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| ***Techniques for Documenting with Proof or Supporting Evidence, and Related Strategies for Problem Solving***  **By David Alderoty © 2017**  **Chapter 18) Technique-16 Experimental Evidence,**  **And Related Concepts**  [**This e-book presents 28 techniques for supporting the validity of the statements you write**](http://www.TechForText.com/DP/List)**.**  **Left click on the above for a list of the techniques**  **This chapter contains a little over 1,900 words**  **If you want to go to chapter 17, left click on the following link:**  [**www.TechForText.com/DP/chapter-17**](http://www.TechForText.com/DP/chapter-17)  **To contact the author use David@TechForText.com**  [**or left click for a website communication form**](http://www.david100.com/Mail)  **Table of Contents, and an Outline of this Chapter**  The following is a hyperlink table of contents, as well as an outline of this chapter. If you left click on a blue underlined heading, the corresponding topic or subtopic will appear on your computer screen. Alternatively, you can scroll down to access the material listed in the table of contents, because this chapter is on one long webpage.  [Topic 1.) Technique-16, Experimental Evidence 4](#_Toc475095041)  [**Subtopic, Experiments, and Experimental Evidence** 4](#_Toc475095042)  [**Subtopic, Note, Some Published Sources and Individuals Might Consider an Experiment Successful Only if it Confirms the Validity of the Hypothesis** 5](#_Toc475095043)  [**Subtopic, Experiments that Do Not Involve a Hypothesis** 6](#_Toc475095044)  [Topic 2.) Formal and Informal Experiments 7](#_Toc475095045)  [**Subtopic, What are Formal Experiments** 7](#_Toc475095046)  [**Subtopic, What are Informal Experiments** 9](#_Toc475095047)  [**Subtopic, Carrying Out Informal Experiments, to Test the Efficacy of Plans to Carry Out a Formal Experimental Project** 10](#_Toc475095048)  [**Additional and Supporting Information For this Subtopic, From the web** 10](#_Toc475095049)  [Topic 3.) Writing with Experimental Evidence, and How To Support the Validity of the Experimental Evidence 11](#_Toc475095050)  [**Subtopic, An Example of a Writer Using his Own Experiments And Related Evidence, to Support the Validity of his Text** 12](#_Toc475095051)  [**Additional and Supporting Information For This Chapter, From Web-Based Articles** 13](#_Toc475095052)  [**Additional and Supporting Information For this Chapter, from Web-Based Videos** 14](#_Toc475095053)  [**Example of Experiments Recorded on Video, from the Web** 15](#_Toc475095054)  **This E-Book Provides Additional and Supporting Information from other Authors, with Web Links**  This e-book contains links to web-based articles and videos from other authors, for **additional, alternative, and supporting information.** The links are the blue underlined words, presented throughout this e-book. However, some of these links are to access different sections of this e-book, or material on my own websites.  Quotes and paraphrases in this e-book have hyperlinks to access the original source. The quotes are presented in brown text, which is the same color of these words. (The precise text color is RGB Decimal 165, 42, 42, or Hex #a52a2a)  Some of the web links in this e-book will probably fail eventually, because websites may be removed from the web, or placed on a new URL. If a link fails, use the blue underlined words as a search phrase, with [www.Google.com](http://www.google.com/) If the link is for a video, use [www.google.com/videohp](http://www.google.com/videohp) The search will usually bring up the original website, or one or more good alternatives. |

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| ***For those who prefer listening, as an alternative to reading, this book is recorded in an audio format.***  [***For an audio narration of this chapter, left click on these words (requires 15 minutes, and 20 seconds).***](P1.mp3) |

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| **Topic 1.) Technique-16, Experimental Evidence**  |||  Technique-16, experimental evidence**,** can be used to support the validity of the statements you are writing. Experimental evidence is also information that can be used to solve a problem or obtain a goal. The experimental evidence can come from published sources, or from experiments that you, or someone you know carried out. The utility of this concept, and its potential use in writing, will become apparent after you read this chapter.  **Subtopic, Experiments, and Experimental Evidence**  |||  I am using the term experiment and experimental evidence, in this e-book in a very broad and general way. Based on the general way I am using the terminology**,** **experiments are carried out to obtain information**. This can involve experiments to determine if a hypothesis is correct, or incorrect.  An experiment is successful if it proves that the hypothesis is **true**, or **false.** An experiment is **not** successful if it does **not** confirm or refute the validity of the hypothesis. Sometimes experiments that fail provide interesting or valuable results that are unrelated to the hypothesis. Experiments can be considered partly successful, if they provide at least some supporting evidence indicating the truth or falsity of the hypothesis.  Experiments involving complex systems, such as social groups, human physiology, and ecological systems, usually provide less than perfect results. Experiments of this nature often involve statistical evaluations indicating the probabilities of a hypothesis being true or false. There are complex mathematical techniques for calculating the probabilities. However, in real life situations, the probabilities and experimental results in general, can be influenced inadvertently or intentionally by social and psychological factors. This is explained in more detail in the following subtopic.  **Subtopic, Note, Some Published Sources and Individuals Might Consider an Experiment Successful Only if it Confirms the Validity of the Hypothesis**  |||  Some sources, and individuals, might consider an experiment only if it proves that a hypothesis is correct. **Thinking in this way, might increase the chances of manipulating the experimental setup, so that it confirms the validity of a hypothesis that might be incorrect.** This can happen inadvertently, and in some cases intentionally, when the researcher is focused on proving the validity of his or her hypothesis. This probably happens frequently, because there are many disagreements about the validity of various hypothetical concepts. This can involve researchers who favor a hypothesis, using less-than-perfect experimental setups that confirm their assumptions, and vice a versa.  Based on the definition I provided in the previous subtopic, an experiment is successful if it proves that a hypothesis is correct or incorrect. However, if a researcher carries out a successful experiment that disproves his or her hypothesis, he or she will usually not be rewarded for the results. The experimenter might decide not to publish such results. In addition, the scientific journals might refuse to publish the results.  However, if an experiment proves that an established theory, or widely accepted hypothesis to be false, the experimenter would receive great rewards for his or her efforts. This is assuming that the scientific community believes the experimental results to be valid.  **Subtopic, Experiments that Do Not Involve a Hypothesis**  |||  However, based on the general way I am using the terminology, an experiment does **not** have to involve a hypothesis. Experiments can be set up to determine what will happen under a specific set of conditions. A simple example is mixing two or more chemicals together to see what will happen. Experiments can also involve an evaluation to determine the utility and/or functionality, of a strategy, method, product, or invention. Experiments can involve testing to see what works, and what does not work. |

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| **Topic 2.) Formal and Informal Experiments**  |||  Experiments can be divided into two broad categories, which I call **formal**, and **informal.** **Formal experiments** are carried out with great care, and with strategies that would minimize the chances of obtaining erroneous results. **Informal experiments** are carried out in a simpler and less precise way than the above. These concepts are explained in detail in the following subtopics.  **Subtopic, What are Formal Experiments**  |||  Based on the way am using the terminology, **formal** experiments are carefully carried out, using various strategies and equipment to avoid errors or erroneous results. Formal experiments may involve a comparison between an experimental group, and a control group, such as when evaluating medications on humans or animals. In such a case, the control group receives a placebo, and experimental group receives the experimental medicine. The placebo group and experimental group are compared to determine if the medication is effective. Similar techniques involving controls are used in human behavior experiments, such as in psychology, and social psychology.  Formal experiments that involve chemistry and physics might not require the type of controls described above. For example, if a chemist is trying to create a new aluminum alloy, he or she, will mix aluminum with other metals, using high-temperature. This would be repeated many times to produce large number of aluminum alloys. Then, each alloy would be tested to determine its properties, such as tensile strength, compression strength, melting point, resistance to corrosion, and potential utility.  Sometimes controls, that are more or less similar to the controls described in the previous paragraph, are required in the physical sciences. For example, if a sample of water is evaluated for purity, using a new experimental testing device, controls should be used. This can involve evaluating two samples of water using the new technique. The experimental sample would be contaminated with a carefully measured level of contaminants. The negative control sample would be distilled water. If the experimental testing device functions properly, it will indicate the quantity of impurity in the contaminated sample. It will also indicate that the distilled water has no contaminants.  **Subtopic, What are Informal Experiments**  |||  In general, formal experiments are time-consuming, expensive, and relatively difficult to carry out. Based on the way amusing the terminology, **Informal** experiments are carried out with less precision, and do not involve all of the strategies used with formal experiments. Informal experiments can usually be carried out with much less time, less effort, less money, and less equipment, then formal experiments. However, these experiments can sometimes produce erroneous results. Thus, the information obtained from an informal experiment generally is not suitable for publication in scientific-journals.  The major advantage of an informal experiment is it can be carried out with only of fraction of the expense, time, and effort of a formal experiment. Thus, it is usually feasible to carry out many informal experiments, which can produce a large amount of information. The information might include some useful or interesting results, as well as some imprecise, ambiguous, and/or erroneous results. However, the results of informal experiments can always be refined and carefully evaluated with formal experimentation.  **Subtopic, Carrying Out Informal Experiments, to Test the Efficacy of Plans to Carry Out a Formal Experimental Project**  |||  When planning a formal experimental project, it is usually best to carry out informal experimentation first. This can involve an initial evaluation of a hypothesis with **informal** experimentation. If the initial results are disappointing, an alternative experimental project can be devised. This can avoid wasted time, money, and effort.  However, if the informal experiments yield promising results the project can be carried out. If a research grant proposal is needed for funding, it might be advantageous to describe the informal experiments in the grant proposal. This is assuming the informal experiments were carried out with a reasonable level of care and precision.  **Additional and Supporting Information For this Subtopic, From the web**  |||  [The importance of "controls"](http://virtuallaboratory.colorado.edu/Biofundamentals/labs/WhatisScience/section_05.html)  [Quality control in clinical laboratory samples, By: Maj. Paul R. Eden](http://www.mlo-online.com/quality-control-in-clinical-laboratory-samples.php)  [What is the purpose of a control in an experiment?](https://www.reference.com/science/purpose-control-experiment-838d3657d464c6c1)  [What Is the Difference Between a Control Variable and Control Group?](http://chemistry.about.com/od/scientificmethod/fl/What-Is-the-Difference-Between-a-Control-Variable-and-Control-Group.htm)  [Video and text: Positive Control: Definition & Experiment](http://study.com/academy/lesson/positive-control-definition-experiment-quiz.html)  [Negative Control: Definition & Experiment](http://study.com/academy/lesson/negative-control-definition-experiment-quiz.html) |

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| **Topic 3.) Writing with Experimental Evidence, and How To Support the Validity of the Experimental Evidence**  |||  When presenting experimental evidence, ideally you should include supporting material to convince the reader that the evidence is valid. **If you obtained the experimental evidence from reliable published sources, the conventional citations would be adequate in this regard.** However, obtaining additional information from other authors that confirm the validity of the experimental evidence would produce a statement that is more convincing. Keep in mind that experimental results from one researcher might confirm a hypothesis, and the results of another researcher might refute the hypothesis.  **If you carried out the experiment yourself, you may be able to support your results by explaining exactly how you carried out the experiment.** This must be done in such a way that the reader with appropriate training can reproduce your experiment, to check its validity. Experimental results are **not** considered valid if they cannot be reproduced by others. In addition, demonstrating your experiments, in person, on video, or over the Internet can also be useful for convincing the readers that your evidence is valid.  The following subtopic, presents an example that shows how experiments carried out by the writer, can be used to support the validity of his text.  **Subtopic, An Example of a Writer Using his Own Experiments And Related Evidence, to Support the Validity of his Text**  |||  I wrote a very short 5000 word web-based e-book early in **2016**. The validity of some of the statements in this e-book, are supported by the results of experiments I carried out. The e-book is titled: ***Experiments with the Filesystems Used on the Web and Personal Computers, Reveal Potentially Useful Techniques.*** This e-book can be access from [www.TechForText.com/EX](http://www.TechForText.com/EX). **This e-book is a good example of a writer using his own experiments to support the validity of his text.**  The experiments presented in the e-book function over the web when the reader clicks on the web link. This supports the validity of the experiments, and related evidence. The e‑book also contains all the information needed to reproduce the experiments, which is additional evidence supporting the validity of the experiments. The e-book also contains some material that is supported by web-based articles and videos from other authors.  **Additional and Supporting Information For This Chapter, From Web-Based Articles**  |||  [Formal Experiments, by Paula Cisewski](https://writersblock.loft.org/2013/10/30/2811/formal_experiments)  [Compare and contrast descriptive studies with formal experiments](https://www.enotes.com/homework-help/compare-contrast-descriptives-studies-with-formal-233929)  [IMPORTANT EXPERIMENTAL DESIGNS](https://sites.google.com/site/experimentaldesignandanaly/what-is-experiment/important-experimental-designs)  [Experimental Techniques](http://www.emotionalcompetency.com/sci/sm5.htm)  [Negative Control: Definition & Experiment](http://study.com/academy/lesson/negative-control-definition-experiment-quiz.html)  [Positive Control: Definition & Experiment](http://study.com/academy/lesson/positive-control-definition-experiment-quiz.html)  [What is a positive control in an experiment?](https://www.reference.com/world-view/positive-control-experiment-cbe13aa0cb8c1c19)  [Negative Controls: A Tool for Detecting Confounding and Bias in Observational Studies](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3053408/)  [Google search: How to write a scientific paper](https://www.google.com/webhp?sourceid=chrome-instant&rlz=1C1OPRA_enUS705US705&ion=1&espv=2&ie=UTF-8#q=How+to+write+a+scientific+paper)  [11 steps to structuring a science paper editors will take seriously](https://www.elsevier.com/connect/11-steps-to-structuring-a-science-paper-editors-will-take-seriously)  [Unit 2: Writing Scientific Papers](http://www.nature.com/scitable/ebooks/english-communication-for-scientists-14053993/writing-scientific-papers-14239285)  [HOW TO WRITE A SCIENTIFIC ARTICLE](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3474301/)  [The structure of a scientific paper](http://virtuallaboratory.colorado.edu/Biofundamentals/labs/WhatisScience/section_04.html)  **Additional and Supporting Information For this Chapter, from Web-Based Videos**  |||  [Steven Pinker on Writing About Science](https://www.youtube.com/watch?v=x3ScGOYQYEI)  [Scientific Writing: Beyond Tips and Tricks, by Judy Swan](https://www.youtube.com/watch?v=jLPCdDp_LE0)  [YouTube search pages: How to write a scientific paper](https://www.youtube.com/results?search_query=How+to+write+a+scientific+paper)  [Steve Quarrie Writing scientific papers: 1](https://www.youtube.com/watch?v=Pm20zWD6nxs)  [Steve Quarrie: Writing scientific papers: 2](https://www.youtube.com/watch?v=PaoTbN-OKEY)  [Steve Quarrie: Writing scientific papers: 3](https://www.youtube.com/watch?v=IFxflL5Wdx0)  [Steve Quarrie: Writing scientific papers: 4](https://www.youtube.com/watch?v=Ri-9EpG13rw)  [Steve Quarrie: Writing scientific papers: 5](https://www.youtube.com/watch?v=1PkkhWHdsx8)  [Steve Quarrie: Writing scientific papers: 6](https://www.youtube.com/watch?v=ijmdKtuFc5c)  [Steve Quarrie: Writing scientific papers: 7](https://www.youtube.com/watch?v=PAo9Ad5U5Q0)  [Steve Quarrie: Writing scientific papers: 8](https://www.youtube.com/watch?v=bxAH70HLlOE)  [Steve Quarrie: Writing scientific papers: 9](https://www.youtube.com/watch?v=2jsmXlxG04s)  [How to Write a Scientific Manuscript](https://www.youtube.com/watch?v=azonm92BSKs)  **Example of Experiments Recorded on Video, from the Web**  |||  [Asch Conformity Experiment, Video](https://www.youtube.com/watch?v=FnT2FcuZaYI)  [The Stanford Prison Experiment Video](https://www.youtube.com/watch?v=sZwfNs1pqG0)  [Experimental Methods in Psychology, Video](https://www.youtube.com/watch?v=8OnL5tm0cmk)  [Milgram Experiment - Big History NL](https://www.youtube.com/watch?v=xOYLCy5PVgM&list=PL4I3j5SGeFx1_8kGbTlggQ5gY4RegwmNB)  [Harlow's Studies on Dependency in Monkeys](https://www.youtube.com/watch?v=OrNBEhzjg8I)  [Emotional Deprivation in Infancy :: Study by Rene A. Spitz 1952](https://www.youtube.com/watch?v=VvdOe10vrs4)  [Piaget's Stages of Development](https://www.youtube.com/watch?v=TRF27F2bn-A)  **If you want to go to chapter 19 of this e-book, left click on the following link:**  [**www.TechForText.com/DP/chapter-19**](http://www.TechForText.com/DP/chapter-19) |