LLT Journal, e-ISSN 2579-9533, p-ISSN 1410-7201, Vol. 28, No. 2, October 2025, pp. 767-787

LLT Journal: A Journal on Language and Language Teaching
http://e-journal.usd.ac.id/index.php/LLT
Sanata Dharma University, Yogyakarta, Indonesia

INTERACTIVE THEMATIC MAPPING FOR EFL EDUCATION: EXPLORING SDG 16 WITH JAPANESE AND COLOMBIAN UNIVERSITY STUDENTS

John Guy Perrem[1*] and Ezana Eyassu Habte-Gabr[2]
Muroran Institute of Technology (National University), Japan
Universidad Externado de Colombia, Colombia
jgperrem@muroran-it.ac.jp and ezana.habte-gabr@uexternado.edu.co
*correspondence: jgperrem@muroran-it.ac.jp
https://doi.org/10.24071/llt.v28i2.11811
received 20 February 2025; accepted 18 August 2025

Abstract
English language education has increasingly incorporated global issues to provide a link between classroom learning and real-world problems. The intent is that by examining such issues, students will engage with challenges while developing language skills in more purposeful ways. Acknowledging this, this study foregrounds the use of interactive online thematic maps for Sustainable Development Goal (SDG) 16 as the central pedagogical tool. SDG 16 focuses on peace, justice, and strong institutions. Responses from 35 Japanese and Colombian university students regarding their use of interactive online thematic maps were analyzed. Across five university EFL lessons, this cross-cultural study used a Likert-scale survey to evaluate how interactive online thematic maps supported vocabulary, reading, analytical thinking, and motivation. Lessons integrated interactive online SDG 16 maps with discussion-based classroom activities that encouraged exploration of indicators such as homicide, corruption, press freedom, and access to justice. Results indicate that interactive online maps enhanced language skills, critical thinking, and understanding of SDG 16. Findings suggest that interactive online maps provide a visually engaging way to link language learning with global citizenship education. This study demonstrates the potential of interactive online thematic maps to integrate sustainability topics into EFL and promote deeper cross-cultural and socio-political awareness.

Keywords: EFL education, global issues, SDG 16, thematic maps

Introduction
English language education increasingly links classroom work with real-world issues through Global Issues in Language Education (GILE), which emphasizes peace, human rights, and sustainability (Cates, 2002; Maley & Peachey, 2017). Sustainable development can be understood as a long-term, people-centered model that focuses on needs, abilities, and action (Herweg et al., 2017). Within this framing, Sustainable Development Goal 16 (SDG 16, henceforth) matters for EFL because it addresses peace, justice, and strong institutions and lends itself to discussion-rich tasks that develop language skills while building global citizenship

This work is licensed under CC BY-SA.
Creative Commons Attribution-ShareAlike 4.0 International License

orientations (Arslan & Curle, 2021; Astawa et al., 2024; Cardiff, 2023). As Jodoin and Singer (2019) note, "English education can play a significant role in not only promoting sustainability concepts but also initiating a dialogue with the values, beliefs, and norms associated with sustainability" (p. 54). Interactive online thematic maps are a promising way to make such topics visible and discussable in the target language, including SDG 16 indicators derived from recent datasets (Sachs et al., 2024).

Existing scholarship has explored SDG-oriented curricula, content-based approaches such as CLIL, and critical pedagogy to support deeper engagement (Bajaj & Hantzopoulos, 2016; Cardiff, 2023; Coyle et al., 2010; Coyle & Meyer, 2021; Maley & Peachey, 2017). However, despite these advances, questions remain about how best to operationalize sustainability content with digital tools in EFL classrooms and how to make complex sustainability datasets linguistically accessible to learners (Jodoin & Singer, 2019). Important debates also persist about the role of sustainability agendas in language teaching, the cognitive demands of interactive visualizations for users, and appropriate classroom supports for working with such data. Prior work typically addresses SDGs broadly or at the level of materials and activities (e.g., Cardiff, 2023; Jodoin & Singer, 2019), but there is limited classroom-based, tool-specific evidence on using interactive online thematic maps to teach SDG 16 in EFL settings, and cross-cultural comparisons across instructional contexts are scarce. To our knowledge, few studies examine student self-reports of learning, engagement, and intentions after sequenced lessons centered on interactive web maps of SDG 16 indicators.

To address this gap, this study analyzes student self-reports from 35 university learners in Japan and Colombia after five discussion-based lessons built around interactive online SDG 16 maps derived from Sachs et al. (2024). We focus on language-skill development, understanding and analytical engagement with SDG 16, perceived usefulness and engagement with the mapping tool, and motivation and behavioral intentions for future use. This study contributes classroom-based, cross-cultural evidence on the pedagogical affordances of interactive online thematic maps for SDG 16 in EFL, providing tool-specific insights that extend beyond general SDG integration. The study has the following three research questions:

1. How do students report changes in language skills after five EFL lessons using interactive online thematic SDG 16 maps?
2. How do students evaluate the usefulness and engagement of the interactive online maps for understanding and analytically engaging with SDG 16 indicators?
3. Do reports differ between the Japanese and Colombian cohorts across these domains, including motivation and behavioral intentions?

Sustainable Development Goal 16 (SDG 16)

SDG 16, one of the 17 goals established by the United Nations, aims to promote peace, justice, and strong institutions. Its objectives include reducing violence, ensuring access to justice for all, and building effective, accountable institutions at all levels (UNDP, 2024). These aims are essential to the development of stable societies globally (Milton, 2021). The online interactive thematic maps used in this research were sourced from the official SDG report website (Figure 1)

and visualize key indicators such as safety, justice, institutional accountability, and corruption across various countries and continents. By working with these maps, students explored concepts through visual representations of trends and SDG ratings connected to the full set of SDG 16 indicators (see Table 1).

SDG 16 was selected for this study due to the relevance of peace across cultural contexts and its accessibility to students without the need for specialized background knowledge. In an EFL GILE context, this goal provides a platform for exploring the role of justice and safety in building equitable societies, while allowing learners to practice language skills through real-world content (Bajaj & Hantzopoulos, 2016; Kanwal, 2024; Maley & Peachey, 2017). Importantly, it also encourages dialogue around regional disparities through English-language interaction (Cates, 2002; Reardon, 1988). Incorporating SDG-related content into EFL lessons (Al-Amin & Greenwood, 2018; de la Fuente, 2021) encourages students to reflect on the conditions needed for peaceful communities and aligns their learning with broader United Nations objectives. Through this, EFL classrooms become spaces for critical discussion and the development of "competencies necessary for a sustainable future," as supported by eco-linguistics and its contributions to sustainability discourse (Jawad, 2024, p. 370).

The integration of SDGs into language education can also promote critical thinking and a sense of global citizenship (Maley & Peachey, 2017). Language learning becomes a means of engaging with themes such as equality and the social conditions that support peace and challenge obstacles to good governance (Bajaj & Hantzopoulos, 2016). Content-based approaches, such as Content and Language Integrated Learning (CLIL), are increasingly adopted to combine language acquisition with peace education (Rico-García & Fielden Burns, 2024). Through this approach, educators can facilitate useful discussions on issues such as public safety, while enhancing students' ability to express their views on such issues (Kanwal, 2024; Maley & Peachey, 2017). Peace education itself has evolved from a focus on pacifism to include social justice, conflict resolution, and human rights (Reardon, 1988). This broader framework makes it especially relevant to EFL classrooms, where it supports the development of global citizenship and social equity (Bajaj & Hantzopoulos, 2016; Cates, 2002). Additionally, as Milton (2021) stated, "Teaching SDG 16-related issues is the most direct way to contribute towards SDG 16" (p. 93).

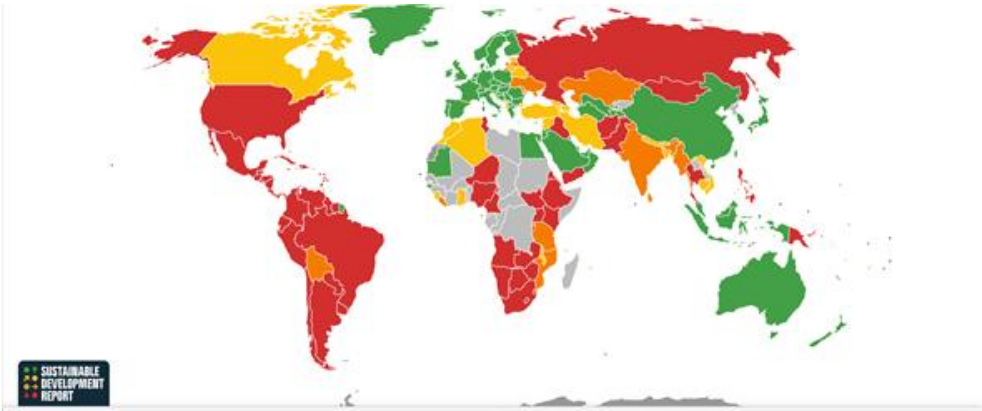

Figure 1. SDG 16 indicator map for homicide per 100,000 population. Source: sdgindex.org, based on Sachs et al. (2024).

Thematic maps

Thematic maps provide a unique opportunity to link language learning with broader global issues visually, aligning closely with the principles of GILE. GILE emphasizes the value of addressing real-world challenges in the classroom, thereby instilling a sense of social responsibility and global citizenship among language students (Cates, 2002). By adopting a GILE approach, educators help students view language learning as more than simply acquiring linguistic skills; it becomes a way to engage with the world and address critical issues affecting societies globally (Akbana & Yavuz, 2020). In addition, it is a means of using comprehensible authentic material in the language classroom and being readily visually accessible, helps students to overcome language barriers.

To evaluate the perceived impact of SDG 16 thematic maps, a survey (see Table 2) was conducted among Japanese and Colombian students enrolled in EFL university courses. The aim was to assess students' experiences with these maps and their English skills acquired through this method. This approach sought to understand how thematic maps contributed to their comprehension of SDG 16 and related issues, making abstract concepts more accessible through engaging, data-driven lessons grounded in global realities.

SDGs in education

The SDGs, adopted by the United Nations in 2015, represent a valuable framework for elevating EFL instruction (Al-Amin & Greenwood, 2018; Maley & Peachey, 2017). Integrating SDGs into EFL curricula allows educators to address important global issues and promote students' understanding of sustainability challenges (Cardiff, 2023). As Maley and Peachey (2017) argue, language teachers are more than instructors of language; they have a lasting impact on their students' attitudes and perspectives. By connecting SDGs to English studies, educators add depth and relevance to students' learning, with the potential to motivate them to explore real-world problems such as poverty, inequality, climate change, and sustainable development. Education is a useful medium for achieving these objectives, as it has the potential to stoke empathy, and the skills necessary for positive societal contributions (Leicht et al., 2018).

Still, some language educators may wonder what SDGs have to do with language teaching. Maley and Peachey (2017) considered this question and provided the following robust response: "There are several intertwined answers to this question. A growing number of ELT professionals have come to believe that language teachers are more than just teachers of language. Through what they teach and their attitudes and practices, they have an enduring influence on the future attitudes and personalities of their students" (Maley & Peachey, 2017, p. 2).

Engaging students with the SDGs can be achieved through various activities, including research presentations, group discussions, and project work (Cardiff, 2023). These activities encourage critical thinking, encourage reflection on individual actions, and help students develop a sense of global citizenship and responsibility. Despite growing literature on SDGs in language education, one area that remains underexplored is combining SDG 16 with interactive digital maps. An issue this study seeks to directly address.

SDG 16's core values align with broader peace education, which aims to provide students with skills to consider conflict and understand diverse perspectives.

Bajaj and Hantzopoulos (2016) note that adding peace education helps students understand the root causes of violence and equips them to advocate for social justice. By linking SDG 16 with peace education, students become more informed members of their communities, better equipped to challenge inequities.

Learning with maps

Thematic maps are effective tools in language learning, particularly when connecting students with complex socio-political topics like those in SDG 16. The cognitive benefits of visual learning tools, including thematic maps, have been documented (Beitlová et al., 2020; Habte-Gabr, 2017; Mayer, 2009; Perrem, 2021; Perrem & Habte-Gabr, 2024; Rico-García & Fielden Burns, 2024). Mayer (2009) asserts that visuals help learners process and retain information more effectively by integrating verbal and non-verbal cues. In language learning, thematic maps aid in developing vocabulary related to governance, justice, and peace by visually representing these abstract concepts. Thematic maps utilize various techniques to present information visually, including shading, the integration of symbols, and color-coding schemes, as commonly demonstrated in SDG choropleth maps. For instance, shading techniques are particularly effective in representing continuous data about a region by applying gradients or tones of color on a cardinal or ordinal scale.

A relevant example could involve mapping indicators tied to SDG 16, such as homicide rates or levels of press freedom. Regions with higher homicide rates might be shaded in dark red to signify greater challenges, while areas with lower rates could appear in lighter shades. Conversely, press freedom levels could be depicted with shades of green, where darker tones represent greater freedom and lighter ones indicate restrictions. Research emphasizes that choropleth maps are especially effective for visualizing spatially linked data, as their two-dimensional format simplifies the interpretation of complex patterns within geographic areas (Schiewe, 2019; Yang et al., 2020). Additionally, these maps supply students with opportunities to engage meaningfully with global issues such as violence and media independence while promoting geographic and socio-political literacy.

Thematic maps complement CLIL approaches, which aim to integrate content and language instruction within a cognitively demanding and discipline-informed framework (Coyle et al., 2010; Coyle & Meyer, 2021). Through visual exploration of topics, students can build target language proficiency and engage with complex socio-political concepts in a structured and engaging way. This supports CLIL's dual focus on conceptual understanding and language development within a disciplinary context. While recent studies have shown that thematic maps can enhance vocabulary acquisition, engagement, and information retention (Perrem & Habte-Gabr, 2024), their value in CLIL-oriented classrooms lies in their ability to support deeper comprehension and promote discussions around real-world issues as well as elicit vocabulary and language in a meaningful context.

Lai (2024) reports that hands-on CLIL tasks can yield large, concurrent gains in target vocabulary and procedural knowledge relative to worksheet work, while students did not report greater perceived ease of learning. The context is primary-level Social Studies and does not involve digital mapping. This leaves open whether similar patterns appear in university EFL courses that use interactive thematic maps on SDG 16, which the present study explores.

Rico-García and Fielden Burns (2024) found that digital thematic maps improved students' comprehension of spatial relationships and enhanced communication skills in a foreign language. Thematic maps also encourage collaboration, as seen in group activities where students interact with digital story maps (Rico-García & Fielden Burns, 2024). Maps have emerged as potential tools for enhancing EFL instruction, providing an engaging way to promote language acquisition, critical thinking, and global awareness (Rico-García & Fielden Burns, 2024). The visual nature of maps offers a unique avenue for language development, similar to numeracy, oracy, and literacy (Perrem, 2021). Students learn to interpret the "language of maps," understanding symbols, scales, and patterns, which is particularly beneficial in EFL classrooms where learners may struggle with complex texts. Thematic maps focusing on specific topics, such as crime or business, offer a focused way to explore vocabulary and concepts in context, reinforcing the cognitive benefits of visual learning by aiding retention and comprehension (Perrem & Habte-Gabr, 2024).

By connecting learning to real-world contexts, thematic maps stimulate "geographical imagination" (Perrem, 2021) inspiring students to engage with places beyond their immediate experience. Studies have shown significant improvements in vocabulary acquisition and retention when using thematic maps in EFL classrooms. For instance, a recent study (Perrem & Habte-Gabr, 2024) found that thematic maps focusing on crime, work, and business led to meaningful vocabulary gains. The visual context provided by these maps facilitated deeper understanding and retention. Thematic maps also help develop higher order thinking skills (HOTS) by encouraging students to analyze, interpret, and evaluate information, stimulating complex cognitive skills (Basyari et al., 2021).

Research on digital maps has shown that they offer numerous benefits for learning, such as interactivity and access to rich information (Jones et al., 2004). However, challenges remain, particularly for novice users, who may struggle with the cognitive demands of interpreting digital maps and understanding representational conventions such as color tones. Addressing these challenges in EFL settings can further enhance the benefits of using thematic maps for language learning. The e-MapScholar project showed the importance of interactivity in engaging learners and supporting their understanding of digital map data, which aligns well with the use of thematic maps in promoting active learning in language education (Jones et al., 2004). This research contributes to the ongoing exploration of digital interactive tools for educational purposes.

Transformative language teaching

Critical pedagogy, as theorized by Paulo Freire (2000) and Henry Giroux (1988), emphasizes empowering students to become active participants in their own learning and agents of social change. Thematic maps also align with these ideas by encouraging students to engage with real-world data, question societal issues, and develop a critical understanding of global challenges. This approach cultivates students' roles as active, informed citizens. Freire's concept of conscientização (critical consciousness) is particularly relevant to SDG education, encouraging students to question the status quo and engage in social justice dialogues. By integrating SDG 16 into language lessons, educators provide opportunities to promote students' potential role in advocating for change. This is because as

students engage in these discussions, they also acquire knowledge about countries and regions.

Giroux (1988) argues that educators should act as transformative intellectuals, helping students connect their learning to broader social contexts. As the SDGs were developed through global consensus, issues related to SDG 16 have a "world-changing" potential (Ramineli et al., 2023) that students can relate to through personal experiences. Norton and Toohey (2004) also stress that language education should prepare learners to confront real-world challenges. When critical pedagogy is integrated with tools like thematic maps, the classroom becomes a space for participatory learning where students develop both linguistic skills and socio-political awareness. Kanwal (2024) even positions English teachers as SDG activists who lead forums for dialogue on the goals. In Colombia, transversal SDG programs have made such activism part of the curriculum itself.

These theoretical perspectives informed both the design and interpretation of this study. Freirean and Girouxian critical pedagogy guided the development of lessons that encouraged students to analyze related data, reflect on social inequality, and discuss their views using English. For example, in Lesson 1, students compared homicide rates and numbers of sentenced detainees across Iceland, the Netherlands, and Serbia using SDG 16 interactive maps, then discussed how these differences reflected broader institutional and social conditions. The use of thematic maps also aligns with Norton and Toohey's (2004) call for language education that connects learners to real-world challenges. Kanwal's (2024) framing of the English teacher as an SDG activist also shaped our understanding of how instructors can position students as socially aware language users. Together, these frameworks provided the foundation for exploring how students perceive the integration of SDG 16 into EFL instruction.

Method

This study utilized a quantitative approach to investigate the impact of interactive thematic maps on students' understanding of SDG 16 and perceived language development in EFL settings. A quantitative survey approach was chosen to systematically evaluate students' language development and understanding of SDG 16 following the thematic map lessons. This method allowed for consistent data collection across both groups, enabling direct comparison of responses between the two contexts (Japan and Colombia). This approach also ensures that the results are easily comparable, enabling the identification of differences or points of note (Cohen et al., 2017; Creswell & Creswell, 2018). The survey utilized a five-point Likert scale. The Likert scale allows for a range of responses, providing insights into varying degrees of agreement or disagreement (Dörnyei & Taguchi, 2010). This is especially effective in educational research, where understanding the depth of student engagement and the effectiveness of learning tools like thematic maps is crucial.

The study involved a total of 35 undergraduate students, comprising 18 from Japan and 17 from Colombia, which provided an international perspective. The students were selected using a convenience sampling method, as they were all students already enrolled in EFL courses taught by the authors. All the students were part of two intact classes (one in each university) and ranged in age from 19–22. The Japanese students were second-year students at a national university in a

mid-sized city, with intermediate to upper-intermediate English proficiency. Their course focused on communication and global issues and included both skills-based and discussion components. The Colombian students were from a private university in a large urban setting, enrolled in an intermediate to upper-level course on tourism administration, government and communication studies with a content-based curriculum. Both courses were taught by instructors with experience integrating global topics and geography.

All students in these two classes were invited to participate, but their participation was entirely voluntary. All the Japanese students completed the surveys on paper during class time. This was administered by Author 1. Ten of the Colombian students responded to an online version of the survey while the remaining seven completed the paper version. These were administered by Author 2. Regarding ethical considerations, the students were informed in writing about the study and how their data would potentially be used for an academic paper. It was also made clear in writing and verbally that it was not compulsory for them to participate if they did not wish to. It was also made clear that their data would be anonymous if they did choose to participate as their names would not be recorded or written on the questionnaires. This information was clearly presented in English, Japanese, and Spanish at the top of the respective questionnaires. While the study did involve human participants, none of the questions related to sensitive or particularly personal matters.

While surveys provide an efficient way to capture trends across different classroom contexts, their use in studies with relatively small sample sizes, such as this one, also presents some limitations. These include the potential for overgeneralization and a limited ability to explore nuanced participant responses. Accordingly, the results of this study are intended to indicate general trends in student responses rather than concrete conclusions that apply universally to all learners.

The primary material used in this study was sourced from the official SDG website which builds maps based on SDG report data from Sachs et al. (2024). These maps focused on indicators related to SDG 16 across different continents and countries. The thematic maps served as the primary instructional tool to help students visually explore and analyze data about the selected countries (Table 1). In addition to the maps, carefully designed lesson plans (Appendix) were developed to integrate these resources into activities involving reading comprehension, vocabulary building, and discussions. These lessons were planned, refined, and exchanged between the two authors in the planning phase of the project prior to the teaching and analysis phase.

The study was conducted over five lessons (Table 1) that focused on different continents, countries and indicators related to SDG 16 in each lesson. The lessons began with an introduction to the chosen indicator and its relevance to SDG 16. The students then engaged in interactive exploration of the thematic choropleth maps, where they examined data across different designated locations, and discussed their observations in English.

The survey used in this study was designed to assess several key aspects of the students' learning experience, specifically focusing on language skills development, understanding and engagement with SDG 16, interaction with thematic maps, and motivation for future learning. The first theme (Q1–Q4)

addressed language skills development, with questions evaluating vocabulary acquisition, reading comprehension, listening, and speaking skills. The second theme (Q5–Q8) focused on understanding and engagement with SDG 16, assessing students' awareness of key indicators. This survey section also included questions about students' analytical thinking skills and their ability to engage with socio-political topics. The third survey theme (Q9–Q11) evaluated the interaction with thematic maps, exploring how effectively students utilized these tools to understand the distribution of peace and justice indicators globally. The survey captured their level of engagement with the thematic maps and if these visual aids supported their learning experience.

Table 1. Summary of locations and SDG 16 map indicators

Lesson	Continent	Countries	SDG 16 Map Indicators
1	Europe	Iceland, Netherlands, Serbia	1. Homicides, 2. Sentenced Detainees
2	Africa	Senegal, South Africa, Egypt	1. Crime is effectively controlled, 2. Birth registration with civil authority
3	South America	Chile, Bolivia, Brazil	1. Corruption Perception Index, 2. Children Involved in Child Labor
4	Asia	South Korea, Malaysia, India	1. Exports of Major Conventional Weapons, 2. Press Freedom Index, 3. Access and Affordability to Justice
5	North America	Canada, USA, Mexico	1. Timeliness of Administrative Proceedings, 2. Lawful Expropriations, 3. Persons Held in Prison

The fourth and final theme (Q12–Q14) addressed motivation for future engagement. This section provided insights into how thematic map activities influenced students' motivation and their intent to participate in similar educational experiences in the future. Table 2 provides an overview of the themes and questions in the SDG 16 survey. Spanish and Japanese versions of the questions were provided in addition to English on the surveys for Colombian and Japanese students respectively.

Author 1 is working at a Japanese university and used their language ability for creating the Japanese version of the questionnaire. This was then checked by a native Japanese speaker to verify for accuracy. Author 2 is working at a Colombian university and used their Spanish language ability to create the Spanish versions of the questionnaire. This was subsequently checked by a native speaker. The survey questions were developed specifically for this study. The indicators featured in the SDG 16 thematic maps were sourced from Sachs et al. (2024) and the survey items were added to align with its thematic focus and educational application. Each item was intended to reflect one of four core themes: English language development, understanding of SDG 16, interaction with thematic maps, and motivation for future engagement. The questions were presented in English, Japanese, and Spanish to ensure accessibility and clarity for all students when they responded to the survey.

Table 2. Summary of survey questions and themes

Q	Survey Question	Theme
1	Vocabulary Acquisition: The lessons helped me to better understand and use key terms related to SDG 16.	English Language Skills Development
2	Listening and Speaking: I can accurately understand and pronounce words and phrases related to SDG 16.	English Language Skills Development
3	Reading Comprehension: I can effectively comprehend written information about SDG 16 indicators.	English Language Skills Development
4	Communication Skills: I can clearly express my thoughts and ideas about SDG 16 issues in English.	English Language Skills Development
5	Awareness of Issues: I have a thorough understanding of the issues and challenges related to SDG 16.	Understanding and Engagement with SDG 16
6	Analytical Thinking: I can critically analyze the data and trends related to SDG 16 indicators.	Understanding and Engagement with SDG 16
7	Interactive Learning Experience: The use of interactive maps significantly enhanced my understanding of SDG 16.	Understanding and Engagement with SDG 16
8	Fact gathering via maps: The maps have given me factual information to support my opinion.	Understanding and Engagement with SDG 16
9	Understanding of SDG 16: The interactive online SDG maps helped me better understand the goals and indicators of SDG 16.	Interaction with Online SDG Maps
10	Understanding of Vocabulary via Maps: The interactive online SDG maps helped to deepen my understanding of the SDG indicator vocabulary.	Interaction with Online SDG Maps
11	Engagement with the Tool: Using the interactive online SDG maps made the research process more engaging and interesting.	Interaction with Online SDG Maps
12	Motivation for Further Learning: This project has motivated me to learn more about SDG 16 and other Sustainable Development Goals.	Impact and Motivation
13	Intent to Use in Future: I am likely to use interactive online SDG maps for future research or projects related to sustainable development.	Impact and Motivation
14	Recommendation to Others: I would recommend using interactive online SDG maps to others for learning about SDG 16.	Impact and Motivation

Survey responses were analyzed using descriptive statistics to identify patterns and trends across the five-point Likert items. For each item, and separately for the Japanese and Colombian cohorts, we computed the mean, median, mode, and the sample standard deviation. Values were rounded to two decimals and mode

ties are reported as "4, 5". Means provided a concise summary of central tendency to support cross-cohort comparison, while medians and modes were reported to respect the ordinal nature of Likert data and to check for skew and clustering. Standard deviations summarized response dispersion and cohort heterogeneity. We treated Likert responses as approximately interval for descriptive summarization and did not conduct inferential testing given the small sample (N = 35). Because the design used a post-unit survey, references to change denote students' self-perceived gains, not observed pre/post-test differences. Descriptive statistics were generated in JASP, an open-source statistical software package developed by the University of Amsterdam. Analyses were then organized by research question (RQ). Descriptives are reported separately for each cohort for all items (Table 3); RQ1 covers Q1–Q4, RQ2 covers Q5–Q11, and RQ3 summarizes the between-cohort contrasts across the full instrument, emphasizing Q12–Q14. The results were shared and cross-checked by both authors using the Excel outputs to confirm accuracy and consistency in interpretation. The structured format of the Likert-scale questions also contributed to the reliability of the data. To ensure validity, the survey items were closely aligned with the study's objectives and thematically categorized to reflect the intended areas of inquiry. Translations into Japanese and Spanish were carefully reviewed to maintain consistency in meaning for both locations.

Findings and Discussion

Findings

Across both cohorts, students reported positive responses for the map-based lessons (see Table 3). Medians clustered at 4, with both groups at 5 on understanding SDG 16 (Q9). Colombian means were higher on most items, whereas Japanese students reported higher perceived gains for understanding SDG 16 (Q9), understanding indicator vocabulary (Q10), motivation to learn more (Q12), and willingness to recommend the maps (Q14). Variability was generally greater in Japan across 12 of 14 items, suggesting a wider spread of experiences compared with Colombia's tighter clustering.

For RQ1, which asks how students reported changes in language skills after five lessons using interactive SDG 16 maps, both cohorts indicated improvement in vocabulary, listening and speaking, reading, and communication (Q1–Q4). Means were consistently higher in Colombia, pointing to stronger day-to-day language benefits at that site, while Japanese responses showed more variability, indicating uneven gains within that cohort. These differences occur within an overall positive range. For RQ2, which examines perceived usefulness and engagement of the maps for understanding and analytically engaging with SDG 16 indicators, ratings were positive at both sites. Awareness of issues (Q5), the interactive learning experience (Q7), and fact gathering via maps (Q8) were rated highly. Analytical thinking (Q6) was higher in Colombia, aligning with that cohort's stronger practical use of the tool, whereas Japan reported slightly higher perceived understanding of SDG 16 (Q9) and of indicator vocabulary via the maps (Q10). Engagement with the tool (Q11) was higher and more uniform in Colombia. Taken together, these results suggest that Colombian students experienced the maps as an effective platform for applied analytical work, while Japanese students reported stronger conceptual uptake related to SDG 16 content. For RQ3, which considers motivation and

behavioral intentions, the clearest contrasts appeared on Q12–Q14. Motivation to learn more (Q12) was higher in Japan, intent to reuse the maps (Q13) was stronger in Colombia, and willingness to recommend the maps to others (Q14) was higher in Japan. A plausible interpretation is that differences in prior exposure to SDGs, comfort with discussion-led classes, and language proficiency shaped how students used the tool, more immediate skill and engagement gains in Colombia, with stronger conceptual and motivational gains in Japan. Again, the contrasts are descriptive and should be interpreted cautiously given the small sample. Detailed item-level interpretations for Q1–Q14 are presented in the subsections that follow.

Table 3. Statistical summary of survey responses

Question	Mean JP	SD JP	Median JP	Mode JP	Mean CO	SD CO	Median CO	Mode CO
Q1. Vocabulary Acquisition	3.94	1.26	4	5	4.24	0.97	4	4
Q2. Listening and Speaking	3.72	1.18	4	4	4.18	0.81	4	4
Q3. Reading Comprehension	3.56	1.25	4	4, 5	4.18	0.73	4	4
Q4. Communication Skills	3.83	1.04	4	4	4.06	0.66	4	4
Q5. Awareness of Issues	3.89	1.08	4	4	3.94	0.56	4	4
Q6. Analytical Thinking	3.39	1.2	4	4	4.06	0.75	4	4
Q7. Interactive Learning Experience	4.28	0.83	4	4, 5	4.35	0.7	4	5
Q8. Fact gathering via maps	4.22	0.81	4	4	4.24	0.56	4	4
Q9. Understanding of SDG 16	4.5	0.71	5	5	4.41	0.71	5	5
Q10. Understanding of Vocabulary via Maps	4.0	1.19	4	5	3.94	0.66	4	4
Q11. Engagement with the Tool	3.94	1.21	4	4, 5	4.41	0.71	5	5
Q12. Motivation for Further Learning	3.67	1.19	4	4	2.76	1.39	2	2
Q13. Intent to Use in Future	3.72	1.02	4	4	4.41	0.62	4	4, 5
Q14. Recommendation to Others	4.56	0.86	5	5	4.35	0.61	4	4

Note: JP = Japan; CO = Colombia. Scale: 1 = Strongly disagree, 5 = Strongly agree. Japan N = 18; Colombia N = 17. Mode ties shown as "4, 5".

Q1. Vocabulary acquisition

The lessons facilitated improved understanding and use of key terms related to SDG 16 (Table 3). The Colombian group reported a slightly higher mean (4.24) than the Japanese group (3.94). Variability was higher in Japan (SD = 1.26) than in

Colombia (SD = 0.97). Medians were 4 in both groups. The modal response was 5 in Japan and 4 in Colombia. These results suggest broadly positive views in both cohorts, with a modest advantage at the Colombian site that may reflect closer English–Spanish lexical proximity and stronger curricular exposure to SDG terminology, while the higher dispersion in Japan points to more heterogeneous experiences across students.

Q2. Listening and speaking

The lessons were associated with perceived gains in listening and speaking (Table 3). The Colombian group reported a higher mean (4.18) than the Japanese group (3.72). Variability was greater in Japan (SD = 1.18) than in Colombia (SD = 0.81). Medians were 4 in both groups, and the modal response was 4 for both. Taken together, these results show positive views across groups. The higher dispersion in Japan may reflect differences in comfort with discussion-led activities. The SDG 16 thematic maps provided a shared reference for communicative tasks, allowing students to practice relevant vocabulary in spoken interaction.

Q3. Reading comprehension

The Colombian cohort reported a higher mean for perceived reading gains (M = 4.18) than the Japanese cohort (M = 3.56) (Table 3). Dispersion was lower in Colombia (SD = 0.73) than in Japan (SD = 1.25). Medians were 4 in both groups; the modal response was a tie (4, 5) in Japan and 4 in Colombia. This pattern fits the demands of the task: reading map legends, indicator notes, and scale explanations. It appears these genres aligned more closely with the Colombian class's content-based coursework, while the wider spread in Japan points to two subgroups, students comfortable with the technical texts (strong agreements) and others reporting smaller gains, likely reflecting uneven familiarity with map conventions.

Q4. Communication skills

The lessons assisted students' ability to communicate ideas related to SDG 16 (Table 3). Students reported gains in communicating ideas about SDG 16. The Colombian cohort showed a slightly higher mean (M = 4.06) than the Japanese cohort (M = 3.83). Variation was greater in Japan (SD = 1.04) than in Colombia (SD = 0.66). Medians were 4 in both groups and the modal response was 4 for both. The maps appear to have provided a concrete focus for explaining and justifying viewpoints, which supported communication in both classes. The tighter clustering in Colombia points to more uniform participation norms or prior experience with content-driven discussion, whereas the wider spread in Japan suggests divergent comfort levels with expressing positions in English during map-based tasks.

Q5. Awareness of issues

Both cohorts clustered around "agree" on understanding key SDG 16 issues (Table 3). The Colombian mean was M = 3.94, very close to Japan's M = 3.89. Dispersion was higher in Japan (SD = 1.08) than in Colombia (SD = 0.56). Medians were 4 in both groups and the modal response was 4 for both. In other words, central tendency is essentially the same, with Colombian answers packed tightly at "agree," while Japanese answers span from neutral to strongly agree. This pattern suggests the maps reliably supported awareness in both groups.

Q6. Analytical thinking

Students reported gains in analyzing SDG 16 data (Table 3). The Colombian cohort showed a higher mean (M = 4.06) than the Japanese cohort (M = 3.39). Variation was greater in Japan (SD = 1.20) than in Colombia (SD = 0.75). Medians were 4 in both groups and the modal response was 4 for both. This pattern suggests that activities requiring comparisons across countries and interpreting indicator patterns were perceived as more effective in the Colombian class, while responses in Japan were more mixed. The tasks appear to have supported analytical moves such as relating indicators to conditions.

Q7. Interactive learning experience

Students rated the interactive elements highly (Table 3). The Colombian mean was M = 4.35 and the Japanese mean M = 4.28. Variation was slightly higher in Japan (SD = 0.83) than in Colombia (SD = 0.70). Medians were 4 in both groups; the modal response was a tie (4, 5) in Japan and 5 in Colombia. This near-ceiling pattern suggests the tool's interactivity was well received in both classes; the Colombian distribution tilts more toward "strongly agree," while Japan shows a split between "agree" and "strongly agree," likely reflecting small differences in interface familiarity or pacing rather than substantive divergence.

Q8. Fact gathering via maps

Both cohorts reported that the maps supported factual retrieval (Table 3). Means were very similar (JP M = 4.22, CO M = 4.24). Variation was lower in Colombia (SD = 0.56) than in Japan (SD = 0.81). Medians were 4 in both groups and the modal response was 4 for both. This pattern fits the nature of the task regarding locating values and reading legends.

Q9. Understanding of SDG 16

High levels of understanding for SDG 16 were reported by both groups of students (Table 3). The Japanese cohort had a slightly higher mean (M = 4.50) than the Colombian cohort (M = 4.41). Dispersion was identical in both groups (SD = 0.71). Medians were 5 for both cohorts, and the modal response was 5 for both. Responses were concentrated at the top of the scale, which indicates that the maps and tasks conveyed the SDG 16 framework clearly in both settings. The identical spread and shared median and mode point to very similar confidence profiles, and the small mean gap is unlikely to be meaningful.

Q10. Understanding of vocabulary via maps

The results show that the interactive online SDG maps helped deepen students' understanding of the SDG indicator vocabulary (Table 3). Means were comparable: Japan M = 4.00 and Colombia M = 3.94. Dispersion differed, with Japan SD = 1.19 and Colombia SD = 0.66. Medians were 4 in both cohorts; the modal response was 5 in Japan and 4 in Colombia. This pattern suggests broadly positive outcomes in both sites, with Japan showing a subgroup of strong endorsements alongside lower ratings from others, and Colombia showing more uniform "agree" responses. A likely explanation is variation in prior exposure to the indicator lexicon rather than differences in general proficiency.

Q11. Engagement with the tool

Using the interactive online SDG maps made the research process more engaging and interesting for students (Table 3). Engagement was high in both cohorts. The Colombian mean was M = 4.41 compared with M = 3.94 in Japan. Variation was lower in Colombia (SD = 0.71) than in Japan (SD = 1.21). The Colombian median was 5 and the Japanese median was 4; modes were 5 in Colombia and a tie (4, 5) in Japan. These results point to stronger and more uniform enthusiasm for the mapping tool in the Colombian class, while responses in Japan split between strong agreement and agreement. The interactive design of the SDG 16 maps enabled students to actively explore data, contributing to an engaging learning experience.

Q12. Motivation for further learning

Motivation differed by site (Table 3). The Japanese cohort reported a higher mean for motivation to continue learning (M = 3.67) than the Colombian cohort (M = 2.76). Dispersion was greater in Colombia (SD = 1.39) than in Japan (SD = 1.19). The median was 4 in Japan and 2 in Colombia; modes were 4 and 2, respectively. This pattern suggests that, despite strong views of the tool and several perceived skill gains, Colombian students were less inclined to pursue further SDG study beyond the class, whereas Japanese students were more open to doing so. A reasonable explanation is differences in perceived relevance or novelty of SDG content across the two programs.

Q13. Intent to use in future

The question measured students' intent to use interactive online SDG maps for future research or projects related to sustainable development. Both cohorts expressed willingness to use the maps again (Table 3). The Colombian mean was M = 4.41, higher than Japan's M = 3.72. Variation was lower in Colombia (SD = 0.62) than in Japan (SD = 1.02). Medians were 4 in both groups; the mode was 4 in Japan and a tie (4, 5) in Colombia. This points to stronger and more consistent intentions to reuse the tool in the Colombian class, while intentions in Japan were positive but more mixed, likely reflecting different views of the maps' relevance to future coursework or projects.

Q14. Recommendation to others

The survey also gauged students' likelihood of recommending interactive online SDG maps to others for learning about SDG 16 (Table 3). Willingness to recommend the maps was high in both cohorts. Japan reported a higher mean (M = 4.56) than Colombia (M = 4.35). Variation was modest and slightly larger in Japan (SD = 0.86) than in Colombia (SD = 0.61). The median was 5 in Japan and 4 in Colombia; modes were 5 and 4, respectively. This pattern points to stronger peer advocacy in the Japanese class, while Colombian students were also positive but clustered at "agree." The maps may have felt especially recommendable to the Japanese cohort due to their perceived novelty in that course context.

Discussion

In relation to the research questions, a coherent pattern emerged. For RQ1, students in both cohorts reported perceived gains across core language skills

following the map-based lessons. For RQ2, the interactive maps were viewed as useful for understanding SDG 16 and for analytically engaging with indicators, with comparatively stronger operational and tool-engagement ratings in Colombia and slightly higher conceptual ratings in Japan. For RQ3, cohort contrasts were most evident in motivation and intended use: Colombian students expressed greater intent to reuse the tool, while Japanese students indicated higher motivation to continue learning and a greater willingness to recommend the approach. The paragraphs that follow interpret these patterns.

Interactive online thematic maps were perceived as effective both for language development and for substantive engagement with SDG 16. This aligns with multimedia learning accounts that highlight the value of combining visual and verbal inputs to support processing and retention (Mayer, 2009) and with CLIL and pluriliteracies arguments that working with disciplinary representations can encourage vocabulary growth and content understanding in the target language (Coyle et al., 2010; Coyle & Meyer, 2021). Prior classroom studies using thematic and story maps similarly report improvements in communication, vocabulary, and task engagement, which is consistent with the present findings (Perrem & Habte-Gabr, 2024; Rico-García & Fielden Burns, 2024).

The international cross-site profile adds nuance to these literatures. Colombian students tended to rate operational use and task engagement more highly and showed tighter clustering of responses, whereas Japanese students gave slightly higher ratings on conceptual understanding and peer advocacy but exhibited greater variability. This asymmetry contrasts with reports of parallel improvements in language and content in some content-integrated courses (Lai, 2024) and cautions against assuming that affective outcomes will rise in step with performance. In the Colombian cohort, strong engagement and intent to reuse coexisted with relatively lower motivation to continue SDG study, which suggests that how digital maps are positioned within a curriculum and the degree of learner autonomy may shape perceived value beyond a single unit (Jones et al., 2004). Greater dispersion in the Japanese data is also compatible with research on novice variation in representational fluency and choropleth interpretation, where differences in reading legends, color ramps, and scales can produce heterogeneous experiences even when central tendency is positive (Beitlová et al., 2020; Schiewe, 2019).

Beyond surface description, students linked map patterns with socio-political topics and reported using map evidence to support claims, which is consistent with the aim of moving toward analytical engagement. This trajectory resonates with critical pedagogy perspectives that position classrooms as spaces for reflection on social issues and for practicing reasoned stance-taking in a second language (Freire, 2000; Giroux, 1988; Norton & Toohey, 2004). The pattern of differences across sites suggests that perceived benefits are moderated by local course aims, prior familiarity with SDG content, and routine with discussion-led tasks. Where operational ratings were stronger, students also tended to express clearer intentions to reuse the tool; where conceptual understanding and peer advocacy were stronger, variability across learners was higher, which is consistent with uneven comfort with map conventions among novices (Beitlová et al., 2020; Schiewe, 2019).

These results point to practical steps that are consistent with the literature and responsive to the observed profiles. Where operational skills trail, brief pre-teaching of indicator vocabulary, short guided walk-throughs of legends and scales,

and modeled comparison language can raise confidence during map work (Coyle & Meyer, 2021; Schiewe, 2019). Where motivation is weaker despite strong engagement, offering limited choice of countries or indicators and building toward small tangible outputs, such as a concise comparative brief, may clarify the payoff beyond a single lesson (Jones et al., 2004). To reduce heterogeneity, quick orientation tasks that model how to read and compare indicators, coupled with sentence starters that connect observations to claims, could align participation. Where conceptual understanding is already strong, retaining explicit framing of SDG 16 while reallocating time to hands-on exploration may help balance conceptual and operational outcomes.

Conclusion

The study suggests that interactive thematic maps may be a useful tool for integrating language learning with global issues like SDG 16. Both Japanese and Colombian students reported improvements in language skills and better understanding of SDG indicators, with motivation mixed across cohorts. The interactive nature of the online thematic maps was perceived to help students explore complex concepts, supporting analytical thinking and engagement. However, these findings should be interpreted with some caution due to limitations regarding the small sample size and the use of self-reported data. Despite these limitations, the findings suggest that interactive online thematic maps may have broader potential in EFL contexts for addressing other SDGs beyond SDG 16. This opens new possibilities for future research using choropleth maps from a GILE perspective, enabling students to engage with a wider range of global challenges in the language classroom. Given the encouraging results observed in this study, further inquiry is warranted to test the effectiveness and adaptability of this approach in diverse international contexts and with other language speakers. Studies could also explore how thematic map-based instruction influences student collaboration, peer interaction, and intercultural competence. Additionally, longitudinal research could assess whether learning outcomes related to language skills and global understanding are retained over extended periods.

Acknowledgements

The authors would like to sincerely thank the students who participated in the study. We also wish to thank the reviewers of the paper for their valuable feedback.

References

Akbana, Y. E., & Yavuz, A. (2020). Global issues in EFL teaching: EFL lecturers' voices at a state university. *Kahramanmaraş Sütçü İmam University Journal of Education, 2*(1), 83–102.

Al-Amin, M., & Greenwood, J. (2018). The UN Sustainable Development Goals and teacher development for effective English teaching in Bangladesh: A gap that needs bridging. *Journal of Teacher Education for Sustainability*, *20*(2), 118–138. https://doi.org/10.2478/jtes-2018-0019

Arslan, S., & Curle, S. (2021). Sustainable Development Goals in the English language high school curriculum in Turkey. *European Journal of Education*, *56*(4), 681–695. https://doi.org/10.1111/ejed.12473

Astawa, P. S. N. P. L. N., Santosa, H. M., Artini, P. L., & Nitiasih, K. P. (2024). Sustainable development goals in EFL students' learning: A systematic review. *PEGEM Journal of Education and Instruction*, *14*(2), 1–11. https://doi.org/10.47750/pegegog.14.02.01

Bajaj, M., & Hantzopoulos, M. (Eds.). (2016). *Peace education: International perspectives*. Bloomsbury Publishing.

Basyari, I., Segara, N., & Fhazarwati, D. (2021). Utilizing thematic maps to develop Indonesia natural resources analytical skills. *IOP Conference Series: Earth and Environmental Science*, *683*, Article 012054. https://doi.org/10.1088/1755-1315/683/1/012054

Beitlová, M., Popelka, S., & Voženílek, V. (2020). Differences in thematic map reading by students and their geography teacher. *ISPRS International Journal of Geo-Information*, *9*(9), Article 492. https://doi.org/10.3390/ijgi9090492

Cardiff, P. (2023). Developing an awareness of the sustainable development goals in EFL. *Literacies and Language Education: Research and Practice*, *Spring 2023*, 27–40.

Cates, K. A. (2002). Teaching for a better world: Global issues and language education. *Human Rights Education in Asian Schools*, *5*, 41–52. https://www.hurights.or.jp/archives/pdf/asia-s-ed/v05/06cates.pdf

Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education* (8th ed.). Routledge.

Coyle, D., & Meyer, O. (2021). *Beyond CLIL: Pluriliteracies teaching for deeper learning*. Cambridge University Press.

Coyle, D., Hood, P., & Marsh, D. (2010). *CLIL: Content and language integrated learning*. Cambridge University Press.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage.

de la Fuente, M. J. (Ed.). (2021). *Education for sustainable development in foreign language learning: Content-based instruction in college-level curricula*. Routledge.

Dörnyei, Z., & Taguchi, T. (2010). *Questionnaires in second language research: Construction, administration, and processing* (2nd ed.). Routledge.

Freire, P. (2000). *Pedagogy of the oppressed (M. B. Ramos, Trans.; 30th anniversary ed.)*. Continuum. (Original work published 1968)

Giroux, H. A. (1988). *Teachers as intellectuals: Toward a critical pedagogy of learning*. Bergin & Garvey.

Habte-Gabr, E. E. (2017). CLIL in the English as a foreign language (EFL) university class: Incorporating thematic world maps in learning. *Papeles*, *9*(17), 69–78. http://dx.doi.org/10.54104/papeles.v9n17.470

Herweg, K., Zimmermann, A. B., Lundsgaard-Hansen, L., Tribelhorn, T., Hammer, T., Tanner, R. P., Trechsel, L., Bieri, S., & Kläy, A. (2017). *Integrating sustainable development into higher education: Guidelines with in-depth modules for the University of Bern*. University of Bern.

Jawad, H. F. (2024). The impact of English language proficiency on achieving sustainable development. *International Journal of Multidisciplinary Research and Growth Evaluation*, *5*(6), 366–372.

Jodoin, J. J., & Singer, J. (2019). A framework for integrating education for sustainable development. *Osaka JALT Journal*, *6*, 51–66.

Jones, A., Blake, C., Davies, C., & Scanlon, E. (2004). Digital maps for learning: A review and prospects. *Computers & Education*, *43*(1–2), 91–107.

Kanwal, A. (2024). An ecolinguistic study of language teachers as activists in promoting dialogue on SDGs. *Journal of Language Teaching and Research*, *15*(5), 1593–1602. https://doi.org/10.17507/jltr.1505.20

Lai, C. J. (2024). The effects of hands-on content-language integrated learning on fourth graders' acquisition of target vocabulary and procedural knowledge in Taiwan. *Humanities and Social Sciences Communications*, *11*, Article 1397. https://doi.org/10.1057/s41599-024-03960-z

Leicht, A., Heiss, J., & Byun, W. J. (Eds.). (2018). *Issues and trends in education for sustainable development*. UNESCO. https://doi.org/10.54675/YELO2332

Maley, A., & Peachey, N. (Eds.). (2017). *Integrating issues in the creative English language classroom: With reference to the United Nations sustainable development goals*. British Council.

Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press.

Milton, S. (2021). Higher education and Sustainable Development Goal 16 in fragile and conflict-affected contexts. *Higher Education*, *81*(1), 89–108.

Norton, B., & Toohey, K. (2004). *Critical pedagogies and language learning*. Cambridge University Press.

Perrem, J. G. (2021). Geographical imagination: Student perceptions of using maps in EFL university classes. *Journal of Language and Culture of Hokkaido*, *19*, 95–116. https://u.muroran-it.ac.jp/hlc/2021/06.pdf

Perrem, J. G., & Habte-Gabr, E. E. (2024). A study using thematic maps for vocabulary acquisition in Japanese and Colombian university English classes. *Memoirs of Muroran Institute of Technology*, *73*, 36–48. https://muroran-it.repo.nii.ac.jp/records/2000168

Ramineli, J. L. F., da Silva, N. C., & de Araújo, M. F. F. (2023). The Sustainable Development Goals from the perspective of Freirean praxis. *Professare*, *12*(3), 1–11. https://doi.org/10.33362/professare.v12i3.3221

Reardon, B. A. (1988). *Comprehensive peace education: Educating for global responsibility*. Teachers College Press.

Rico-García, M., & Fielden Burns, L. V. (2024). Charting cultural fluency: Leveraging digital story maps for language proficiency in ESP education. *Research in Education and Learning Innovation Archives*, *33*, 58–79. https://doi.org/10.7203/realia.33.27589

Sachs, J. D., Lafortune, G., & Fuller, G. (2024). *The SDGs and the UN Summit of the Future*. Dublin University Press.

Schiewe, J. (2019). Empirical studies on the visual perception of spatial patterns in choropleth maps. *KN-Journal of Cartography and Geographic Information*, *69*(3), 217–228. https://doi.org/10.1007/s42489-019-00026-y

United Nations Development Programme. (2024, February 15). *SDG 16: Peace, justice and strong institutions: Promote peaceful and inclusive societies*. https://www.undp.org/asia-pacific/publications/sdg-16-peace-justice-and-strong-institutions-promote-peaceful-and-inclusive-societies

Yang, Y., Dwyer, T., Marriott, K., Jenny, B., & Goodwin, S. (2020). Tilt map: Interactive transitions between choropleth map, prism map and bar chart in immersive environments. *IEEE Transactions on Visualization and Computer Graphics*, *27*(12), 4507–4519. https://doi.org/10.48550/arXiv.2006.14120

Appendix

Lesson overview and procedures for SDG 16 mapping sequence

Lesson	Continent	Countries (SDG 16 status)	Indicators	Class procedure
1	Europe	Iceland (SDG Achieved); Netherlands (Significant Challenges Remain); Serbia (Major Challenges Remain)	1. Homicides 2. Sentenced Detainees	1) Discussion – ask students what biggest problems facing the world are. 2) Introduce SDGs (term only, not the definitions). 3) Do Listen and Repeat for Pronunciation. 4) Provide pairs matching activity where students match the SDG with the definition (Reading). 5) Show correct answers for matching activity. 6) Paraphrasing Partner for SDGs – show SDG icon and partner must explain the SDG to their partner. 7) Explain we are going to focus on SDG 16; provide background information on SDG 16. 8) Show the SDG Maps on the website. 9) Interactive maps from the SDG Index website, focusing on SDG 16: https://dashboards.sdgindex.org/map/goals/SDG16 10) Provide students with the vocabulary sheet. 11) Elicit responses for meaning and explain each of the terms. 12) Group Discussion – students share initial perceptions about what they expect in relation to SDG 16 for European countries. 13) Show the interactive SDG map for Europe – ratings and trends. 14) Have students research the following two indicators and compare information/trends: Homicides; Sentenced Detainees. 15) Europe focus countries: Iceland; Netherlands; Serbia. 16) Have them note similarities, differences, and trends. (Comparisons English). 17) Report back – groups share findings. 18) Provide feedback. Conclude Thematic Maps Project (TMP) lesson.
2	Africa	Senegal (Significant Challenges Remain); South Africa (Major Challenges Remain); Egypt (Major Challenges Remain)	1. Population who feel safe walking alone at night in the city or area where they live 2. Birth registration with civil authority	1) Memory check – for lesson 1 vocabulary. 2) Explain that the SDG map focus will be on Africa today. 3) Explain SDG Indicator Vocabulary. 4) Group Discussion – students share initial perceptions about what they expect in relation to SDG 16 for African countries. 5) Show the interactive SDG map for Africa – ratings and trends. 6) Have students research the two indicators and compare information/trends. 7) Africa focus countries/status: Senegal – Significant Challenges Remain; South Africa – Major Challenges Remain; Egypt – Major Challenges Remain. 8) Note similarities, differences, and trends. 9) Report back. 10) Provide Feedback. Conclude TMP Lesson.
3	South America	Chile (Significant Challenges Remain); Bolivia (Major Challenges Remain); Brazil (Major Challenges Remain)	1. Corruption Perception Index 2. Children Involved in Child Labor	1) Memory check – for lesson 2 vocabulary. 2) Explain that the SDG map focus will be on South America today. 3) Explain SDG Indicator vocabulary. 4) Group Discussion – share initial perceptions for SDG 16 in South American countries. 5) Show the interactive SDG map for South America – ratings and trends. 6) Research the two indicators; compare information/trends. 7) South America focus countries/status: Chile – Significant Challenges Remain; Bolivia – Major Challenges Remain; Brazil – Major Challenges Remain. 8) Note similarities, differences, trends. 9) Report back. 10) Provide Feedback. Conclude TMP Lesson.
4	Asia	South Korea (Challenges Remain); Malaysia	1. Exports of Major Conventional Weapons	1) Memory check – for lesson 3 vocabulary. 2) Explain that the SDG map focus will be on Asia today. 3) Explain SDG Indicator vocabulary. 4) Group Discussion – initial

		(Significant Challenges Remain); India (Major Challenges Remain)	2. Press Freedom Index 3. Access and Affordability to Justice	perceptions/expectations for SDG 16 for Asian countries. 5) Show the interactive SDG map for Asia – ratings and trends. 6) Research three indicators; compare information/trends: Exports of Major Conventional Weapons; Press Freedom Index; Access and Affordability to Justice. 7) Asia focus countries/status: South Korea – Challenges Remain; Malaysia – Significant Challenges Remain; India – Major Challenges Remain. 8) Note similarities, differences, trends. 9) Report back. 10) Provide Feedback. Conclude TMP Lesson.
5	North America	Canada (Significant Challenges Remain); USA (Major Challenges Remain); Mexico (Major Challenges Remain)	1. Timeliness of Administrative Proceedings 2. Expropriations are lawful and adequately compensated 3. Persons Held in Prison	1) Memory check – for lesson 4 vocabulary. 2) Explain that the SDG map focus will be on North America today. 3) Explain SDG Indicator vocabulary. 4) Group Discussion – initial perceptions for SDG 16 for North American countries. 5) Show the interactive SDG map for North America – ratings and trends. 6) Research three indicators; compare information/trends: Timeliness of Administrative Proceedings; Expropriations are lawful and adequately compensated; Persons Held in Prison. 7) North America focus countries/status: Canada – Significant Challenges Remain; USA – Major Challenges Remain; Mexico – Major Challenges Remain. 8) Note similarities, differences, trends. 9) Report back. 10) Provide Feedback. 11) Explain and distribute the TMP SDG 16 Questionnaire. 12) Collect the Questionnaire. 13) Conclude Lesson.

Note. Continents and Countries (All Lessons). 1. Europe: Iceland, Netherlands, Serbia. 2. Africa: Senegal, South Africa, Egypt. 3. South America: Chile, Bolivia, Brazil. 4. Asia: South Korea, Malaysia, India. 5. North America: Canada, USA, Mexico. Indicators Covered in Which Lesson. Lesson 1: 1. Homicides 2. Sentenced Detainees. Lesson 2: 1. Population who feel safe walking alone at night in the city or area where they live 2. Birth registration with civil authority. Lesson 3: 1. Corruption Perception Index 2. Children Involved in Child Labor. Lesson 4: 1. Exports of Major Conventional Weapons 2. Press Freedom Index 3. Access and Affordability to Justice. Lesson 5: 1. Timeliness of Administrative Proceedings 2. Expropriations are lawful and adequately compensated 3. Persons held in prison.