# BEST PRACTICE EXAMPLES - SOLVED TASK

1. Name of the task:
   **Making digital maps with GIS**

2. Why did you choose this task?
   Maps can convey vast quantities of information in a compelling graphical form, disclose patterns in big data sets, and tell lively stories about new places. Therefore, maps can be employed as a powerful analysis tool in a variety of research topics, yet making your own map often comes with challenges as well. Data sources need to be acquired, evaluated, and processed before they can be presented on a map. Subsequently, the appropriate symbology (i.e. colour scale and symbol size) needs to be selected in order to make your map comprehensible for others. Carrying out this process helps pupils to experience the decisions that professional cartographers and researchers have to make, and lets them think critically about their data sources and the stories they want to tell.

3. Subjects covered from STEAM areas:
   Science, Technology, Arts.

4. Target group (age range and size of the group):
   11-13 years, 20-30 students per group.

5. Duration of the activity:
   Three lessons of 90-100 minutes each.

6. Key words:
   GIS, map, data visualisation, storytelling.

7. Key sentence describing context of the activity, followed by short description (200 words):
   Using GIS software, e.g. ArcGIS Online or QGIS, pupils will make a digital map about a topic of their own choosing. They use their map to answer a geographical research question and learn how to communicate their results in an enticing way to a wider public.

8. Description of the activity environment, including the list of materials and tools needed:
   Student access to GIS software, e.g. ArcGIS Online of QGIS.

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9. Step by step, detailed description of the activity, including teaching and learning strategies:

| Phase | Description | Teaching strategy | Suggested time |
|---|---|---|---|
| 1 | General introduction about the assignment and planning for the next lessons. | Divide the class in groups of two. Other phases are mostly student-led. | 10 min. |
| 2 | Pupils devise their own geographical research question. | Help pupils with the demarcation of their research question. Think about data availability, time management, level of difficulty, general feasibility. | 30 min. |
| 3 | Data acquisition: decide what data sources are needed to answer the research question and either look for data sets that are already available or compose your own dataset (.csv-files can be imported in GIS). Rephrase the initial research question when needed. At the end of this phase, all relevant data sources should be collected and ready to use in the GIS software. | Stimulate pupils to divide tasks and keep track of the time.<br><br>Help pupils to find and execute relevant tools in the GIS software.<br><br>NB: pupils who compose their own data set need to include relevant geographical references in order to import data in the GIS. Check for syntax errors. | 60 min. |
| 4 | Data visualisation: pupils work on the visualisation of their data sources. They can make use of tools available in the GIS software, e.g. filtering, clustering, overlay, buffer, intersect. Finally, the pupils revise the symbology of the features on their map. They can customise, for instance, the colour scale, symbol size, labels and pop-up windows. | Help pupils to find appropriate settings in the GIS software. | 90 min. |
| 5 | Data presentation: pupils select a medium to present their research results. This can be a static map, an interactive website (e.g. StoryMaps in ArcGIS Online or Google Sites), or an online application (e.g. GeoApps in ArcGIS Online). | Optional: organise a small ‘symposium’ where pupils can present their work. | 90 min. |

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10. Learning objectives/competencies:
    Academic skills:
    - Translate ideas into a research question.
    - Divide big and complex tasks in smaller steps.
    - Manage big data sets.
    - Visualise data for a wider public.

    Cartography:
    - Make use of cartographic analysis tools.
    - Make use of cartographic design principles.

11. Evaluation/Assessment guidelines:
    Student are evaluated on four criteria: participation (group work), technical difficulty and quality of their work, ability to work iteratively, and creativity.

12. Lessons learned:
    - Not all data sources that students would need for their final projects are readily available. This means that they often need to change plans or decide to make their own data sets (if possible). This consumes a lot of time and can lead to frustration, possibly resulting in a loss of motivation. It helps to have some data sets or resources available, especially about the students' own living environment.
    - Students need to get explicit instruction on and practise with syntax rules. This helps them to evaluate their data input and avoids failures in the final data analysis later on.
    - Younger students in particular usually do not have a lot of experience with defining good research questions for their final project. They need help to get beyond simple questions, i.e. 'where are fastfood restaurants located in our city?', in order to come up with more captivating research questions, i.e. 'are fastfood restaurants more common in less affluent neighbourhoods?'

13. Additional information/Links:
    - Esri has an extensive online training programme to get acquainted with ArcGIS Online: https://www.esri.com/training/arcgis-online-training/
    - A lot of map layers are already available via Esri and can easily be imported via ArcGIS Online.
    - Eurostat or the national bureau of statistics often have good quality data sets available on a variety of topics: https://ec.europa.eu/eurostat/data/database

14. Contact person:
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