skills. These methods should be implemented in the curriculum, not only in higher education but also at lower levels. Teaching data literacy at different levels of education ensures that students develop a solid understanding of data from an early age that they can build on throughout their higher education.

One particularly effective approach of teaching data literacy is trough data visualizations, that enables complex datasets to be presented in a way that is easily understandable. Visualizations, such as graphs, charts, and maps, provide a clear and concise way to present data and make it easier for students to understand complex concepts. This visual approach is especially beneficial for students who may find traditional methods of data analysis challenging. Data visualizations can also help students to identify outliers in the data that may not be apparent in a text-only presentation.

Combining data visualisation with storytelling offer promising ways to improve data literacy and make data more engaging and memorable. While visualizations can enhance the understanding of the data, adding a meaningful narrative will make the data even more engaging and memorable. This process is not only about understanding the data, but also about effectively communicating its meaning through a compelling story (McDowell et al. 2024).

By integrating data visualizations and map-based storytelling into classroom and curricula, educators can significantly improve data literacy of their students and provide them with the skills necessary to effectively analyse and interpret data. Since data visualizations have also been shown to promote civic engagement (Boham, 2015), map-based storytelling can be seen also as an extremely effective tool for engaging citizens.

Recognizing the potential of utilizing map-based storytelling to enhance data literacy and create engagement among youth, we adopted this innovative teaching approach into our classroom. By incorporating real-world open datasets, we strive to engage young audiences, enhance their critical thinking skills, and promote a deeper comprehension of socio-economic issues.

In the following section, we provide a practical demonstration of our proposed approach through a case study of a Datathon project. This case study, titled “Croatian youth vs. EU: Who has it better?”, showcases a map-based storytelling solution created by our students and illustrates how theoretical concepts can be applied in real-world contexts to foster data literacy and civic engagement among young learners.

3. Empowering Data Literacy and Innovation: A Case Study from the Croatian Datathon

A Datathon is an event where participants, often including students, researchers, and professionals, come together to collaboratively explore and analyze datasets, typically from public or open data sources. The primary goal of a Datathon is to develop innovative solutions or insights based on the data provided, often within a limited timeframe, ranging from a few hours to several days.

These events are instrumental in promoting open data reuse by providing a structured platform for participants to:

Promote Open Data Utilization: Datathons encourage participants to leverage open datasets from public sector sources such as government agencies or international organizations. By focusing on these datasets, participants can create applications, visualizations, or analyses that demonstrate the potential of open data in addressing societal challenges or improving services.

Foster Collaboration and Innovation: Datathons foster collaboration among individuals with diverse expertise, such as data scientists, programmers, designers, and domain experts. This interdisciplinary collaboration often leads to innovative solutions that combine technical skills with domain knowledge, fostering creativity and problem-solving.

Enhance Data Literacy: Participants in Datathons gain practical experience in working with real-world datasets, enhancing their data literacy skills. They learn to clean, analyze, and visualize data effectively, which is crucial in today's data-driven world.

Engage Citizen Scientists: Datathons often invite members of the public to participate, democratizing data analysis and encouraging citizen scientists to contribute to meaningful projects. This engagement can lead to a better understanding and appreciation of open data's potential impact on governance, policy-making, and societal issues.

Showcase Impact and Drive Policy Change: Successful projects from Datathons can demonstrate the tangible benefits of open data reuse, influencing policy-makers to adopt more transparent data practices. By showcasing the practical applications of open data, these events advocate for greater openness and accessibility in government data policies.

3.1 Case Study: Croatian Datathon 2023

In April 2023, the Croatian Central State Office for the Development of the Digital Society announced an open call for participation in the Datathon as part of the "Adaptation of public sector information systems to the Open Data Portal". The event took place on May 12, 2023, at the University of Zagreb Faculty of Electrical Engineering and Computing during the DORS/CLUC 2023 conference, the largest regional conference on open-source software and Croatian Linux Users' Convention.

The Datathon aimed to inspire participants to conceptualize and develop IT solutions that leverage open data for enhanced open data promotion and visualization. Participants were encouraged to utilize open data sourced from national and regional portals, focusing on its potential impact in key thematic areas such as Social, Political, Environmental, or Economic domains. At the conclusion of the event, teams showcased their projects, competing for prestigious awards and recognition.

We encouraged three first-year master’s students specialising in geoinformatics at the University of Zagreb Faculty of Geodesy to participate in this event because Datathons are instrumental in advancing our mission to promote open data usage and boost data literacy. These competitions offer a fertile ground for students to apply their academic knowledge and technical expertise to develop innovative solutions that address real-world challenges and foster community engagement. Beyond networking opportunities, students enhance their analytical, interpretative, and data visualization skills through hands-on project work.

As part of their Datathon preparation, we mentored these students through the elective course "Multimedia Cartography" offered at the the master's program in Geodesy and Geoinformatics. This course introduces advanced concepts in multimedia cartography, covering diverse cartographic media for spatial mapping, visualization, and effective communication. It encompasses Internet and Web mapping, digital atlases, interactive mapping, web graphic design, geovisualization, and animation systems, equipping students with both theoretical knowledge and practical skills to create compelling multimedia cartographic products.

During the course, the students refined their proficiency in open data utilization, interactive mapping techniques, and narrative visualization strategies. Leveraging their educational background in geoinformatics and newly acquired skills, they successfully developed a captivating map-based storytelling project titled "Croatian vs EU Youth: Who has it better?" (URL2).

Prompted by a newspaper article in the Croatian press suggesting that Eurostat data indicated Croatian youth enjoyed a higher quality of life than their European Union counterparts, our students embarked on an extensive research endeavour. Knowing that the situation is not what it seems to be, students were motivated to research further to uncover a comprehensive understanding and present their findings in a compelling manner that resonates with the audience. Their motivation was further fuelled by the European Commission's designation of 2022 as the European Year of Youth, aiming to raise awareness among young people and empower them to actively shape a more democratic, sustainable, and inclusive Europe.

In search of the full picture, the students used six open statistical datasets from Eurostat (Statistical Office of the European Union) and one dataset from the Croatian Bureau of Statistics official website. They employed a combination of SVG, HTML, CSS, and JavaScript to investigate whether Croatian youth really have it better than their counterparts in the EU. Accessing these datasets through the Observable (URL3) and DataWrapper (URL4) platforms enabled them to process, analyze, and visualize the data effectively. Observable's collaborative environment facilitated data exploration and manipulation, while DataWrapper aided in creating interactive and visually appealing mapping visualizations.

3.2 Exploring Croatian Youth's Quality of Life: Insights from Data Analysis and Story-Driven Visualization

To assess the well-being of young people in Croatia and compare it with their counterparts across the EU, the storytelling begins with two mapping visualizations depicting the youth population in 2020. These visualizations utilize open government data, sourced from the official Eurostat website for EU data and the Croatian Statistical Office website for Croatia-specific data. In 2020, young people aged 15-29 constituted an average of 16.5% of the EU population (Figure 1), a figure mirrored precisely by Croatia. However, a closer look at Croatia's map (Figure 2) reveals significant regional disparities: while Zagreb exhibits a youth population exceeding 20%, most other districts fall below 10%.

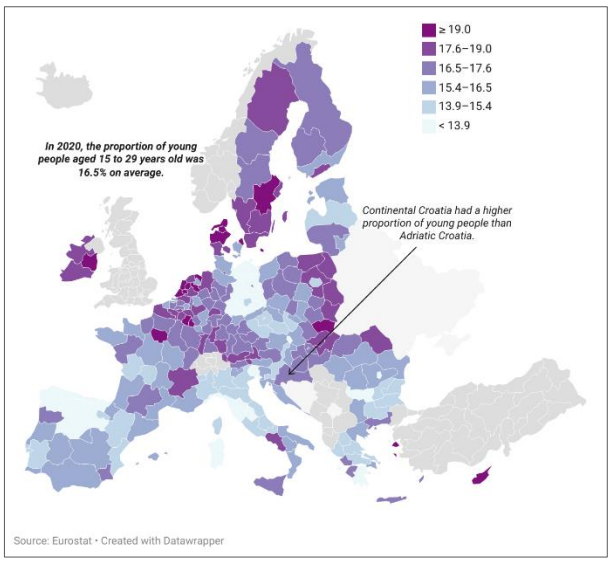

Figure 1. Population density of young people in Europe depicted on a choropleth map (URL2)

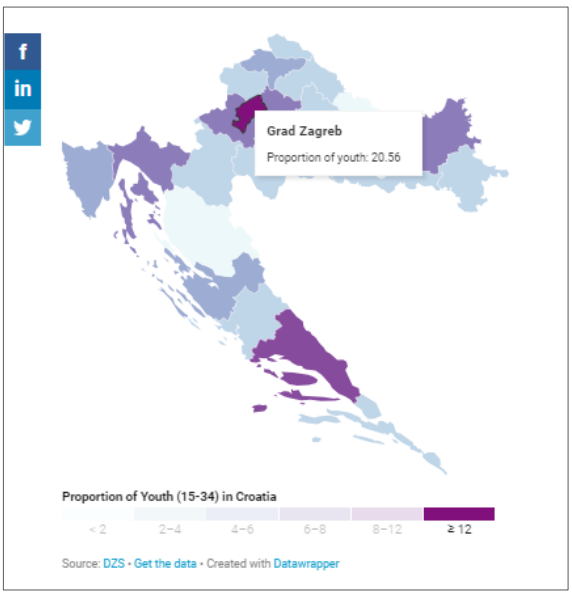

Figure 2. Population density of young people in Croatia depicted on a choropleth map (URL2)

The story follows with examining data about living conditions in Europe, i.e. the datasets that has the information about severe material and social deprivation among European citizens. According to Eurostat, young people in Croatia had the lowest poverty rates among EU countries (excluding Luxembourg) in 2021 (Figure 3). Only 1.4% of young people lived in severe material and social deprivation, i.e. they could not afford at least 7 out of 13 essentials due to financial constraints, including housing costs, adequate nutrition and social activities.

Although the low percentage of material and social deprivation may not suggest it, the living conditions for young people in Croatia are less favourable than they seem. To prove this, the story follows exploring the data about employment percentage, which reflects the number of young individuals who are employed and earning an income. This data is now presented using a different visual representation, a graph (Figure 4).

The graph clearly shows how Croatia has seen a significant increase in employment rates since joining the EU, but the figures are still below the EU average. The visualization also highlights a sharp decline in employment rate, that was caused by the 2020 global COVID-19 pandemic. The story then follows with another interesting information from the Eurostat dataset: since joining the EU in 2013, the rates of young people in Croatia who are not in education, employment, or training have dropped from 22% to 13% in 2022.

Delving deeper into the Eurostat dataset on the estimated average age when young people leave their parental home reveals a notable trend in Croatia compared to other EU countries (Figure 5). Across the EU, young people typically depart their parental household at around age 27. In stark contrast, in Croatia, this age rises significantly to 33. This prolonged co-residence is a contributing factor to Croatia having one of the lowest rates of young people experiencing material and social poverty among EU nations. Here, parental support enables youth to attain financial stability before pursuing independent living.

Further exploration of the data through mapping reveals additional insights. The proportion of young adults living with their parents is notably higher in southern and eastern European countries, influenced by cultural norms, economic conditions, and limited job opportunities. Visualizing this data on maps underscores the spatial patterns and emphasizes the significance of geographical context in understanding socio-economic dynamics.

Examining the breakdown by gender among individuals aged 18 to 34 who reside with their parents provides even deeper insights. Across most countries, a larger percentage of young men live with their parents compared to young women. In Croatia, 83.5% of young men still reside with their parents, marking the highest proportion among EU member states, whereas 69% of young women in Croatia live with their parents..

The narrative concludes with projections for Europe's young population in 2050 (Figure 6). This final map illustrates future trends in youth demographics alongside the current distribution across the EU. By 2050, the proportion of young people in the EU is forecasted to decrease to 14.9%, indicating a progressive aging of the population. In Croatia, only Zagreb and Istria County are anticipated to see a slight increase in youth population, while other regions, notably Vukovar-Srijem County, are projected to experience a significant decline. Enhanced interactivity allows users to zoom in and out, facilitating focused exploration of specific areas of interest.

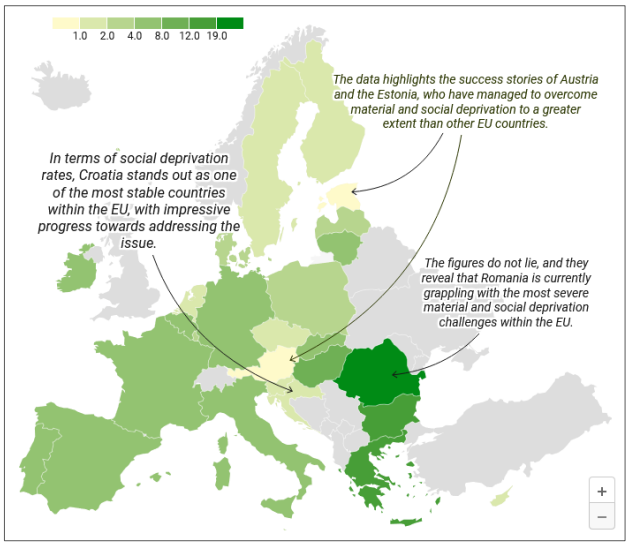

Figure 3. Material and social deprivation of young people in EU depicted on a choropleth map (URL2)

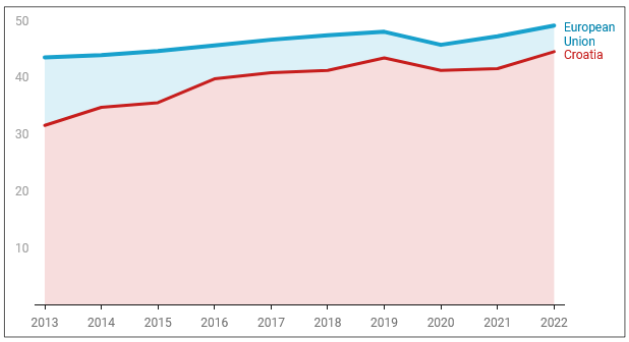

Figure 4. Youth employment (in percentage rate) in Croatia vs. EU (URL2)

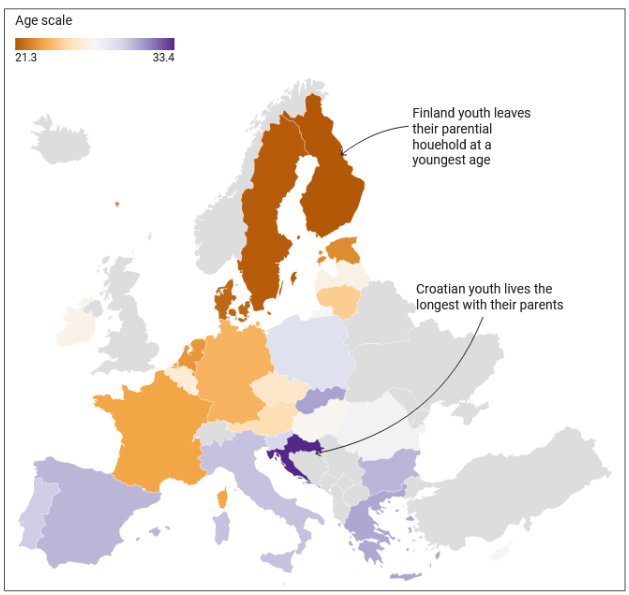

Figure 5. Estimated average age of young people leaving the parental household (URL2)

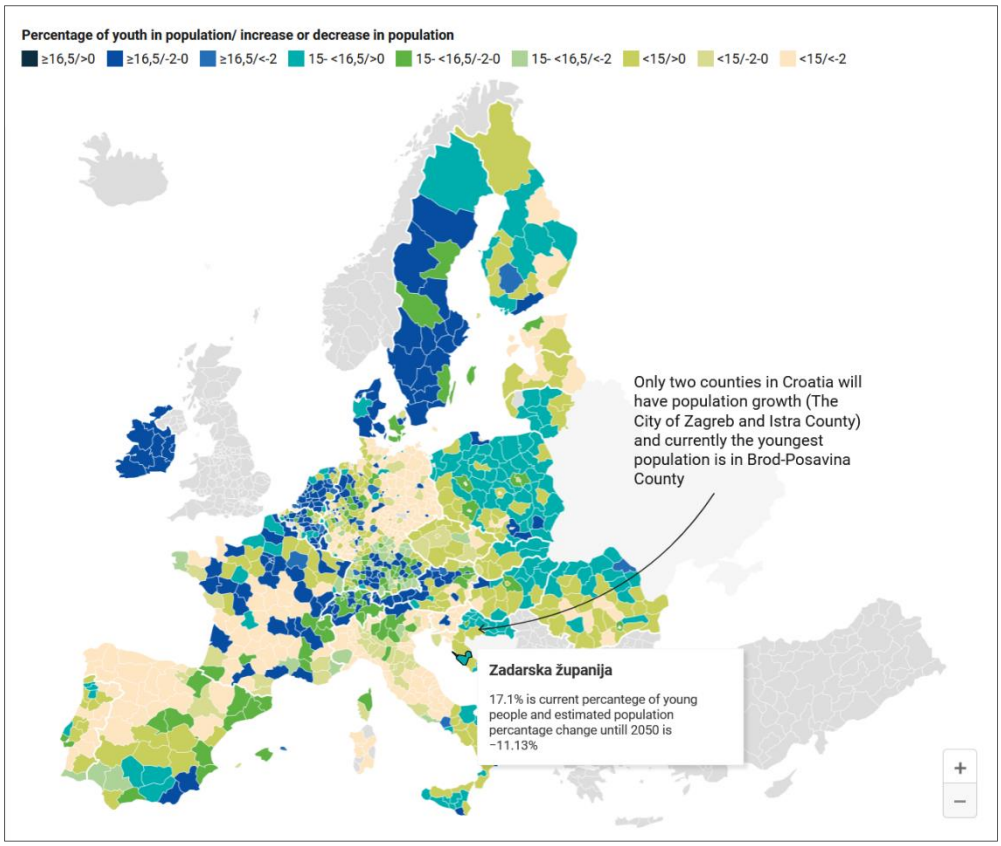

Figure 6. Map illustrating projections for the youth population in the EU for the year 2050, depicting the percentage change compared to the current population in 2021. (URL2)

4. CONCLUSION

In conclusion, this study highlights the importance of promoting data literacy among young people in today's digital age. As data continues to play a central role in decision making and drive innovation across multiple sectors, the ability to understand, analyse and communicate with data effectively becomes increasingly important.

The integration of data visualization and storytelling presents promising avenues for advancing data literacy, making data more accessible, understandable, and memorable. The innovative approach of map-based storytelling not only enhances engagement but also cultivates essential critical thinking skills necessary for addressing complex socio-economic issues. By incorporating these educational strategies into classrooms, educators can significantly enhance students' capacity to analyze and interpret data effectively.

The use cases of data-driven storytelling developed by our students for the Datathon competition exemplify the efficacy of this approach. Their project "Croatian Youth vs EU: Who has it better?" prioritizes storytelling, engagement, and the cultivation of critical thinking among its young audience. Leveraging cartographic techniques, the solution incorporates interactive maps and visual elements that enable citizens to personalize their engagement with data, fostering a deeper understanding of how living conditions for young people vary across EU countries.

Through meticulous data analysis, the study uncovers nuances in interpreting socio-economic indicators, offering valuable insights for both educators and learners.

Empowered by the technical skills acquired in the "Multimedia Cartography" elective course, our students demonstrated not only their proficiency in understanding data but also their ability to effectively communicate it. Participation in the Datathon empowered them to transition from the role of "data reader" to "data communicator". Moreover, their reliance on open data and technologies underscores the potential of the open movement to advance data literacy among youth.

Although this solution was originally developed for the purposes of the Datathon, it has the potential for wider applications. The expert jury of the Datathon awarded a prize to our map-based storytelling approach "Croatian Youth vs EU: Who has it better?", recognizing its innovative approach and potential.

However, due to the limited scope of the presentation and the absence of a broader, more targeted audience, the true extent of its impact on citizen engagement and understanding remains undetermined. Moving forward, future research aims to develop a metric to measure engagement and conduct tests with a target audience to see to what extent this map-based storytelling approach facilitates their understanding of the issues and encourages them to engage. Future studies with more comprehensive metrics and diverse audiences are necessary to fully evaluate the effectiveness and social impact of this solution.

Nonetheless, this research has confirmed how important it is for young people to poses data literacy skills. By equipping the next generation with data skills, we can ensure that they are ready to tackle future challenges and make a meaningful contribution to an increasingly data-driven world.

Acknowledgements

This research is part of the Twinning Open Data Operational project that has received funding from the European Union’s Horizon 2020 research and innovation program under grant agreement no. 857592. Work by Andrea Miletić was additionally supported by “Young Researchers’ Career Development Project—Training of Doctoral Students” (DOK-01-2020) founded by Croatian Science Foundation.

References

Bohman, S., 2015: Data Visualization: An Untapped Potential for Political Participation and Civic Engagement. In: Kő, A., Francesconi, E. (eds) Electronic Government and the Information Systems Perspective. EGOVIS 2015. Lecture Notes in Computer Science, vol 9265. Springer, Cham.

Demirtas, C., 2024: Data Literacy and Education: A Science Mapping Study. Participatory Educational Research. 11. 220-243. https://doi.org/10.17275/per.24.43.11.3.

Hossain, M. A., Dwivedi, Y. K., & Rana, N. P., 2016: State-of-the-art in open data research: Insights from existing literature and a research agenda. Journal of Organizational Computing and Electronic Commerce, 26(1–2), 14–40. https://doi.org/10.1080/10919392.2015.1124007

Kempeneer, S., Wolswinkel, J., 2023: Rethinking Open Government Data for Citizen Participation. An Introduction to a Special Issue. 1 Jan. 2023 : 163 – 173.

McAuley, D., Rahemtulla, H., Goulding, J., Souch, C., 2014: How Open Data, data literacy and Linked Data will revolutionise higher education. Retrieved May, 8, 2015.

McDowell, K., Turk, M.J., 2024: Teaching data storytelling as data literacy, Information and Learning Sciences, Vol. 125 No. 5/6, pp. 321-345. https://doi.org/10.1108/ILS-06-2023-0068

Montes M., Slater D., 2019: Issues in Open Data - Data Literacy. In T. Davies, S. Walker, M. Rubinstein, & F. Perini (Eds.), The State of Open Data: Histories and Horizons. Cape Town and Ottawa: African Minds and International Development Research Centre.

Ologbosere, O. A., 2023: Data literacy and higher education in the 21st century. IASSIST Quarterly, 47(3–4). https://doi.org/10.29173/iq1082

Ridsdale, C., Rothwell, J., Smit, M. & Bliemel, M, Irvine, D. & Kelley, D., Matwin, S., Wuetherick, B., Ali-Hassan, H., 2015: Strategies and Best Practices for Data Literacy Education Knowledge Synthesis Report. https://doi.org/10.13140/RG.2.1.1922.5044.

Simpson, A., 2011: On Privacy and Public Data: a Study of data.gov.uk. Journal of Privacy and Confidentiality. 2011. 51-65. https://doi.org/10.29012/jpc.v3i1.595.

Susha, I., Grönlund, Å. & Janssen, M., 2015: Organizational measures to stimulate user engagement with open data. Transforming Government: People, Process and Policy. 9. 181-206. https://doi.org/10.1108/TG-05-2014-0016.

Szukalski, B., 2016: From Open Data to Data Engagement, https://www.esri.com/about/newsroom/arcuser/from-open-data-to-data-engagement/

Welle Donker, F. & van Loenen, B., 2016: How to assess the success of the open data ecosystem? International Journal of Digital Earth, 10(3), 284–306. https://doi.org/10.1080/17538947.2016.1224938

Wolff, A., Gooch, D., Montaner, J., Rashid, U. & Kortuem, G., 2016: Creating an Understanding of Data Literacy for a Data-driven Society. The Journal of Community Informatics. 12. https://doi.org/10.15353/joci.v12i3.3275.

Zuiderwijk, A., Janssen, M., 2013: Open Data Policies, Their Implementation and Impact: A Framework for Comparison. Government Information Quarterly. 31. https://doi.org/10.1016/j.giq.2013.04.003.

URL1: European legislation on open data: Shaping Europe’s digital future. https://digital-strategy.ec.europa.eu/en/ policies/ legislation-open-data
(14 June 2024)

URL2: In Search of the Complete Picture! Croatian Youth vs. EU: Who Has It Better? https://observablehq.com/d/0b3a6b62efb044e1 (14 June 2024)

URL3: Observable – a platform for interactive programming and data visualization. https://observablehq.com (14 June 2024)

URL4: DataWrapper – a tool for creating interactive charts and visualizations from data. https://www.datawrapper.de (14 June 2024)