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# **“Student Science Research Projects 101”**

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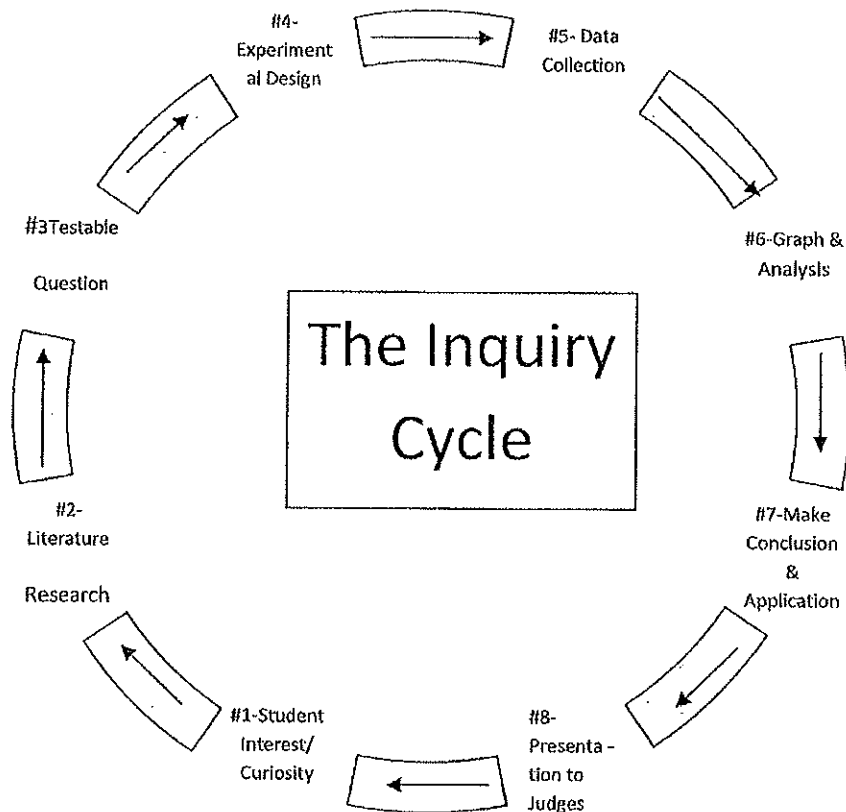
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**"DVSF Inquiry Based Science Research Project Workshop"**



**1. Choosing a topic**

- a. Choose something that interests the student—use brainstorming or 4 question model.
- b. Choose something you want to know more about or a topic you are dealing with in class
- c. Talk to your parent, a scientist, a relative or a neighbor about something they are working on or a problem they see needs solved

(1) Monell Institute of ...

Like skills  
 - talking to someone you don't know  
 about something you do know.

Books: The Truth about Science  
 Students and Research

d. Other Resources

1. [www.dvsf.org](http://www.dvsf.org) -- under Student Resources or Teacher Resources
2. <https://student.societyforscience.org/resources-2> —abstracts of former ISEF projects
3. [www.sciencebuddies.org](http://www.sciencebuddies.org) – many good middle school plus high school starter projects
4. Find a mentor to help you – DVSF has a Mentorship Program that will align a student who has an idea already with a professional scientist who can answer some questions for student via email- Contact DVSF Mentorship Program at: <http://www.drexel.edu/dvsf/mentorship.htm> for more info.

2. **Paperwork – All projects will need Forms 1, 1A and 1B.** Human Projects will also need a Form 4. Vertebrate animal projects will need Forms 5. Bacteria projects will need to have form 6A and B. See <https://student.societyforscience.org/forms> for more information and the forms you need for your project. There is a forms “Wizard” to help you know which to use at: <https://apps2.societyforscience.org/wizard/index.asp>

3. **Log Book-** date each entry--- include literature research info, bibliography, any interviews, raw data taken, **any** activity done that dealt with the project, **any change in procedures**, include photos of work, your thoughts/observations

4. **Background research**

- a. use credible sources – such as .gov or .edu
- b. cite your information – use proper format (Smith, 2013)
- c. use books, magazines, computer sites, interviews, journals
- d. Google Scholar
- e. Caution! Wikipedia is not always reliable
- f. written paper by expert in the field
- g. Bibliography should have a minimum of 5 sources

5. **Identify Problem**

- a. Testable question—a question that requires data to be taken to answer
- b. Not informational question

## 6. Form Hypothesis

- a. Answers question based on background research
- b. Use If... Then... Because format
- c. Don't change hypothesis if data shows different result

## 7. Plan out experimental design

- a. identify variables- conditions in experiment that could be changed
- b. independent variable- the variable you choose to change
- c. dependent variable – the variable you measure because you changed the independent variable
- d. Identify Constants- what will remain the same throughout the experiment
- e. Control – the group to whom you will compare the experimental group
- f. 2 key principles – 1) be sure you do a **“controlled” experiment**- only one variable is changed all others are held constant  
2) Have **adequate sample size**--replication - The more times you perform the experiment the more accurate your results
- g. The project should be **“replicable”** – make the procedure very clear and specific- someone reading your procedures should be able to **“replicate”** the process

## 7. Perform experiment

- a. collect data and record using data tables
- b. use quantitative(numbers) measurements using the **metric system**
- c. be sure data tables are titled, labeled and units identified
- d. use qualitative(using words) observations if helpful- list as **“Observations”**
- e. document data taking with photos
- f. if observations are qualitative in nature(color), set up a numbered color chart(e.g., a deepening color of purple for a blueberry stain)

## 8. Analyze data

- a. Graphs – a **“picture”** of your data--bar, line, scatter, pie
- b. Title
- c. Label axis
- d. Measurements in metric
- e. Extrapolate—a guess at what the results would be if graph line is extended
- f. Interpolate—a guess at what the results would be in between the data points on the graph

## 9. Draw conclusions based on original question

- a. Conclusions must be based on the data taken not on what your literature research identified
- b. Look at graph to see the relationship between the change of the independent variable and its impact on the dependent variable.
- c. Do not change hypothesis if it states a different expected result than what you got
- d. include a summary of what you discovered
- e. include an explanation as to why you achieved this outcome
- f. discuss how you would improve this experiment if you were to repeat it
- g. discuss how what you discovered can be used (application) by society and by scientists
- h. discuss how you will continue this project

## 10. Abstract

- a. a quick "snapshot" of your project
- b. no more than 250 words and no more than 3 paragraphs
- c. what was the testable question
- d. what were the key procedures
- e. what did you discover

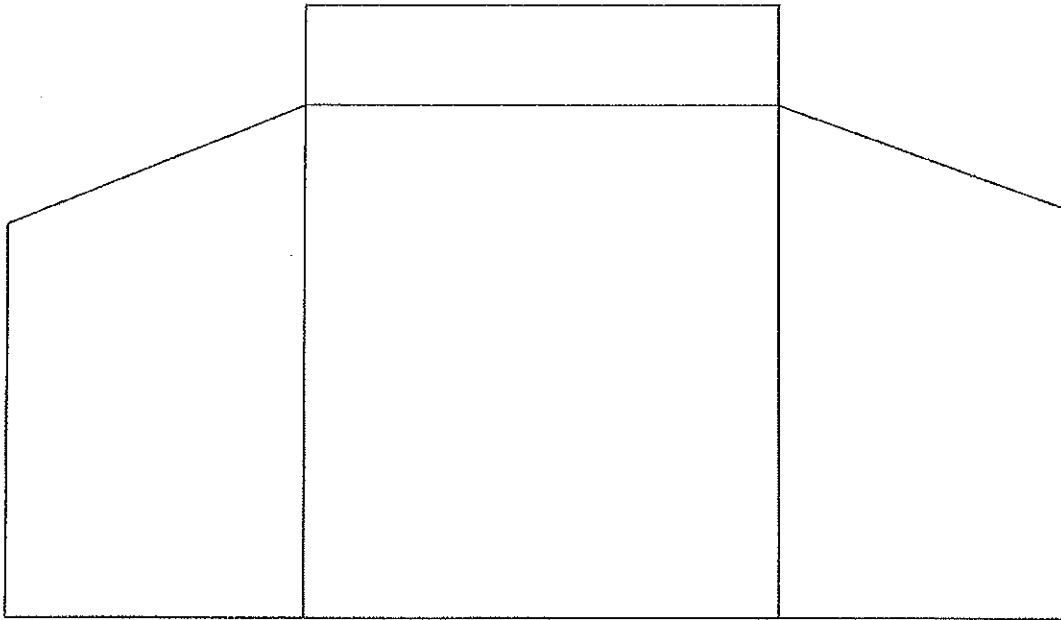
### Sample Abstract

#### **DECLINE IN BLUE JAY POPULATION IN CHURCHVILLE, PA DUE TO WEST NILE VIRUS**

The purpose of this research project was to study the *Cyanocitta cristata* population in Churchville, PA and whether it was declining because of West Nile Virus (WNV). I compiled data from different sources to create graphs, from which I was able to conclude whether the Blue Jay population was rising or falling. I compared the number of birds reported with WNV with trends in Blue Jay population. My hypothesis was the *Cyanocitta cristata* population was declining because of West Nile Virus. As I progressed, I discovered more causal factors that needed further exploration. My goal was to eliminate all of the possible factors to find the factor that truly affected the population. My project included gathering data from various sources, compiling graphs, studying background, and analyzing overall results. I gathered data from Churchville Nature Center (CNC), the National Audubon website, and other sources. The CNC data was a weekly bird count of the local ecosystem in Churchville over the last four years. The data from the Audubon Society concerned the numbers of birds seen once annually at the Christmas Bird Count, done for over a century. It was important to study the Blue Jay habits to better understand how the factors affect that particular bird, so I compiled a Bird Biography. I got information on the disease from USGS, the CDC and other sources. The PA WNV website contained the number of positive avian cases annually in Bucks County. The Bucks Health Department answered specific WNV questions. My findings support my hypothesis that *Cyanocitta cristata* population is declining in Churchville and its cause is West Nile Virus. My data predicts that by the year 2007, there will be no Blue Jays sighted in Churchville, yielding significant impact on the ecosystem. Because of the relative newness of the disease in the U.S. and importance of its impact on the species, this topic requires further study.

**Simple Format for Writing Your Abstract**

Purpose of project/experiment: an introductory statement (thesis) explaining the reason for the research, or a statement of the problem.
Summary of the procedures, emphasizing the key points or steps.
Data/Observations with conclusions, applications and sources of error. Possible extensions.



Log  
Book

Background  
Research

ISEF Student Handbook can be very helpful-

<https://member.societyforscience.org/document.doc?id=12>

As well as the Forms and Rules webpage for ISEF

<https://student.societyforscience.org/resources-2>

The Current Year's Forms are available now at:

<https://student.societyforscience.org/forms>

### **Other Resource Books:**

Students and Research, Cothron, Giese, Rezba, Kendall/Hunt Publishing, Dubuque, Iowa, 2000. (This is outstanding for all levels and particularly good for high school. Covers all aspects of science research project along with statistics.)

STEM:Student Research Handbook, Darci Harland, NSTA Press, Arlington, VA, 2011. (Another outstanding book for all levels as well as making excellent STEM connections.)

Getting Started in Science Fairs From Planning to Judging, Phyllis Perry, McGraw-Hill, 1995. (Good middle school level book with multiple project ideas in various categories.)

How to Make Your Science Project Scientific, Thomas Moorman, John Wiley & Sons, 2002. (Good middle school level to intro high school level book that deals with well with experimental design and controlled experiments.)

### **Conclusions**

1. Why do you think is this a worthwhile experience for your students?
2. Where can you find help in this process?
3. What is the value for you as an educator in having your students do student science research?