ARTICLE

Implementing story maps as a teaching tool at a CODeL institution

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ABSTRACT

New technological competencies are required in a changing world to address complex global challenges. This research aims to evaluate the integration of story maps as a teaching tool in an online classroom for a fourth-year university Geography module. Data were collected through analysis of assignment answers for this module submitted in the 2024 academic year. Throughout the semester and during assignment marking, the challenges students faced in this module were recorded. This information was noted from student assignments, as well as from discussions in the weekly online lectures, individual student inquiries, email correspondence, and on the discussion forum on the module e-learning website. Thematic analysis of the data, drawing on research notes and the students' reflections in the prescribed assignment, was conducted. Results of this study suggest that story maps should not be used as an alternative to a single written assignment but rather be incorporated as a teaching tool into the module content throughout the learning period. Visual communication through story maps can support academic learning outcomes and contribute to the development of students' spatial thinking skills.

Keywords: Assessment, Spatial thinking, Story maps, Teaching and learning, Visual literacy

INTRODUCTION

New technological competencies are required to address complex challenges in a changing world. The application of story maps in the teaching and learning of Geography goes beyond the use of technology because visual literacy, spatial literacy, computer literacy, and technological competencies are closely intertwined (Park, 2022). Stokes (2002) emphasised the importance of using visual materials in teaching to promote visual skills, alongside verbal, reading, and mathematical skills. Geography is ideally suited to develop students' visual literacy and spatial thinking skills (Bednarz & Lee, 2019; Bednarz & Mitchell, 2025). Visual literacy refers to an individual's ability to interpret images meaningfully and create effective visual messages (Stokes, 2002; Avgerinou & Pettersson, 2020). Balancing relevant texts with multimedia is essential for effective visual communication (Caquard & Dimitrovas, 2017). The use of story maps in teaching and assessment in Geography offers a method for increasing cognitive and spatial understanding (spatiality) (Tasliya et al., 2023). As an example, ArcGIS StoryMaps is described on their website as 'a story authoring web-based application that allows you to share your maps in the context of narrative text and other multimedia content.' It is an integrated set of map(s), related content (text, photos, video, embedded items, lists, images, graphs), and functionalities such as (pan/zoom, pop-ups, swipe, time slider, etc.) that makes it a fully functioning information product that can 'seamlessly integrate live maps, real-time data, multimedia, and more within a slide-based format' (ESRI, 2025).

Several studies have described the perceptions of students on story maps in Geography teaching and learning (e.g., Strachan & Mitchell, 2014; Cope et al., 2018), increased geo-capability in presenting story maps within the context of geographical information systems (Tian et al., 2022) and the use of story maps as assignments in Geography (Treves et al., 2021). Previous work also includes an evaluation of story maps by future Geography teachers (Vojteková et al., 2022). However, in the context of online learning, limited attention has been given to the use of story maps. The focus of this study is to reflect on an experiment in online teaching that deals with the integration of story maps as a teaching tool. The study objectives were to (1) document the challenges students faced in completing assignments; (2) assess how students perceive the role and value of story maps; and (3) recommend teaching and learning strategies for using story maps in online education.

BACKGROUND ON THE TEACHING CONTEXT

A Comprehensive Open Distance eLearning (CODeL) institution entails teaching and learning undertaken at a physical distance between the lecturer and students (Gezani, 2024; Letseka et al., 2025). Teaching and learning occur via a virtual learning platform and can be synchronous or asynchronous (Maré & Mutezo, 2020). In a fully online teaching mode, the lecturer facilitates the learning process, and students participate in peer discussions (Ngubane-Mokiwa, 2017). Collaborative learning takes place in

virtual discussion forums on the e-learning site. Theoretically, this should lead to virtual communities of practice within the online environment (Kretovics, 2003; Maré & Mutezo, 2020). It is essential for the lecturer to provide a clear structure, including learning outcomes, module content and resources, various types of assessment, and sources of support available for students. Students, at their own pace, should regularly visit the module website to read the learning materials and complete activities electronically. Various e-learning tools are available on the module website, including weekly online lectures, and question-and-answer sessions that support students in their learning. They can pose questions during online lectures and email lecturers or send messages via the module's e-learning platform. Lectures are recorded and made available as additional resources for students to review or access if they have missed a class. Due to the online system's flexibility, students can take responsibility for their own progress in the module. In the e-learning environment, students can log in to the module site at any time to access lectures, read materials, listen to multimedia, and complete their online activities. Should they need additional support, they can also request an individual online meeting with the lecturer.

The selected module is part of an Honours (4th-year) degree programme in Geography. The module aims to guide students in developing their voice on human resource issues across regions of the Global South (Pretorius et al., 2015). A spatial problem-based learning approach is followed in the module. The teaching and learning strategies are grounded in observations of the local environment, the identification of real-world challenges related to the Sustainable Development Goals (SDGs), a literature review, and the creation of a story map. This module was selected for this study because the researcher is the primary lecturer on the module. It also proved suitable for applying story maps as a visualisation tool in students' local contexts.

In 2024, 67 students were registered for this module. The student cohort is not homogeneous. There are considerable differences in age, background, access to tools, and technological proficiency in navigating the e-learning environment. The module is offered in English only. To accommodate the language composition of the class of 2024 (Figure 1), an electronic glossary of commonly used geographical terminology was made available to the students.
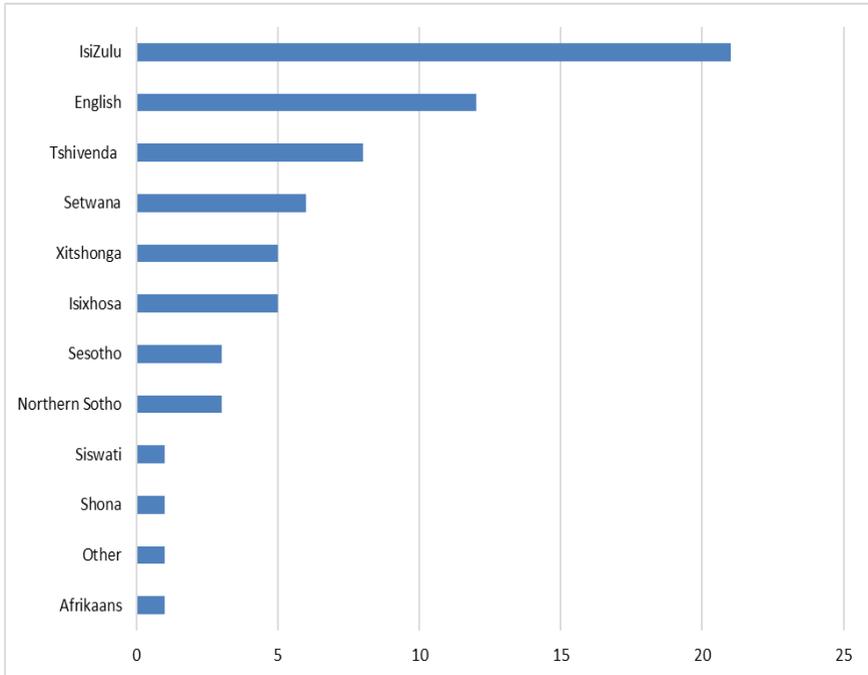
Figure 1. Language composition of the class of 2024 (%)

The residence location of registered students for the 2024 academic year is presented in Figure 2. Transactional distance is becoming more important than geographical distance in online interactions (Moore, 2018; Rakoma, 2018). The locations of students is therefore less important than their connectivity and their ability to interact regularly with the module's online materials. Previous research on the challenges faced by online students has recommended providing additional technical support to students from rural areas (Ratoma, 2018; Zwane & Mudau, 2024).
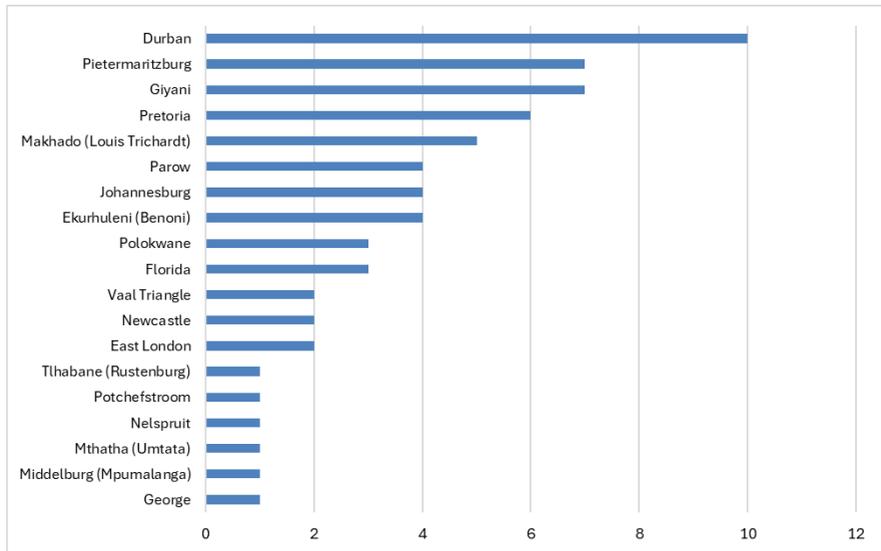
Figure 2. Location of residence of registered students in 2024 (%).

METHODOLOGY

A qualitative case study approach was followed. Data were collected through the observation and analysis of students' assignment answers. During the 2024 academic year, the lecturer documented the challenges that students faced while completing their assignments. Notes were taken of the weekly online lectures and individual inquiries, student emails, and responses to the discussion forum on the module website. With consent, the PDF documents of students' assignments were imported as source data files, which were then thematically analysed using ATLAS.ti25 software (Cope et al., 2018). In the assignment, the first step was for students to respond to ten questions to plan their story map. Based on this, they were then tasked with creating their story map. Finally, they were asked to reflect on the advantages and challenges of creating and using story maps. For data analysis, a hybrid approach to thematic coding was followed. Initial coding, using *a priori* codes based on the elements of the question, was followed by inductive coding to identify sub-codes that emerged from the students' answers. Structural coding added to the validity of the data and the transparency of the research.

The Health Research Ethics Committee of the College of Agriculture and Environmental Sciences at the University of South Africa (UNISA: Ref: #2024/CAES_HREC/5496) granted ethical clearance for this research. The Unisa Research Permission Committee (RPC) of the Senate Research, Innovation, Postgraduate Degrees, and Commercialisation Committee (SRIPCC) approved the use of UNISA data for this research (Ref: 2024-RPC_088).

RESULTS

None of the students registered in 2024 had prior knowledge of, or experience with, story maps. The students were introduced to story maps in an online session. They were also referred to ESRI guidelines on creating an account and story maps, through the ESRI website. The lecturer assumed that the students would be able to use the provided guidelines to create their story maps intuitively. However, this was not the case and follow-up online sessions were required where the lecturer provided individual guidance and support via email or virtual meetings. Weekly online sessions provided students with the opportunity to ask questions and discuss aspects of the assignment with the lecturer and their peers. They were invited to submit technical questions in advance of the online class to ensure effective support. Unfortunately, only about 10% of the class regularly attended the online sessions which were recorded and made available on the module website. Some students preferred listening to recordings using nighttime data rather than attending synchronous online discussions. Students could also post questions on an online discussion forum at any time. The flexibility of the online learning context enabled both synchronous and asynchronous student support.

Thematic analysis of assignment answers

Content analysis was conducted on the students' responses to the assignment. Students could select their own topic, reflect on where the story map could be used, and on the process of creating their own story map.

The following independent thematic codes were applied manually:

- Topic,
- The benefits associated with story maps and their applications,
- The challenges encountered,
- The lessons learned and recommendations for successfully creating story maps.

Based on students' reflections on the story map assignment, sub-codes were created under each of the aforementioned codes. Data could therefore be categorised to create themes. Figure 3 represents the frequency of topics in the 60 story maps submitted. Many of these topics conform to several SDGs. For example, water, waste, and sanitation were the most frequently addressed themes in the assignments and this conforms with SDG 6 (Ensure the availability and sustainable management of water and sanitation for all). The theme of Zero Poverty is encapsulated in SDG 1. SDG 11 (Sustainable Cities and Communities) was addressed under the themes of informal settlements, inadequate infrastructure, and inadequate service provision. SDG 15 (Life on Land) and SDG 4 (Quality Education) were also addressed in the assignment answers.
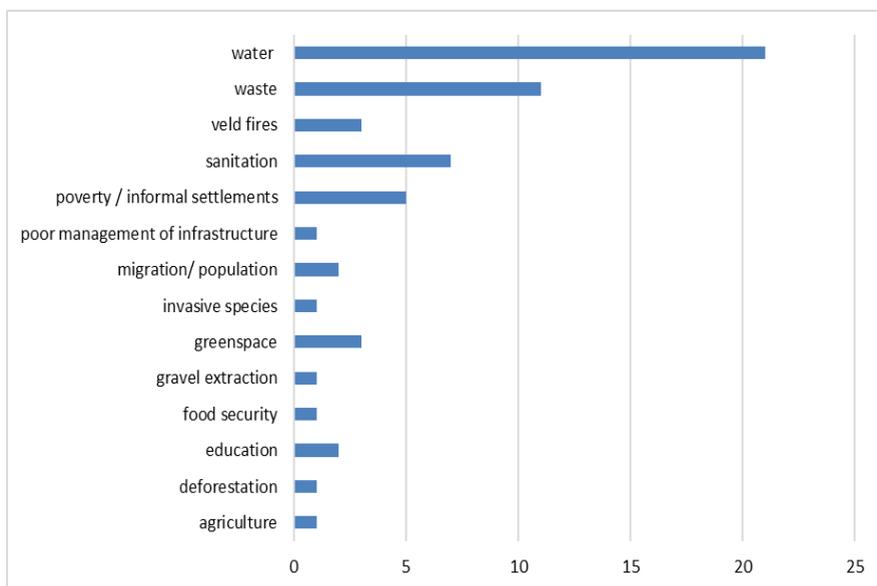
Figure 3. Topics presented in the story maps submitted by the students (%).

Benefits and applications of story maps

Students were asked to reflect on the assignment by identifying the benefits and uses of story maps. Table 1 presents themes identified across all benefits and applications, as determined from the students' assignment answers. Selected students' responses to the perceived benefits of the use of story maps, indicating the document code (D) imported into ATLAS.ti, are shown in Table 2.

Table 1. Benefits and applications of story maps derived from assignment answers.

Benefits	Applications
• Catch the attention of the reader • Fun to use • Integrate maps, videos, photographs, and text, and have links to documents and websites (multimedia) • Facilitate a better understanding of complex issues • Promote interactivity • Create opportunities for creativity • Use colour images • Integrate and store data from different sources	• In Education – from the primary to the tertiary level • In Government and in policymaking • In the dissemination of research findings • In advocacy • In social media • On the Internet / Websites • In public participation initiatives • In community development • In non-profit organisations • In planning

Benefits	Applications
• Available as cost-free versions • Accessible • User-friendly (easier to apply than GIS) • Have the potential to incorporate GIS • Used in a variety of contexts • Flexible in terms of the dissemination of information to different audiences • Promote visual communication • Visually represent the spatial context of an issue, event, or theme. • Convey a clear and impactful message • Useful in different contexts	• In project proposals • In conservation • In marketing • At corporate events/meetings • In presentations at the workplace

Table 2. Reflection on the benefits and applications of story maps.

'The advantage of using ESRI StoryMap software [is] that it is very interactive. Once you get the hang of using and navigating the website and stuff, it becomes enjoyable to read the different stories. The software makes it easy to combine geographical data with images and videos to tell a story. You can be as creative as you want without a lot of restrictions. I also like that there is so much that you can do with the free version, as a beginner, without the need to buy a subscription.' D4

'The communication in the story map is clear; it can be a tool used by teachers or universities to illustrate how geographic and social dynamics can be used to engage society.' D5

'Story maps enable the incorporation of interactive maps, images, videos, and infographics, which simplify the comprehension of complicated topics such as water scarcity and make them more captivating for the viewers. Incorporating GIS data into one platform, along with textual information, enhances the presentation of the spatial dimensions of various resource challenges, such as the geographical distribution of [the elements of] climate change, migration, and infrastructure issues. The capability to share the story map online broadens its accessibility to a wide audience, aiding in raising awareness about South Africa's water issues and possible solutions outside of conventional methods, such as reports.' D6

'The benefits of using story maps: They provide visual clarity and are direct and to-the-point, making it easier to understand and interpret the content on the story map. With the coordination of pictures, videos, and maps, [the story map] engages and captures the attention of the audience. Browsing through other story maps, one realizes that this is the tool that can be used for educational purposes, to plan and provide a report on a project. The story map that one has created can be used by [the] local municipality when drafting integrated waste management [strategies] and integrated development plans. It can be used by catchment management forums to ascertain the source and causes of pollution. It can be used by the South African National Biodiversity Institute (SANBI) as they monitor aquatic ecosystems.' D7

'Story maps may be an effective teaching tool to improve geographical or spatial thinking, which is predicted to be a prerequisite for success in many STEM [science, technology, engineering, and mathematics] fields.' D16

'It is a competent tool that is used in the business world for staff orientation, making market events known, and promoting business activities. On a broader scale, the use of story maps encompasses [aspects such as] climate change, demography, and urbanization.' D13

'Story maps, which concentrate on particular geographical regions, can highlight local resource management issues and motivate action by illustrating [these issues]. Users can publish their story maps visually [and display their content] for others to see.' D16

'The story map can also be used by decision-makers to strategically plan for the conservation and preservation of" [recreational and conservation areas and for ecosystem monitoring].' D17

Reflection on challenges faced while creating story maps and lessons learnt

The sub-themes related to challenges in the use of story maps were identified using ATLAS.ti (Figure 4). Creating a story map can be overwhelming for inexperienced users and more time was required to create story maps for assignments than was initially anticipated. Furthermore, achieving visual balance among the story map's components is difficult, as the map can quickly become cluttered. This type of assignment is more data-intensive than a written essay and therefore poses challenges in terms of the cost of internet data. One of the challenges in this research was to access relevant data and statistics to present in the story map, thereby substantiating the intended message. Students also experienced equipment challenges that impacted the creation of a story map for the assignment. Some direct reflections on these challenges by students (Table 3) can also supplement and expand upon the identified sub-themes.
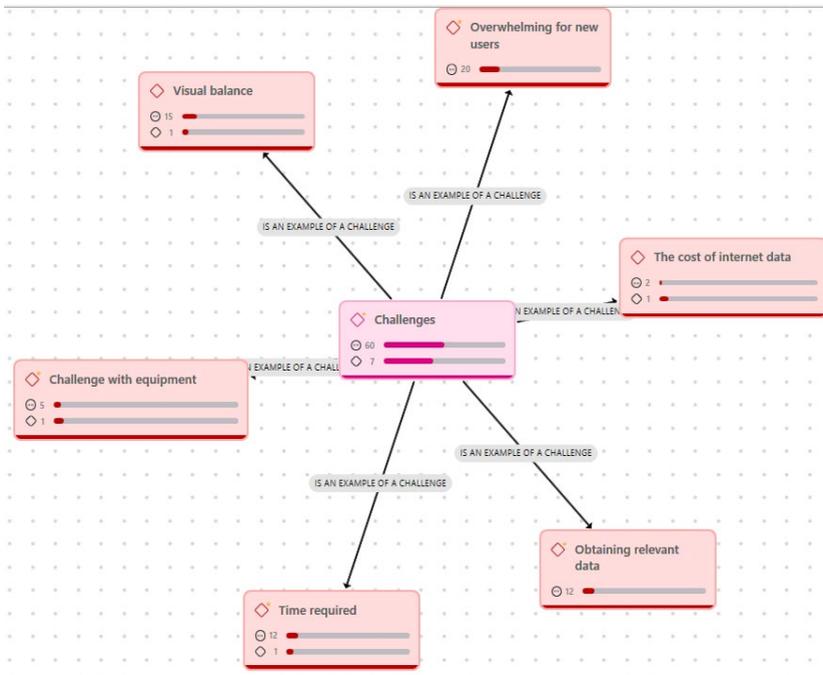

Figure 4. Sub-themes of the identified challenges experienced when creating story maps.

Table 3. Reflections on the challenges associated with the technical aspects of mapmaking.

'I think my laptop is a little bit outdated because when I tried to create my map, my basemaps wouldn't show on my screen. I had to watch a lot of YouTube tutorials, but I just could not get my story map started. I managed to borrow an updated laptop, and I got my work done, thankfully. Another challenge was underestimating the time this Story Map would end up taking. When creating a story, ample time is needed, especially when you are a beginner. Lesson learned.' D4
'In terms of the technical aspects, I did not encounter significant difficulties. I [had] prior experience working with GIS software, which made this project extremely enjoyable. However, I did face challenges with time management, particularly in balancing my work and university commitments.' D6
'It was challenging to locate precise and current data concerning water consumption, infrastructure, and migration patterns, particularly in a suitable format for ESRI Story Map. Finding the right [balance] between captivating visuals and detailed content proved to be challenging. An excess of data could be too much for the audience, whereas a lack of information may not convey the complexity of the water scarcity problem effectively. Proficiency in utilizing the ESRI platform's various functions, including incorporating dynamic maps, videos, and interactive content, involved a learning process, especially in coordinating spatial data with storytelling components.' D6
'ESRI [Story Map] is good in visualizing geographic data, but simplifying technical information for beginners and non-experts can be [intimidating] and difficult. So, it would be useful for ESRI to use simple language to make it easy for beginners to understand the software.' D51
'I had some difficulty making the map at first. It was very new to me, and I needed to refer back to the recorded lectures multiple times before getting the hang of it. I also struggled with editing text and had issues with spacing. However, overall, the map-making and story map database were relatively user-friendly, and I feel that I will get better at it with time.' D57

Despite the challenges presented in Figure 4 and Table 3, positive comments were also made by students regarding what they had learnt through the assignment and their intention to create more story maps in the future (Table 4). The story map assignment was 'more interesting than the average PDF assignments we typically have to submit' (D57).

Table 4. Reflections on what was learned.

'The learning process was an eye-opener for me in terms of how information can be compiled and presented in a literary and visual way by incorporating maps and pictures. I think it [would also be helpful] to consider creating different versions of the story map for different audiences, such as one for policymakers that focuses on data-driven solutions and one for the general public with more educational content.' D6
'To use ESRI Story map was very challenging for me because it was the first time writing about it, but with the resources that [she] was giving, it was very significant and very helpful as I managed to create my own story map using the guidelines from our Lecturer.' D29
'Creating the story map was essentially a fun-filled and refreshing experience. However, I found it slightly challenging to balance my content with visual aids, as the internet connection was [intermittent] due to bad weather conditions. [Cutting] my content to the [specifications of the] design elements was very time-consuming. Apart from these two issues, I enjoyed utilizing this tool as part of the assignment.' D25

'One of the most challenging aspects of creating this story map was gathering sufficient data, integrating diverse data sources, and balancing visual appeal with informational clarity. Another difficulty was ensuring that the narrative flowed logically. These challenges highlighted the importance of careful planning and resource management in such projects.' D33

'Those using StoryMaps should be encouraged to learn how to analyze spatial, social, and environmental data in order to draw conclusions from maps and other visual aids in creating more compelling stories. Story maps have the potential to produce convincing arguments for global issues such as deforestation, climate change, and biodiversity loss, and [their] use should be promoted in the corporate world to reach a wider audience.' D25

DISCUSSION

The findings of this study relate to the context in which teaching and learning occur (Letseka et al., 2025), to general technical challenges, and to assignment-specific challenges (Figure 5). These are now examined.
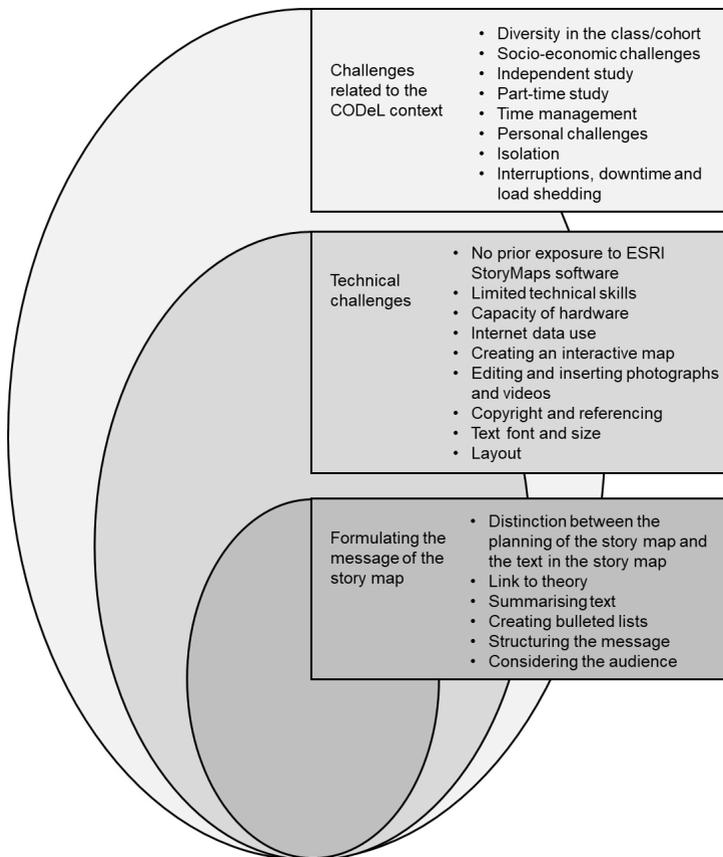

Figure 5. Challenges faced by students through the assignment process.

Findings related to the CODeL context

Challenges in the South African socio-economic context filter into the online learning environment. This research confirms the findings of other researchers on challenges experienced by online learning students (Rakoma, 2018). In fully online delivery, limited internet accessibility can be a barrier to learning (Ngubane-Mokiwa, 2017; Maré & Mutezo, 2020). Accessibility was also affected by load shedding, interruptions, or downtime in the virtual learning environment, as well as by the cost of internet data. Due to the visual nature of the story map assignment, more internet data was required than would have been the case for a written essay-type assignment.

Various e-learning activities were available on the module site. Discussion forums were created to support the development of a community of practice. Participation in online activities during the learning period, however, was lower than expected. This phenomenon has been found in other online learning environments and could be compared to survey fatigue (Adams & Umbach, 2012). The fact that marks were not allocated to students for participation in the online discussion forums may explain their limited participation. All students, however, participated in the assessed Assignment 01, which was in the format of a discussion forum. For this assignment, they were required to identify a challenge related to resource use within their own life and could choose the topic on which to post their comment. In this activity, they were asked to share their experiences, recommend information sources, and suggest mitigation strategies for addressing the identified challenge.

Time management was identified as an issue as many students were studying part-time. Students do not always realise the time required to complete an assignment. Power interruptions and intermittent internet connectivity exacerbated time management. Despite these, it is evident that students appreciate online interactions with the lecturer and their peers. This finding aligns with the Theory of Relational Distance (Moore, 2018), which posits that the structure and connectivity of the online environment, as well as support in online sessions, are crucial requirements for success.

Technical challenges

Technical challenges in this assignment included students' lack of appropriate technological skills and up-to-date hardware for creating a story map. Due to limited access to computers, students often rely on cell phones for their studies (Ngubane-Mokiwa, 2017; Rakoma, 2018). The instability of the internet and power supply interruptions also added to these challenges. This was reflected in the students' questions submitted via email and the online discussion forums. The digital divide was evident in the diversity of general computer skills, ranging from advanced GIS skills to minimal computer skills, as well as in difficulties finding relevant images and data required for the assignment (Ngubane-Mokiwa, 2017; Rakoma, 2018).

The most significant technical challenge students faced was creating an account and logging in to the ESRI website. In cases where students did not publish their story maps, the lecturer could not access them without the account login credentials. Some students created a trial ArcGIS Pro account rather than an ESRI StoryMap account. This meant they were unable to access their story map after the trial period expired. In 2025, ESRI StoryMaps was replaced by ArcGIS StoryMaps, and the previous accounts no longer existed. Fortunately, this occurred after the conclusion of the 2024 learning period.

Many students found creating an interactive map in the software challenging and often opted to copy and paste an image of a map instead. Because interactive maps lose their interactive nature when copied into a story map, this strategy was unacceptable. Students had to insert an Express map and add geotagged photographs. On producing an interactive map, many requested assistance with their map annotations.

As part of the story map, students were required to include a video illustrating the scope of the identified challenge. This could be a recording of the site rather than a talking head-style presentation. The recorded videos showed a range of skill levels, from brief silent recordings to professionally edited videos with soundtracks, including music and interpretation. Authenticity was crucial in assessing the video in question. To submit an assignment that includes text, a video, and a story map, guidance was necessary to integrate these components into a cohesive document.

The story map

The story map assignment was an alternative to a written formative assessment. Planning the message and considering the audience are important in any visual communication. Students had to answer ten questions before designing their story map but some were unable to connect a generic discussion to a specific local area or audience in the assignment. Others required clarification on which text to include in the story map, as they could not distinguish between the answers to the planning questions and the story map text itself. In the planning stage, for example, they were required to provide the rationale for their selection of images. However, this text was not required in the story map or in the photograph titles.

One requirement was that the story map's message be clear and capture the reader's attention. However, several story maps were cluttered despite a guideline framework being provided to scaffold the story map. Formulating the message for a story map was identified as a challenge and as such the module content was not well integrated into the story map's message. The message should be the starting point for product planning, and the audience and message are central to the design of a story map (e.g., de Jager, 2014; Du, 2024; Lockshin, 2025). Visual literacy (de Jager, 2014; Song et al., 2022; Karagyozova, 2024; Obzhorin, 2025), spatial literacy (Heath, 2023), and spatial thinking (Carow, 2024) are important in this context. Carow & Pretorius (2024) recommend improving spatial literacy in Geography teaching; story maps are an effective tool for this purpose.

The approach adopted in this module was to ground the learning experience in students' local contexts (Pretorius et al., 2015; Lee & Kriewaldt, 2024). Therefore, the selection of topics and links to SDGs can be indicative of the student's lived experience. Challenges related to water, sanitation, and poverty were the most frequently addressed topics, and population, migration, agriculture, food security, infrastructure maintenance, and environmental management (e.g., green space, wildfires, invasive species, deforestation, and gravel extraction) were also identified. The selection of topics was unsurprising as these themes were included in the module's study materials.

Despite the challenges, students maintained a positive attitude towards this learning experience and, with support, successfully created a story map. The interactive nature of the ESRI StoryMap programme was regarded as a benefit. This finding corresponds with those studies that have used this programne for creating interactive and interpretative resources (e.g., Alemy et al., 2017; Park, 2022).

Common errors in the assignment

In most cases, students used high-quality photographs to enhance the story map's message. However, incorrect rotation, distortion, cropping, and blurring occurred. In some cases, the images were not correctly oriented before being uploaded to the story map and thus appeared upside-down or lopsided. Image distortion occurred when the aspect ratio was not locked before the image was inserted. Image cropping was particularly ineffective when a map was inserted, and sections of the area depicted were not visible. Due to the reduction in size of the large map images, the annotations on the images were often illegible. Maps were required for the question on planning the story map. In this section, pictures of maps were often copied and pasted with their sources not always acknowledged. The inclusion of incorrect or irrelevant maps indicated a lack of understanding of the maps presented in the assignment. There were also errors in the layout of the story map (e.g., the relative font sizes for the hierarchy of headings and subheadings were sometimes misstated). Some story maps were cluttered and included irrelevant text. This shortcoming contributes to ineffective communication of the story map.

CONCLUSIONS

The use of story maps as an alternative to a written assignment proved to be an interesting learning experience, and students' technical skills, level of access to technology, and ability to complete the specific tasks within the timeframe were major factors influencing their success. Using story maps as a teaching tool can be a more effective way to develop spatial and visual literacy than including a map in a written assignment, and that story maps can be integrated as a teaching tool rather than used as an alternative to a single written assignment. The story map can also be used in diverse settings, depending on the intended audience, the message to be delivered, and the context in which it is presented. Creating a story map could enhance students' spatial and visual literacy skills by selecting

the relevant text, images, and maps, and to consider the layout of the story map (Caquard & Cartwright, 2014). To facilitate this, lecturers should consider the characteristics of the online learning environment and their students' profiles when designing an online learning experience (Letseka et al., 2025). It is essential not only to support students in terms of module content but also to disseminate information about the support provided at the institutional level (Maré & Mutezo, 2020). This is particularly important where students rely exclusively on cell phones.

REFERENCES

Adams, M. J. D., & Umbach, P. D. (2012). Nonresponse and online student evaluations of teaching: Understanding the influence of salience, fatigue, and academic environments. *Research in Higher Education,* 53(5), 576–591.

Alemy, A., Hudzik, S., & Matthews, C. N. (2017). Creating a user-friendly interactive interpretive resource with ESRI's ArcGIS story map program. *Historical Archaeology*, 51, 288–297.

Avgerinou, M. D., & Pettersson, R. (2020). Visual literacy theory: Moving forward. In: Josephson, S., Kelly, J. D., & Smith, K. (eds), *Handbook of Visual Communication: Theory, Methods, and Media*, 2nd Ed. (pp. 433–464). Routledge, New York.

Bednarz, R., & Lee, J. (2019). What improves spatial thinking? Evidence from the Spatial Thinking Abilities Test. *International Research in Geographical and Environmental Education*, 28(4), 262–280.

Bednarz. S. W., & Mitchell, J. T. (eds) (2025). *Handbook of Geography Education*. Springer, Cham.

Caquard, S., & Cartwright, W. (2014). Narrative Cartography: From Mapping Stories to the Narrative of Maps and Mapping. *The Cartographic Journal*, 51(2), 101–106.

Caquard, S., & Dimitrovas, S. (2017). Story Maps & Co. The state of the art of online narrative cartography. *Mappemonde*, 121, 3386. https://doi.org/10.4000/mappemonde.3386

Carow, S. P. (2024). *A strategy for the improvement of spatial thinking in undergraduate Geography at South African universities*. Unpublished PhD thesis, UNISA.

Carow. S., & Pretorius, R. W. (2024). A critical reflection on the inclusion of spatial thinking in undergraduate Geography modules: A case study of selected South African universities. *Journal of Geography Education in Africa*, 7, 17–40.

Cope, M. P., Mikhailova, E. A., Post, C. J., Schlautman, M. A., & Carbajales-Dale, P. (2018). Developing and evaluating an ESRI story map as an educational tool. *Natural Sciences Education*, 47(1), 1–9.

de Jager, A.E. (2014). The importance of visual literacy for a changing Geography. In: Valanides, N. (ed), *Reconceptualising Visual Literacy in the 21st Century: Describing Reality, Creating Imagery and Deciphering Visuals* (pp. 93–104). IVLA, Loretto.

Du, A. (2024). Effective Strategies for Engaging with Your Audience. Available from https://www.ESRI.com/arcgisblog/products/story-maps/constituent-engagement/effective-strategies-for-engagingwith-your-audience/ Accessed 15 January 2025.

ESRI (2025). Introduction to StoryMaps. Available from https://doc.arcgis.com/en/arcgis-storymaps/get-started/what-is-arcgis-storymaps.htm Accessed 25 July 2025.

Gezani, B. (2024). Online Learning in the Comprehensive Open Distance and eLearning Context – A Case Study of the University of South Africa. *E-Journal of Humanities, Arts and Social Sciences* (EHASS), 5(7), 1265–1274.

Heath, G. (2023). The acquisition of spatial and mountain literacy by children in Hergé's Tintin in Tibet. *Journal of Geography Education in Africa*, 6, 53–78.

Karagyozova. S. (2024). Digital Storytelling as a Method of Achieving Visual Literacy. *Pedagogy / Pedagogika*, 96(8), 1104–1118.

Kretovics, M. (2003). The Role of Student Affairs in Distance Education: Cyber-Services or Virtual Communities. *Online Journal of Distance Learning Administration*, 6(3), 1–15.

Lee, S. J., & Kriewaldt, J. (2024). Where powerful knowledge and pedagogical content knowledge intersect: the case of knowledge and beliefs for teaching school geography through inquiry. *International Research in Geographical and Environmental Education*, 34(1), 79–94.

Letseka, M., Mphahlele, R., & Akintolu, M. (2025). University of South Africa. In: Mishra, S., & Panda, S. (eds), *Handbook of Open Universities around the World* (pp. 105–116). Routledge, Oxford.

Lockshin, V. C. (2025). Why Knowing Your Audience is Your Most Important Knowledge Asset. Non-profit Storytelling. Available from https://www.thestorytellingnonprofit.com/blog/why-knowing-your-audience-is-your-most-important-knowledge-asset-a-free-resource/ Accessed 13 January 2025.

Maré, S., & Mutezo, A. T. (2020). The effectiveness of e-tutoring in an open and distance e-learning environment: evidence from the University of South Africa. *Open Learning: The Journal of Open, Distance, and e-Learning*, 36(2), 164–180.

Moore, M. G. (2018). The theory of transactional distance. In: Moore, M. G., & Diehl, W. C. (eds), *Handbook of Distance Education*, 4th Ed. (pp. 1–15). Routledge, New York.

Ngubane-Mokiwa, S. A. (2017). Implications of the University of South Africa's (UNISA) shift to Open Distance e-Learning on Teacher Education. *Australian Journal of Teacher Education*, 42(9), 111–124.

Obzhorin, A. M. (2025). "Visual Renaissance": A Review of Research on Visual Literacy. *Communications: Media. Design,* 10(2), 19–45.

Park, Y. M. (2022). A GPS-enabled portable air pollution sensor and web-mapping technologies for field-based learning in Health Geography. *Journal of Geography in Higher Education*, 46(2), 241–261.

Pretorius, R., Nicolau, M., Immelman, J., de Jager, A., Nőthling, M., & du Plessis, A. (2015). Virtual Learning Environments for transformation to sustainability: A case study from the "South". In: Leal Filho, W., Azeiteiro, U. M., Caeiro, S., & Alves, F. (eds), *Integrating Sustainability Thinking in Science and Engineering Curricula* (pp. 335–348). Springer, Switzerland.

Rakoma, M. A. (2018). *Rural students' experiences of online learning support in an open distance learning environment.* Unpublished MPhil dissertation, University of Stellenbosch.

Song, Z., Roth, R. E., Houtman, L., Prestby, T., Iverson, A., & Gao, S. (2022). Visual Storytelling with Maps: An Empirical Study and Story Map Themes and Narrative Elements, Visual Storytelling Genres and Tropes, Individual Audience Differences. *Cartographic Perspectives,* 100, 10–44.

Stokes, S. (2002). Visual literacy in teaching and learning: A literature perspective. Electronic *Journal for the Integration of Technology in Education*, 1(1), 10–19.

Strachan, C., & Mitchell, J. (2014). Teachers; Perceptions of ESRI Story Maps as Effective Teaching Tools. *Review of International Geographical Education Online*, 4(3), 195–220.

Tasliya, R., Fatimah, E., & Umar, M. (2023). Investigating the impact of story maps in developing students' spatial abilities on hydrometeorological disasters for e-portfolio assignments. *International Journal of Social Science, Educational, Economics, Agriculture Research and Technology* (IJSET), 2(9), 459–475.

Tian, J., Koh, J. H. L., Chang, R., & Wang, Y. (2022). Understanding higher education students' developing perceptions of geocapabilities through the creation of story maps with geographical information systems. *British Journal of Educational Technology*, 53(3), 687–705.

Treves, R., Mansell, D., & France, D. (2021). Student authored atlas tours (story maps) as geography assignments. *Journal of Geography in Higher Education*, 45(2), 279–297.

Vojteková, J., Žoncová, M., Tirpáková, A., & Vojtek, M. (2022). Evaluation of story maps by future geography teachers. *Journal of Geography in Higher Education*, 46(3), 360–382.

Zwane, S. A., & Mudau, P. K. (2024). South African Rural University Students' Experiences of Open Distance E-learning Support. *International Journal of Learning, Teaching and Educational Research*, 23(2), 46–67.