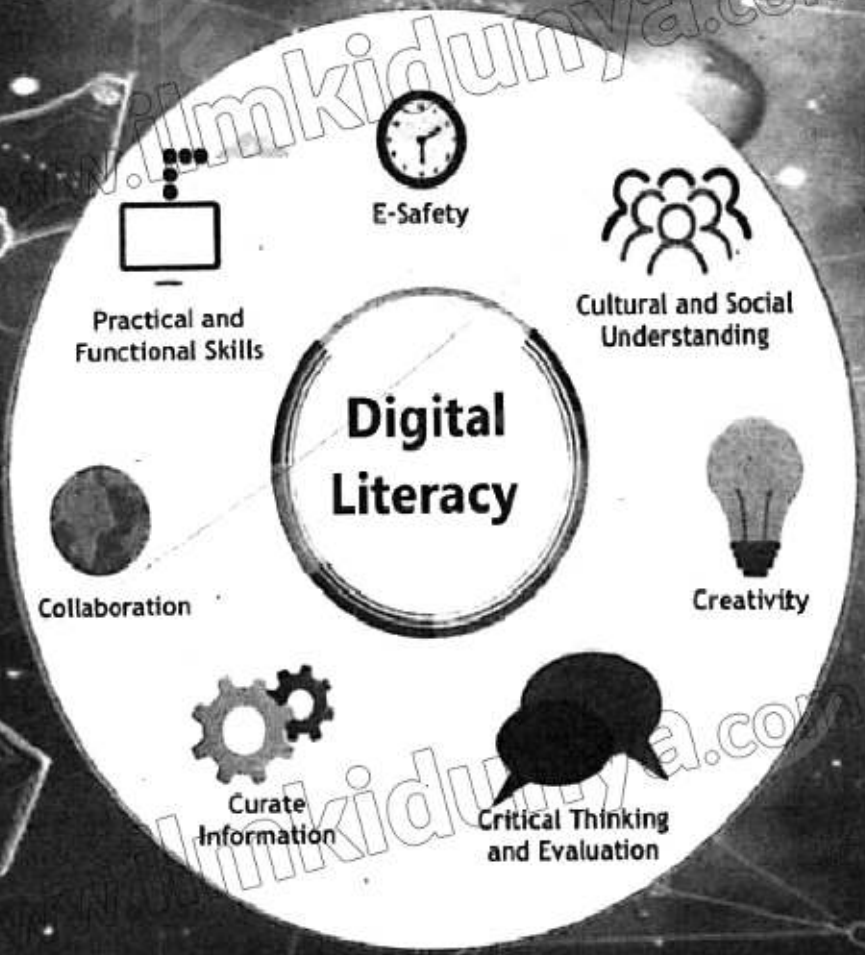
7 Digital Literacy

Learning Outcomes

At the end of this unit students will be able to:

- create an artefact that answers a research question, communicates results and conclusions through digital resources or tools



Introduction

Research is the process of investigating a specific question or topic by systematically gathering, analyzing, and interpreting information. It is an essential skill for students, as it helps you to solve problems and answer questions effectively. At the core of any research project is the research question, which serves as a clear, focused, and specific guide for the entire investigation. A well-defined research question helps narrow down the scope of the research and provides direction.

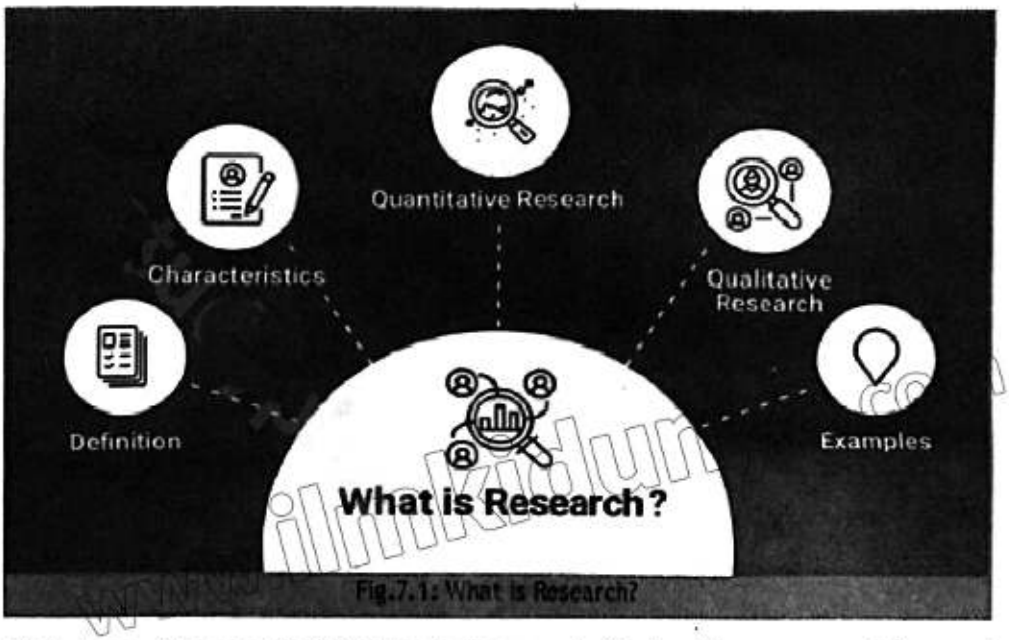


Fig.7.1: What is Research?

In today's digital age, the use of digital tools has revolutionized how research is conducted and presented. These tools allow you to gather and process data more efficiently, while also enabling you to communicate your findings in creative and engaging ways. Understanding the importance of these tools is critical for becoming an effective researcher in the modern world. Conducting research effectively and communicating results are essential skills. A well-crafted artefact not only addresses a research question but also effectively communicates the results and conclusions through digital tools. This guide will explore how to perform advanced searches for locating research information, and how to use digital tools to present results and conclusions.

7.1 Performing Advanced Searches to Locate Information

Information is available from a variety of sources, including books, academic journals, articles, websites, and multimedia platforms. Students need to learn how to identify and use credible sources of information for their research. Basic search techniques often involve entering simple keywords into search engines, but advanced searches require more sophisticated methods. For instance, Boolean operators (AND, OR, NOT) can be used to refine search results. Students can also use quotation marks to search for exact phrases, apply filters to narrow down by date or type of source, and utilize academic databases such as Google Scholar and PubMed to access specialized and peer-reviewed materials.

Fig 7.2 shows how to choose the Advanced Search option on Google home page, after typing your search string click on Tools Option and Advanced Search Menu will open.

Fig 7. 2 Advanced Search on Google Search Engine

Fig 7.3 shows the options when you select the option of advanced search on Google. (The interface may vary depending on the type and version of your web browser) In the "Search for" option you can select various options like everything if you are searching for common information. You can choose Articles if you are searching for articles related to your search string.

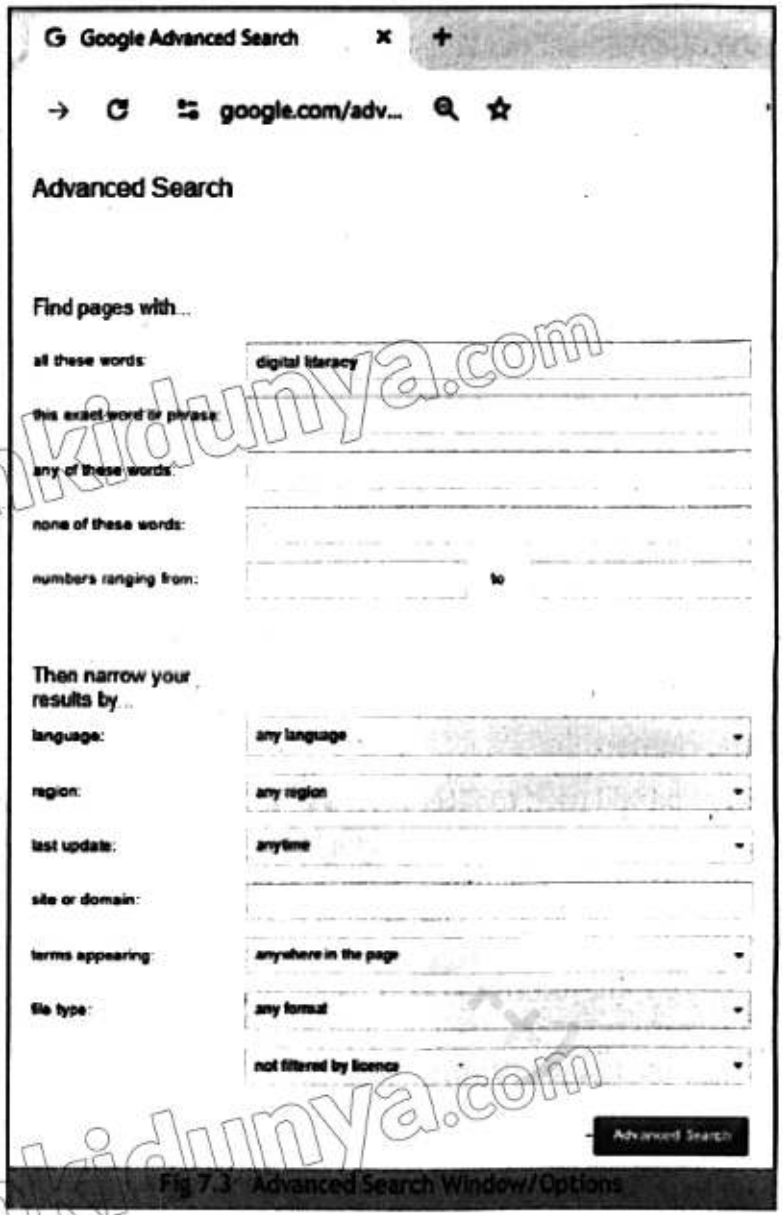


Fig 7.3 Advanced Search Window/Options

All these words:

This field is used to include multiple words that must all appear in the search results. For example, if you want to search for the string Digital Literacy Google will return the results that include both words Digital and Literacy.

This exact word or phrase:

This field is used to include multiple words or phrases that must all appear in the search results. For example, if you want to search the string "Digital Literacy" Google will return the results that include complete phrase Digital Literacy rather than separate words from the phrase or search string. (Tip: double quotes can be used to exactly find the search string)

Any of these words:

This field is used to include any of the words from the search string. For example, if you want to search for the string Digital Literacy Google will return the results that include some results which will include the word Digital while some results which contain the word Literacy.

None of these words:

This allows you to exclude specific words from your search results. For example, "Digital - Literacy" will show results that have "Digital" but not "Literacy". (Tip: Hyphen - sign can be used before the word to exclude the words to be excuded)

Numbers range:

This is useful for finding results within a specific range (e.g., dates, prices). For example, "books Rs500..Rs1500" will show books priced between Rs.500 to Rs. 1500.

Language:

You can filter search results based on language preferences. For example, choose "Urdu" to limit results to Urdu language content.

Region:

You can limit results to specific countries or regions. Fo r example, you can specify country name "Pakistan" to only get results from Pakistan based websites.

Site or domain:

Site operator limits the search to a specific website or domain. For example, "site: fbise.edu.pk" will retun. the results from the Federal Board of Intermediate and Secondary Education website only.

File type:

You can search for specific file types like PDFs, Word documents, PowerPoint files, etc. for example, "filetype: pdf digital literacy" will return only PDF files about digital litracy.

Usage rights:

This option will used to filter results based on usage rights, such as free content which does not restrict copyright policy. For example, to search images if you write "labeled for reuse" it will return the results/images which you can use for free.

Intitle:

This option will return the web pages that contains the keywords/search string in the title of document/page. For example, Intitle: HSSC Result 2025 will return all the webpages that will contain HSSC Result 2025 in their title.

Practice Examples:

Example 1: Searching for articles on machine learning but excluding "deep learning".

Search: machine learning -deep learning

Example 2: Searching for PDFs about Python programming.

Search: filetype: pdf python programming

Evaluating the credibility of sources is crucial for ensuring that research findings are reliable. Credible sources include peer-reviewed articles, websites with trusted domains (such as .edu,

.gov, or .org), and up-to-date information from well-known authors or institutions. Once the relevant information is found, students can use citation management tools like Zotero or Mendeley to organize their sources and keep track of important references. This will help ensure that all sources are properly cited in the final research artefact.

7.1.1 Creating the Artefact

To begin creating the artefact, the first step is data collection by performing advanced searches to locate credible sources. This involves using search engines, academic databases, and digital libraries to find relevant information related to the research question. Various primary and secondary methods of data collection have been discussed in detail in previous grades. You can use any reliable method of data collection. The reliability and accuracy of the data is a challenge. Therefore, while collecting data, you should be able to verify a valid source of data.

Fig.7.4: Creating the Artefact

7.1.2 Communication of Collected Data

Once the data has been collected and analyzed, the next step is to communicate the findings through digital tools. There are a wide variety of digital tools available, each suited to different types of presentations. For text-heavy reports, tools like Microsoft Word, Google Docs, or LaTeX can be used to write and format research papers. These tools allow for detailed explanations of findings, along with proper referencing and citations. For visual presentations, PowerPoint, Google Slides, or Prezi are commonly used. These platforms enable students to create visually engaging slideshows that communicate key points in an organized manner. Data visualization tools like Excel, Google Sheets, and Tableau can be used to create charts, graphs, and tables that help illustrate trends or patterns in the research data.


Fig.7.5: Communication of Collected Data

7.1.3 Layout of the Digital Artefact

The artefact must be structured in a logical way to effectively communicate results and conclusions. Following is a list of some important parts of a digital artefact like a sale report, a software user manual or a presentation etc.

Introduction

Typically, a digital artefact should start with the section named Introduction, which presents the

research question and objectives, a methodology section explaining how the research was conducted, a results section that presents the data using visuals where appropriate, and a conclusion that summarizes the key findings. Digital tools allow for the inclusion of interactive elements, multimedia, and hyperlinks, all of which can enhance the depth and accessibility of the artefact.

Assume you are designing a digital artefact about the impact of social media on mental health. The introduction part can contain a brief overview of the task/project. It includes some background information, and context of the purpose for which you are designing this artefact.

Findings

An important aspect of creating the artefact is ensuring that the findings are communicated clearly and concisely. Visuals play a key role in this process, as they help to break down complex data into more digestible formats. Well-designed graphs, charts, infographics, or videos can make it easier for an audience to understand the significance of the results. Students must be careful to ensure that all visuals are clearly labeled, accurate, and relevant to the data being presented. Visual aids should complement the research rather than distract from it.

For example, you collected some data from the audience by using questionnaires. The data show different ratios and nature of the impact of social media according to different age groups. You can organize your findings in tabular form.

Result/Conclusion

Finally, the artefact must be concluded by providing a clear interpretation of the results and their implications. Conclusions should directly address the research question and provide answers or insights based on the data collected. It is also important to suggest future research possibilities or areas where further investigation could be beneficial. For example, if the research focused on the effects of a school breakfast program on student attendance, the conclusion might highlight specific grade levels or demographic groups that showed the most improvement and suggest expanding the study to other variables such as academic performance.

Creating an artefact to answer a research question has several steps. First, you need to formulate a clear question. Then, you conduct advanced searches to gather reliable data. Next, you use digital tools to organize and present your findings. Finally, you ensure that your artefact effectively communicates your results. This process helps you develop research, analytical, and digital skills. It also enables you to present complex ideas in a clear and engaging way. By leveraging digital resources and tools, you can create impactful artefacts that showcase your understanding and share your conclusions with others.

7.1.4 Using Digital Tools to Communicate Results and Conclusions

There are many digital tools available to students for presenting their research. Text-based tools such as Microsoft Word or Google Docs are useful for writing detailed research reports, while presentation tools like PowerPoint, Google Slides, or Prezi are ideal for visual presentations. When dealing with data, tools such as Excel, Google Sheets, or Tableau can be used to create graphs, charts, and tables that help illustrate key findings. For more visually engaging

presentations, multimedia tools like Canva and Piktochart can be used to create infographics, while collaboration tools like Google Drive, Trello, or Microsoft Teams enable groups to work together efficiently.

Fig.7.6: Digital tools available to students

Choosing the right digital tool depends on the nature of the research and the intended audience. For example, if a research project involves extensive numerical data, it may be better to use data visualization tools like Excel or Tableau. On the other hand, for more general presentations, PowerPoint or Google Slides are often more appropriate. Regardless of the tool used, students should structure their artefact clearly, with sections such as an introduction, which presents the research question and objectives, a methodology section describing the research process, results with clear visuals like graphs and charts, and a conclusion which summarizes key findings and suggests future research directions. Proper citation of all sources is necessary, and digital tools like EasyBib or Zotero can be helpful in generating citations in styles such as APA, MLA, or Chicago.

Creating effective visuals is an important skill, as graphs, charts, and infographics help to clarify and emphasize key points in the research. Students should ensure that all visuals are properly labeled and directly related to their findings. Visuals should enhance the understanding of the audience, not overwhelm them with unnecessary information.

7.1.5 Creating a Research Artefact

To reinforce the concepts learned, we can create a research artefact. For this project, we will select a research question of interest, for example, "How does social media affect student productivity?". You can then apply advanced search techniques to locate credible information on their topic, organize their findings, and use a digital tool to create an artefact that communicates their research.

Figure 7.2 shows the process of creating a research artefact. At the first step i.e. initial problem, identify a problem or research question. e.g. How can we reduce energy consumption in commercial buildings? To explain the problem, clarify and refine the problem statement. e.g. What are the most effective strategies for reducing energy consumption in commercial office buildings in urban areas? Now the explicated Problem will be the final problem statement i.e. This artefact will investigate the effectiveness of retrofitting commercial office buildings with energy-efficient lighting and HVAC systems.

In the next step create an outline and define the requirements for the artefact. i.e. introduction, literature review, case studies, recommendations, conclusion. The requirements can be Interactive dashboard, 3D model, references, and presentation. In the next step list the requirements. i.e. Visually appealing, easy to navigate, accurate, reliable and relevant content. The technical requirements will be Interactive elements, compatible with multiple devices.

To design and develop the artefact, create the artefact based on the outline and requirements. i.e. design an interactive dashboard using power bi, create a 3d model using sketch up, write the content and references. The final product will be the desired artefact. An interactive dashboard presenting energy consumption data and 3D models of commercial office buildings. To demonstrate the artefact, present it to the audience. To evaluate it, assess the effectiveness and quality of the artefact. Evaluate the artefact based on clarity, organization, and effectiveness of presentation. The evaluation has identified areas for improvement, such as adding more interactive elements or clarifying the recommendations.

As part of the activity, students can work in groups to collaboratively research different questions, gather data, and present their findings using tools such as Google Slides or Prezi. This allows them to practice using digital tools, while also fostering teamwork and collaboration. After completing the artefact, each group will present their work to the class, receiving peer feedback on the clarity, organization, and effectiveness of their presentation.

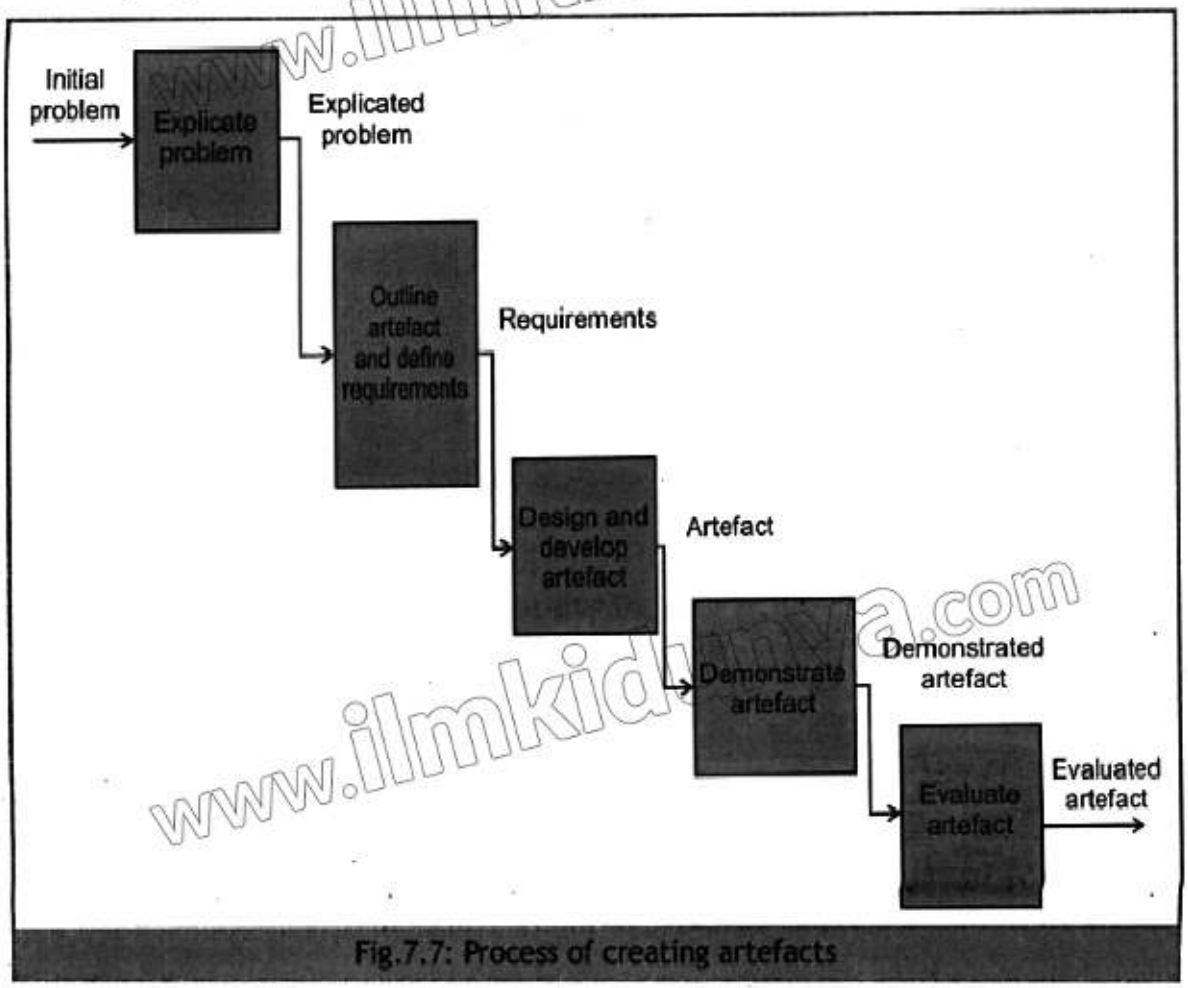


Fig.7.7: Process of creating artefacts

7.1.6 Reflection and Self-Assessment

After completing the research project, it is important to reflect on the research process. This reflection allows us to identify challenges, such as difficulty finding credible sources or presenting complex data, and to consider how to overcome these challenges. You can also think about what worked well in your research and where they might improve in future projects.

In addition to reflecting on the research process, you should also assess your ability to use digital tools effectively. A self-assessment checklist can help you evaluate your skills in selecting appropriate tools, organizing information, and presenting data in a clear and engaging way. This reflection and self-assessment will help to build confidence and improve research and presentation skills over time.

Summary

- **Research** is the process of investigating a specific question or topic by systematically gathering, analyzing, and interpreting information. It is an essential skill for students, as it helps you to solve problems and answer questions effectively.
- **Research questions** are at the of any research project, which serves as a clear, focused, and specific guide for the entire investigation.
- properly cited in the final research artefact.
- **Creating the artefact,** involves the first step of data collection by performing advanced searches to locate credible sources.
- **Sources of reliable data** include academic databases, and digital libraries to find relevant information related to the research question. Various primary and secondary methods of data collection have been discussed in detail in previous grades.
- **A digital artefact** must be structured in a logical way to effectively communicate results and conclusions. Following is a list of some important parts of a digital artefact like a sale report, a software user manual or a presentation etc.
- **Findings** An important aspect of creating the artefact is ensuring that the findings are communicated clearly and concisely. Visuals play a key role in this process, as they help to break down complex data into more digestible formats.
- **Well-designed graphs, charts, infographics, or videos** can make it easier for an audience to understand the significance of the results.
- **Result/Conclusion** Finally, the artefact must be concluded by providing a clear interpretation of the results and their implications. Conclusions should directly address the research question and provide answers or insights based on the data collected
- **Digital Tools** available to students for presenting their research. Text-based tools such as Microsoft Word or Google Docs are useful for writing detailed research reports, while presentation tools like PowerPoint, Google Slides, or Prezi are ideal for visual presentations.
- **Creating effective visuals** is an important skill, as graphs, charts, and infographics help to clarify and emphasize key points in the research. You should ensure that all visuals are properly labeled and directly related to their findings. Visuals should enhance the understanding of the audience, not overwhelm them with unnecessary information.

Exercise

Select the best answer for the following Multiple-Choice Questions (MCQs).

1. Which of the following advanced search operators would be used to limit the results to a specific website domain such as .gov, or .edu
   a) Quotation marks (" "_)
   b) Filetype,
   c) hyphen Operator (-)
   d) Site Operator
2. What is the primary benefit of using hyphen operators in advanced searches?
   a) It narrows down result to academic articles only
   b) It ensures you only get peer reviewed sources.
   c) It helps include or excluding specific terms from search results
   d) It automatically filters irrelevant websites.
3. Which digital tool is the best suited for performing large data of complex numerical data in an interactive format.
   a) Google slides
   b) Tableau
   c) Canva
   d) Adobe Spark
4. What is the first step in creating an artefact?
   a) Data Analysis
   b) Data Collection
   c) Communication of Findings
   d) Verification of sources
5. What is the purpose of data visualization tools?
   a) To create a visually engaging slide show
   b) To write and format research papers
   c) To illustrate trends or patterns in research data
   d) To verify valid sources of data
6. What is the most effective way to structure a digital research presentation of clarity?
   a) Start with detailed statistics and end with general ideas
   b) Use visuals exclusively without any text
   c) Begin with the research question, followed by methodology, results, discussion and conclusion.
   d) Use a random order of topics to keep the audience engaged.
7. Which of the following would be the best strategy to find peer-reviewed journal articles on a specific research topic?
   a) Use Boolean operator with a file type search
   b) Limit your search to .com sites
   c) Search for your topic using the OR operator to get broader results
   d) Use "quotation marks" and the site .edu operator.

8. How does the precision of a research question influence data collection methods?
   a. It limits the number of sources used
   b. It directs the selection of relevant, credible data
   c. It simplifies data visualization techniques
   d. It eliminates the need for secondary sources
9. Why might improper citation damage the effectiveness of a digital artefact?
   a. It keeps the artefact short and brief
   b. It questions the authenticity and reliability of the research
   c. It complicates the artifact's structure
   d. It distracts from the visuals used

Give short answers to the following Short Response Questions (SRQs).

1. How can Boolean operators enhance the effectiveness of online search?
2. Describe one advantage of using the site operator in advanced search queries.
3. How can a digital artefact be designed or created?
4. List all the steps to create an artefact.
5. What is the importance of layout of digital artefacts?
6. Why is the structure of a research presentation important when communicating results?
7. What is the main benefit of using infographics to present research findings?
8. Explain how advanced search techniques can save time in the research process.
9. What digital tool would you recommend for creating a video summary of research findings?
10. How do infographics simplify complex ideas for a general audience?
11. What is one key difference between static and interactive data visualizations?
12. In what ways can poorly designed visuals distort the intended meaning of research findings in an artefact?
13. Explain how the alignment between research questions, findings, and conclusions ensures consistency in a research artefact.

Give long answers to the following Extended Response Questions (ERQs).

1. Explain the role of advanced search techniques in improving the quality of research. Provide examples of specific operators and how they can be applied to a research topic.
2. Analyze the importance of structuring a research presentation effectively. How do introduction, methodology, results, discussion, and conclusion sections contribute to clear communication?
3. How can digital tools be used to engage diverse audiences in understanding complex research topics? Give examples of how visuals, videos, and interactive elements contribute to audience engagement.

4. Explain how advanced search operators like site:, filetype:, and quotation marks can be used together to locate high-quality academic sources for a research paper. Provide a step-by-step example.
5. Evaluate the use of data visualization tools like Tableau and Microsoft Excel in presenting research findings. How do these tools help in interpreting and presenting complex datasets?
6. How do advanced search techniques improve both the accuracy and efficiency of locating information online? Discuss the importance of using the right keywords and operators for specific research tasks.
7. Analyze the benefits of creating an interactive dashboard for communicating research results. How does this tool differ from traditional static presentations?
8. Propose a strategy for peer-reviewing digital research artefacts in a classroom setting. How can peer feedback improve both content quality and presentation design?
9. Critically evaluate how the credibility and bias of sources affect the quality of a digital artefact. How can a researcher minimize bias while selecting sources?

Activity 1: Create a digital Research Artefact using advanced search technique

Objective: Students will use advanced search techniques to gather relevant information on a research topic and create a digital artefact to present their findings using appropriate digital tools.

Outcome: This activity will help students understand how digital research is helpful in creating artefact.