

# VIENNA INTERNATIONAL SCIENCE AND ENGINEERING FAIR

## PROJECT SUGGESTIONS

Your project may be one of several types depending on your topic and your objective. It is important for you to identify the type of project you intend to carry out so that you can focus your activities on meeting your objective. Among the types of projects you might consider are: research, information, demonstration, or design. These four types are described below:

### 1. Research Project

In this type of project, the objective should be to answer a question using the scientific method. This method involves identifying a question you would like to answer, forming a hypothesis or educated guess as to what the answer to the question might be, designing an experiment to determine whether or not the answer is correct, performing the experiment, evaluating the results, and then drawing a conclusion.

In doing this type of project, the report and display should clearly describe what was done in each of the steps. The report should also include some background material indicating what has or has not been done by other scientists to answer this or similar questions, and also it should include a discussion of what further questions or possible experiments might be useful to provide more information on the topic.

An example of a research project would be "An investigation of the effect of artificial light on plant growth". The question might be: How does artificial light affect plant growth? The hypothesis might be: Plants grow faster under natural sunlight than under artificial light. The experiment might involve growing several plants, some under natural sunlight and some only under artificial light. Note that an experiment would have to be carefully designed to ensure that the primary difference between the conditions of the two groups of plants was the type of light (and not temperature, water, soil condition, type of plant, etc.). The experimental data might be a record of the height versus time of the plants grown under different lighting conditions. The results would be an objective determination of which group of plants grew the fastest. The conclusion would then be that the hypothesis is either correct or not (or it cannot be determined from the results obtained). It might be worthwhile to discuss why the results turned out the way they did and how to go about testing further hypotheses about the effects of lighting on plant growth.

### 2. Information Project

This type of project presents information that could be acquired by reading (encyclopaedias, book, magazine articles, etc.) or by talking to authorities (teachers, scientists, etc.) about a well defined topic. The report for this type of project would provide a clear and well organized presentation of the information, and the display would provide pictures, diagrams, specimens, etc. along with some written descriptions to present this information effectively. This type of project differs from the research project in that it does not involve an experiment designed to answer a specific question.

An example of this type of project might be one entitled, "Eyes - How They Differ in Different Animals and Insects". The report for this project might explain the similarities and differences in the function of eyes in different species. The display might include diagrams of the eyes of different animals, which point out both similarities and differences.

### 3. Demonstration Project

This type of project is similar to the Information project, but it has the additional element of a model or device that demonstrates how something works. A significant part of the effort involved in this type of project might be building the model or device. The report

should explain the history, applications, and types of devices of this sort, as well as an explanation of how it works. The display might include pictures of device in operation, some diagrams to show how it works, as well as the actual working model.

An example of this type of project might be one titled: "The Electric Motor". The report would include a review of the history of the development of electric motors, a description of different types and how they work, a discussion of current applications of electric motors, and an explanation of how the working model was constructed. The display would include a working model of a motor built by the student. The display might also include pictures and diagrams of electric motors organized to make a point (like how they have evolved, or how many types there are, or how many applications they have).

### 4. Design Project

This type of project is similar to the demonstration project in that it involves the construction of a working device or model. The primary difference is that the design process begins with a technical objective, which is met by using knowledge of scientific principles or information derived from experiments to determine how the device should be constructed. This process often involves optimization or determining how to get the most from the least. The report for this type of project should clearly identify the design objective and the scientific information used to plan the construction of the device. The report could also include background information on this type of device as in the demonstration project, but it might concentrate more exclusively on the design process. The display should describe the design process and include the device itself. The display might also include examples of how the type of device you designed could be used.

An example of this type of project might be: "A Bridge Design". The technical objective could be to design a bridge that would span a certain distance and support a specified weight using the least amount of construction material possible. The scientific information that the designer would use might include the strengths of different building materials and the stresses to which they would be subjected in designs of different types. The designer might need to perform experiments to determine material strengths and the types of stresses created in different designs. The report for this project would include an explanation of the design objective, a discussion of the types of design options considered, an explanation of the scientific principles used in evaluating options, the sources of information used, the results of experiments, if any, used to provide information for the design, a description of the construction process, and an explanation of how the final product did or did not meet the design objective. It might also be useful to discuss ideas for possible future designs that were inspired by the work.

### Additional Suggestions

Note that while good projects of all of these types have been entered in previous fairs, students are particularly encouraged to enter projects in categories 1 or 4 (research or design projects). These types of projects are more like the work done by professional scientists and engineers and may give you a better feel for the kind of work you might do if you decide on a career in science or engineering.

Note that you will not be required to make a formal presentation, but you will be interviewed for about ten minutes by each of three different judges. You should prepare for these interviews as if you were preparing to make a formal presentation.