

HOW TO COMMUNICATE SCIENTIFIC RESULTS EFFECTIVELY

Simultaneously develop scientific and communication skills



The scientific poster represents a preferred communication format in the academic and professional world. It constitutes an educational exercise that allows students to simultaneously develop their scientific and communication skills. In the context of the SteamCity project, this learning takes on a particular dimension by encouraging students to adopt an approach where scientific rigor meets visual creativity. Creating a scientific poster is more than just a layout exercise. It engages students in a process of reflecting on their findings, requiring them to identify the essential elements of their investigation and construct a coherent narrative. This process develops their critical thinking and their ability to distinguish between essential and nonessential, a fundamental skill for transmitting knowledge.

Introducing the concept of visual data storytelling transforms this classic exercise into a stimulating creative experience. Students discover that scientific communication can simultaneously captivate and inform, without ever sacrificing data accuracy.

Educational objectives

Scientific skills

Creating a scientific poster consolidates their understanding of the scientific method. Students must clearly articulate the transition from hypothesis to conclusions, including methodology and analysis of results. This exercise requires them to critically review their entire experimental approach, identifying the strengths and limitations of their investigation. They learn to contextualize their findings within the existing body of knowledge, developing their ability to make connections between different concepts.

The need to present data visually deepens their understanding of statistical and graphical tools. Students must choose the most appropriate representation for each type of data, understanding the advantages and limitations of each format. This reflection on data visualization develops their statistical literacy, an essential skill in our world dominated by quantitative data.

Communication skills

The exercise develops the ability to synthesize, requiring students to distill weeks or months of work into a few powerful visual elements. This format constraint encourages them to prioritize information and identify the key messages of their investigation. They learn that communicating effectively doesn't mean saying everything, but rather saying the essentials in a memorable way. The visual dimension of the poster introduces students to the principles of graphic design as applied to scientific communication. They discover how visual choices influence the perception and understanding of information. This awareness of the impact of design develops their ability to create professional communication materials, a skill valued in all professional fields.

Cross-functional skills

Working on scientific posters in groups develops collaborative skills. Students must negotiate content and presentation choices, learning to defend their ideas while remaining open to suggestions. This group dynamic replicates the real-life conditions of professional scientific work, where collaboration is essential.

The oral poster presentation develops oral communication skills. Students learn to adapt their speech to their audience, answer questions clearly, and defend their conclusions confidently.



DETAILED STRUCTURE OF THE SCIENTIFIC POSTER

Format you post

The scientific poster is designed to be displayed in a hall alongside several other posters. An ideal format allows for effortless reading from a distance of 1.5 meters for a printed poster, or 50 cm for a PDF on a screen. The font size and dimensions of your illustrations must be adapted to these requirements. To avoid visually cluttering the poster, limit the text and use two or three particularly striking illustrations.

For a poster that will be printed, an A0 format is recommended. It can be portrait or landscape depending on the organization of the information and the choice of readability. Printing the poster is always an important moment for the learners, so if you have the means, it is important to allow the printing of several posters during the year. After the presentation session, the physical support can remain in the classroom to promote the students' work and so that they can be proud of their learning/discoveries. If space does not allow it, the students take turns taking the poster home to show it to their families as the culmination of a research project.

To begin, the Canva template provides the recommended structure and proportions for a portrait poster. This simple structure can be adapted depending on the subject, but the key is to keep the form simple and read quickly. The main result should be at the center of the form to quickly catch the reader's eye.

Introduction, hypotheses

Hook that illustrates the importance or topicality of the subject studied Scientific context Clear, testable hypothesis directly linked to the contextual elements presented

Methodology, procedure

- Step 1
- Step 2
- Step 3

Plan

PROJECT TITLE

Authors' names
School, city, country

Results

Presentation of the results, what was observed

Observation 1

Observation 2

Diagram

Element 1 20%
Element 2 20%
Element 3 20%
Element 4 20%
Element 5 20%

Chart

Series 1 Series 2
Series 5

Item 1 Item 2 Item 3 Item 4 Item 5

Discussion

Interpret the results by placing them in the broader scientific context

Conclusion

Conclusion of the study in relation to the research problem

Bibliography

-
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[SteamCity Poster Template Example - Available Here](#)

The title and contributor identification area

The title is the first contact between the poster and its audience. It should serve as an ultra-condensed summary of the research, instantly communicating the topic and, ideally, arousing curiosity. An effective title avoids excessive technical jargon while maintaining scientific precision. It can take different forms depending on the communication objective: a descriptive title that clearly announces the content, a question title that poses the research question, or a positive title that presents the main result.

The identification area includes not only the authors' names and the institution, but may also include institutional logos, contact information, and acknowledgements to project partners. This section establishes the credibility of the work and anchors the research in its institutional context. In the SteamCity project, the inclusion of the logo and the mention of the ERASMUS+ program enhances the European dimension of the work.

The visual organization of this upper area establishes the graphic tone of the entire poster. The typographic and color choices made here are reflected throughout the document, creating a coherent visual identity. The title size, generally between 72 and 96 points, must allow it to be read from several meters away, an essential criterion in poster exhibition contexts.

Introduction and presentation of the problem

The introduction should immediately grab attention while establishing the context of the investigation. It ideally begins with a hook that illustrates the importance or timeliness of the topic under study. This hook could take the form of a surprising statistic, a question, or an everyday observation that reveals a complex scientific phenomenon.

The development of the scientific context should be gradual, moving from the general to the specific. This funnel structure guides the reader from familiar concepts to the specific research question. References to previous work, although necessary to establish scientific legitimacy, should remain succinct and directly relevant to the problem.

The formulation of the problem or hypothesis represents the final point of this section. It must be clear, testable, and directly linked to the contextual elements presented. The use of boxes or graphic highlighting can draw attention to this crucial formulation. The specific objectives of the investigation can be presented in the form of concise points, facilitating understanding of the different dimensions of the work.

Presentation of the methodology

The methodology section must balance scientific accuracy with accessibility. The challenge is to provide enough detail to make the experiment reproducible while avoiding overwhelming the reader with technical details. Using annotated diagrams, flowcharts, or timeline infographics transforms a potentially dry procedural description into an engaging visual narrative.

Photographs of the experimental setup or study area add a concrete dimension to the methodology. These images should be carefully selected and framed to show the essential elements without visual clutter. Annotations directly on the images guide the eye and explain the key components of the setup.

Protocol descriptions can benefit from being presented in the form of numbered steps with icons or pictograms representing each phase. This visual approach facilitates memorization and rapid understanding of the experimental sequence. Critical experimental parameters should be highlighted, allowing the reader to assess the rigor of the approach. The explanation of data analysis methods, often neglected, deserves special attention. Students should briefly but clearly explain how the raw data were transformed into presentable results. This methodological transparency enhances the credibility of the work.

The results: the visual heart of the poster

The presentation of the results is the central element of the poster, both in terms of content and visual impact. This section must transform potentially complex data into immediately understandable information. The choice of visualization type depends directly on the nature of the data and the message to be conveyed.

Bar charts are excellent for comparisons between distinct categories, while line charts reveal time trends or ongoing relationships. Pie charts, while visually appealing, are only suitable for data representing parts of a whole. Heat maps can effectively represent multidimensional data, while scatter plots reveal correlations well.

Every visualization must adhere to the principles of graphic integrity. The axis scale should start at zero for bar charts to avoid visual distortions. Error bars, essential for communicating measurement uncertainty, should be clearly explained in the legend. The statistical tests used should be mentioned, with significance values clearly indicated.

The spatial organization of the various visualizations should tell a progressive story. The main results occupy a central position and a larger size, while the secondary or complementary results are arranged on the periphery. This visual hierarchy naturally guides the reader's gaze through the narrative of the discoveries.

Figure legends deserve special attention. They should be self-contained, allowing the figure to be understood without reference to the main text. Each legend includes a concise description of what is depicted, the units of measurement, the sample size, and, if relevant, the specific experimental conditions.

Discussion and conclusion

The discussion interprets the results by placing them in the broader scientific context. This section builds bridges between observations and existing knowledge, identifying convergences and divergences with the scientific literature. Students should demonstrate their ability to think critically, recognizing the strengths and limitations of their conclusions.

The analysis of patterns observed in the data must go beyond simple description to propose explanatory mechanisms. These interpretations must remain cautious, clearly distinguishing between conclusions solidly supported by the data and reasonable but unproven speculation. This nuance develops students' scientific integrity.

Discussing methodological limitations demonstrates scientific maturity. Students must identify factors that could influence their results, whether sample size, experimental conditions, or analytical methods. This acknowledgment of limitations, far from weakening the work, strengthens its credibility.

The conclusion should create a narrative loop by explicitly returning to the initial question. It summarizes the main findings in a few powerful sentences, directly answering the questions posed in the introduction. The opening to future perspectives shows that science is an ongoing process, with each answer generating new questions.



VISUAL DATA STORYTELLING - MAKING DATA ACCESSIBLE AND CAPTIVATING TO A WIDE AUDIENCE

Visual storytelling in a scientific poster goes beyond the simple juxtaposition of graphic elements. It involves creating a deliberate path that guides the reader through a progression of ideas. This narrative progression typically follows a classic dramatic arc: exposition of the problem, building tension through the methodology, culminating in the revelation of the main results, and resolution in the conclusions.

The concept of visual flow organizes the poster's elements to create a natural eye movement. Invisible leading lines, created by the alignment of elements and the strategic use of white space, guide the eye from one section to the next. Transitional elements, such as subtle arrows or gradual color variations, reinforce this narrative continuity.

Using visual metaphors can make abstract concepts more accessible. For example, a cyclical process can be represented by a pie chart, while a hierarchy can adopt a pyramid structure. These visual metaphors facilitate intuitive understanding while adding an aesthetic dimension to the poster.

Visual hierarchy

Visual hierarchy is established through several simultaneous dimensions. Size remains the most obvious factor, but color saturation, contrast, and spatial position play equally important roles. Critical elements benefit from a combination of these factors to attract and hold attention.

The inverted pyramid principle, borrowed from journalism, applies perfectly to the scientific poster. The most important information appears first and prominently, followed by progressively more specific details. This structure allows for different levels of reading depending on the reader's time and interest.

Creating strategic focal points uses contrast to draw attention to key findings. A brightly colored graph on a neutral background, a contrasting box for an important conclusion, or a striking image can serve as visual anchors that immediately capture the eye and communicate the essence of the message.

Balance between elements

Visual balance doesn't mean rigid symmetry. Asymmetrical balance can create more dynamism and visual interest while maintaining overall harmony. The rule of thirds, a fundamental principle of visual composition, guides the placement of key elements at the intersections of the imaginary lines dividing the poster into nine equal sections.

The optimal text-to-image ratio varies depending on the content, but a ratio of 30% text to 70% visuals is generally a good starting point. This ratio forces students to synthesize their ideas while prioritizing visual communication. White space, ideally 20 to 30% of the total surface area, is not wasteful but essential breathing spaces that improve readability and visual impact.

Stylistic consistency unifies the various elements into a harmonious whole. This consistency is expressed through the consistent use of the same fonts, colors, and graphic styles. Stylistic variations must be intentional and serve a specific communication purpose, such as distinguishing different categories of information.



IN-DEPTH TECHNICAL ADVICE

Color palette

Color choice profoundly influences how content is perceived and memorized. A palette limited to three or four main colors, plus their variations in saturation and brightness, creates a strong visual identity without confusion. The dominant color establishes the overall mood, while accent colors draw attention to key elements.

Color psychology guides color choices based on the message being conveyed. Blues evoke confidence and professionalism, greens suggest growth and environment, while oranges and reds create urgency and energy. These cultural associations must be considered in the context of the target audience.

Color accessibility ensures that the poster remains readable for everyone, including people with color blindness. Using contrast checking tools and combining color differences with brightness differences ensures inclusive communication. Patterns or textures can complement colors to distinguish elements in graphics.

Typography

Typographic hierarchy structures information through different levels of headings and text. The main heading, section headings, subheadings, and body text should be clearly differentiated by size, weight, and possibly font. This differentiation guides reading and makes it easier to quickly scan the content.

Legibility from a distance determines typographic choices. Sans-serif fonts like Arial, Helvetica, or Calibri offer better readability on posters. A minimum size of 24 points for the main text ensures comfortable reading from a distance of one meter, while section headings in 36-48 points visually structure the space.

Line and paragraph spacing significantly influences readability. Line spacing 1.2 to 1.5 times the font size improves reading comfort, while generous margins between sections create a clear structure. Justified alignment, while aesthetically pleasing in some contexts, can create uneven spacing that is detrimental to reading fluency.

Effective Data Visualizations

Creating effective graphics requires careful consideration of the data-to-ink ratio, a concept developed by Edward Tufte. Each graphic element should contribute to communicating the data, eliminating unnecessary decorations that distract from the main message. Background grids should be subtle, borders minimal, and 3D effects generally avoided.

Direct chart annotation eliminates visual back-and-forth between data and legends. Placing labels directly on or near the elements they describe improves immediate understanding. This approach is particularly effective for line charts where legends can be placed at the end of each line.

Representing uncertainty through error bars, confidence intervals, or shaded areas communicates the robustness of results. This transparency about data variability strengthens scientific credibility while educating the audience about the importance of uncertainty in science.



PHASING OF POSTER PRODUCTION

Planning phase

Planning begins with a comprehensive brainstorming session, where all potential poster elements are listed without censorship. This divergent phase allows students to identify all possible content before making a selection. Students can use mind maps or sticky notes to visually organize their ideas.

Selecting essential content is the most critical step. Students must identify the elements essential to understanding their investigation, distinguishing between the necessary and the desirable. This prioritization can be facilitated by creating an importance-relevance matrix where each element is evaluated according to these two criteria.

The paper poster sketch allows for rapid exploration of different spatial arrangements. These rudimentary sketches, completed in a few minutes, test various configurations without the time investment of digital creation. This exploratory phase fosters creativity and innovation in layout.

Creation phase

Digital creation transforms the sketch into a professional poster. Tools like Canva offer adaptable templates that speed up the process while maintaining high visual quality. PowerPoint or Google Slides, more familiar to students, also allow you to create posters with their layout tools, but with a less satisfying result.

Importing and creating visual elements requires careful attention to resolution and quality. Images should have a resolution of at least 300 DPI for printing, ideally 500 DPI. Graphics created in specialized software should be exported in vector formats whenever possible to maintain sharpness at all scales.

Progressive iteration and refinement gradually improve the poster. Each version should be saved separately, allowing you to return to previous versions if necessary. Feedback from peers and teachers at different stages of the process enriches the final result. It's important to practice presenting the poster as you create it to ensure you don't forget anything necessary and, above all, don't keep anything unnecessary.

Finalization phase

Content review checks for scientific accuracy, terminological consistency, and the absence of errors. This review benefits from a read-aloud that reveals awkward wording and repetitions. An outside perspective, ideally someone unfamiliar with the project, can identify confusing or missing elements.

Small-scale print tests allow you to check readability and visual impact before final printing. These tests often reveal contrast or font size issues that are not apparent on screen. Black and white printing also tests the robustness of visual communication regardless of color.

Preparation for the oral presentation accompanies the finalization of the poster. Students must prepare a two- to three-minute presentation that guides the audience through the poster, as well as answers to potential questions. This preparation transforms the poster from a static object into an interactive communication medium.



EDUCATIONAL SUPPORT STRATEGIES

Differentiation according to levels

Adapting to different skill levels requires a flexible approach. For beginners, using more structured templates with predefined areas makes creation easier. Advanced students can explore more creative layouts and sophisticated data visualizations.

Progressive scaffolding introduces concepts gradually. Beginning with the analysis of existing posters develops visual literacy before creating new ones. Intermediate exercises, such as creating mini-posters on simple topics, build skills gradually.

Individualized support recognizes each student's specific strengths and challenges. Some will excel at data analysis but struggle with design, while others will demonstrate the opposite. The instructor can form complementary teams or provide targeted resources as needed.

Curricular integration

Connecting with other disciplines enriches the learning experience. The skills developed in visual arts apply directly to the poster design, while the French lessons contribute to editorial clarity. This interdisciplinary approach reflects the project's STEAM philosophy.

Alignment with learning objectives ensures that the exercise contributes to curricular competencies. Poster creation can simultaneously address science, communication, and digital literacy objectives. This pedagogical efficiency maximizes the value of the time investment.

Continuous formative assessment guides students throughout the process. Regular checkpoints allow for course corrections before major errors accumulate. This approach reduces frustration and improves the quality of the final product.



EVALUATION CRITERIA

Clarity Assessment

- The clarity of the main message is assessed by the rapid passage test: can a reader understand the main point in two minutes? This assessment can be formalized by an exercise in which people outside the project summarize what they have understood after a limited reading time.
- Logical progression examines the flow of scientific narrative. Each section should naturally lead to the next, creating a coherent argument. Transitions between sections, whether textual or visual, facilitate this progression and maintain reader engagement.
- Audience suitability ensures that the level of complexity matches the intended audience. A poster intended for scientific peers may use more technical terminology than a poster intended for the general public. This adaptation demonstrates students' ability to adapt their communication according to the context.

Rigor Assessment

- The accuracy of the data presented is the fundamental criterion. Every figure and every graph must be verifiable and correctly represented. External data sources must be cited, and the original data collection methods clearly explained.
- The validity of the experimental approach examines whether the methodology actually allows the hypothesis to be tested. Appropriate controls, sufficient sample size, and management of confounding variables demonstrate an understanding of the scientific method.
- Intellectual honesty is demonstrated in the balanced presentation of results, including data that do not support the initial hypothesis. Discussion of limitations and potential sources of error demonstrates students' scientific maturity.

Visual impact assessment

- The overall appeal of a poster is measured by its ability to attract attention in a competitive environment such as a poster session. Aesthetic choices should serve the communication without dominating it, creating a balance between beauty and functionality.
- Visualization effectiveness examines whether graphics and images clearly communicate their message. Each visual element must have a specific function and fulfill it effectively. Purely ornamental decorations without informative value should be avoided.
- Innovation in presentation values creative approaches that enhance communication. This innovation can be manifested in spatial organization, visual metaphors used, or data visualization techniques. Originality is encouraged as long as it serves the scientific message.



PROSPECTS FOR EXPANSION AND ENRICHMENT

Presentation and defense of the poster

Organizing a formal poster session simulates the experience of attending a scientific conference. Students present their work to peers, teachers, and potentially external guests. This experience develops oral communication skills and the ability to popularize science.

Preparing a 60-second elevator pitch requires extreme synthesis of the message. This exercise develops the ability to identify and communicate the essence of a complex project, a valuable skill in all professional contexts.

Video recording of presentations allows for self-assessment and continuous improvement. These recordings can also create a library of resources for future cohorts of students.

Examples and models

Analyzing award-winning posters from academic competitions provides models of excellence. These examples concretely illustrate theoretical principles and inspire students. Critically discussing these models develops aesthetic and scientific judgment. Depending on the discipline being studied, it is relevant to choose posters presented at research conferences. It is always very enriching to see that a researcher manages to make complex subjects understandable in a few words and a few illustrations.

Creating a gallery of posters from previous years within the school creates a local tradition and references. This archive allows students to see the evolution of approaches and draw inspiration from their predecessors.

Detailed assessment rubrics, shared at the beginning of the project, clarify expectations and guide self-assessment. These rubrics can be transformed into checklists that students use to review their work before submission.

European collaborative dimension

As part of the SteamCity project, the exchange of posters between partner institutions enriches the experience. Students discover different cultural and methodological approaches to scientific communication. These exchanges can be accompanied by international feedback sessions via videoconference.

The creation of multilingual posters, with versions in different European languages, develops language skills while exploring the challenges of scientific translation. This international dimension prepares students for modern science, which is inherently collaborative and multicultural.

Organizing inter-institutional competitions with mixed juries creates positive emulation. Harmonized evaluation criteria across partner countries establish common standards while respecting cultural diversity.



CONCLUSION

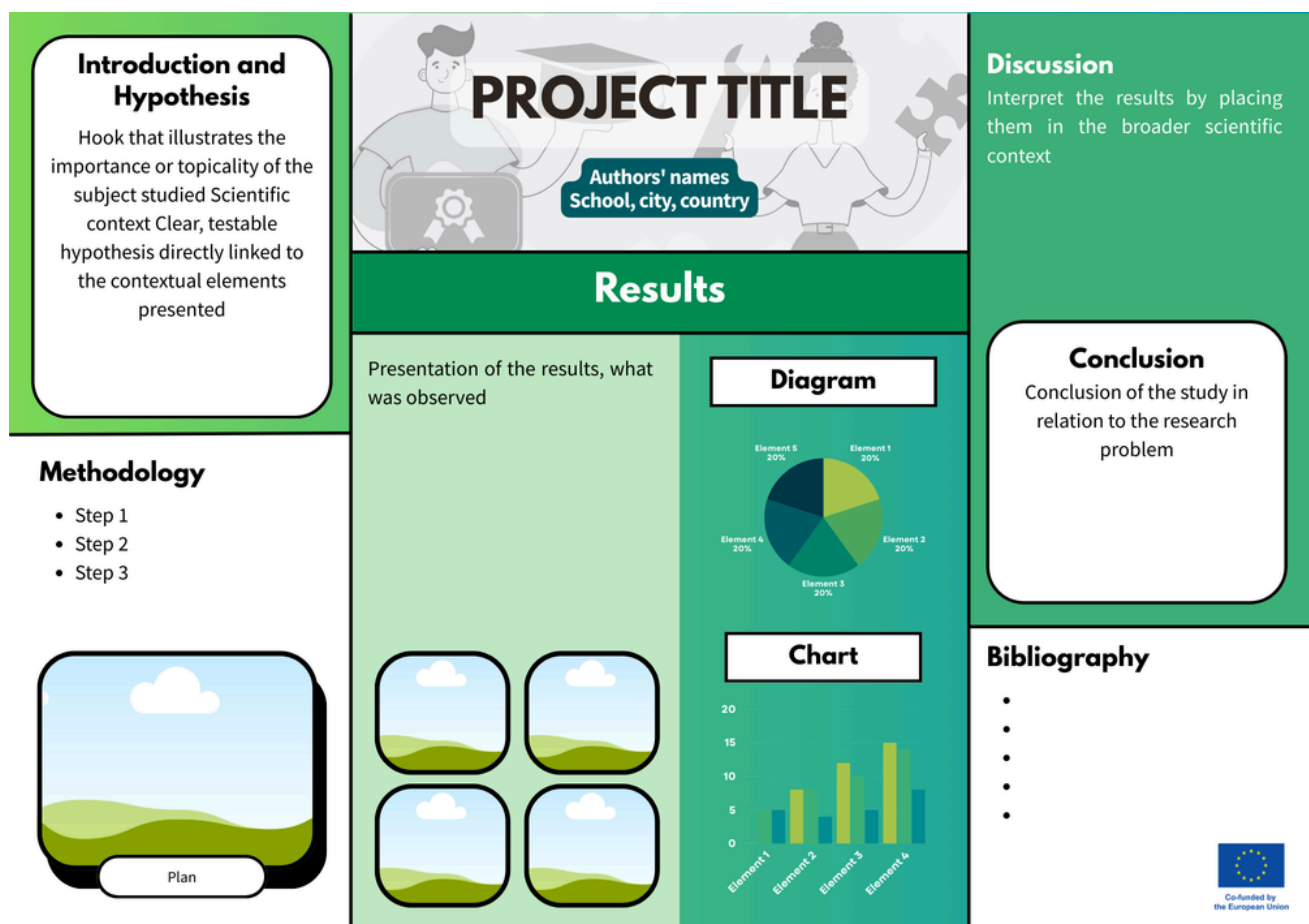
Creating a scientific poster goes beyond an academic exercise to become a comprehensive learning experience. It simultaneously develops scientific rigor and communicative creativity, preparing students for communication challenges where the ability to present complex information in an accessible manner is crucial.

The integration of visual data storytelling transforms this traditional exercise, making it relevant to a digitally native generation. Students learn that science can be rigorous and captivating, precise and creative, academic and accessible. This duality enriches their understanding of science as a human endeavor of discovery and knowledge sharing.

The poster creation process, from conceptualization to final presentation, mirrors the full cycle of scientific research. Students experience the joys and challenges of scientific communication, developing an appreciation for the work required to transform data into shareable knowledge. This experience prepares them not only for graduate studies in the sciences, but for any career requiring the synthesis and communication of complex information.

The STEAM approach promoted by the SteamCity project finds perfect expression in the scientific poster. The intersection of science, technology, art, and communication creates a rich and multidimensional learning experience. The skills developed transcend disciplines, forming citizens capable of navigating and contributing to our information society.

Learning how to create an effective science poster teaches students that communicating science is not an optional extra to scientific work, but a fundamental responsibility. In a world where global challenges require shared understanding, training future scientists and citizens to communicate clearly and effectively becomes an educational imperative. The science poster provides an ideal vehicle for developing this skill.



[SteamCity Poster Template Example - Available Here](#)

