

Forming a research project using the scientific method: a research experiment on maple syrup production

By Sarah Lehnert

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The Ohio State University-Ohio Agricultural Research and Development Center

Abstract: The purpose of this activity is to introduce high school freshmen to the scientific method and report writing through the design, implementation, and analysis of a semester-long experiment. The students were responsible for designing a research project on sap production in maple trees beginning with the formation of a research question and ending with a full research report written in standard scientific format.

Grade level: 9th (Botany)

Objectives: 1) Introduce students to the scientific method, 2) give student real-life experience designing and analyzing a research project, 3) use a local resource (woodlot) for place-based learning, and 4) provide students with practice writing a scientific report.

National Standards: Understanding of:

- * Scientific inquiry
- * Natural resources

Ohio Benchmark and Academic Content Standards – Grade 10:

Life Science: D.10

Describe how cells and organisms acquire and release energy (photosynthesis, chemosynthesis, cellular respiration and fermentation).

Life Science: D.11

Explain that living organisms use matter and energy to synthesis a variety of organic molecules (e.g., proteins, carbohydrates, lipids and nucleic acids) and to drive life processes (e.g. growth, reacting to the environment, reproduction and movement).

Scientific Inquiry: A.2

Present scientific findings using clear language, accurate data, appropriate graphs, tables, maps and available technology.

Scientific Inquiry: A.4

Scientific Method Research Paper Examples

Emilie Sanchez



Scientific Method Research Paper Examples:

A Preliminary Report on International Fisheries Management Research National Research Council (U.S.). Working Group on International Fisheries Management, 1971 *A Preliminary Report on International Fisheries Management Research*, 1971 Science Fair Projects For Dummies Maxine Levaren, 2011-05-04 Uh oh now you've gone and done it you volunteered to do a science fair project Don't sweat it presenting at a science fair can be a lot of fun Just remember the science fair is for your benefit It's your chance to show that you understand the scientific method and how to apply it Also it's an opportunity for you to delve more deeply into a topic you're interested in Quite a few scientists including a few Nobel laureates claim that they had their first major breakthrough while researching a science fair project And besides a good science fair project can open a lot of doors academically and professionally but you already knew that Stuck on what to do for your science project This easy to follow guide is chock full of more than 50 fun ideas and experiments in everything from astronomy to zoology Your ultimate guide to creating crowd pleasing displays it shows you everything you need to know to Choose the best project idea for you Make sure your project idea is safe affordable and doable Research take notes and organize your facts Write a clear informative research paper Design and execute your projects Ace the presentation and wow the judges Science fair guru Maxine Levaren gives walks you step by step through every phase of choosing designing assembling and presenting a blue ribbon science fair project She gives you the inside scoop on what the judges are really looking for and coaches you on all the dos and don'ts of science fairs And she arms you with in depth coverage of more than 50 winning projects including Projects involving experiments in virtually every scientific disciplines Computer projects that develop programs to solve a particular problem or analyze system performance Engineering projects that design and build new devices or test existing devices to compare and analyze performance Research projects involving data collection and mathematical analysis of results Your complete guide to doing memorable science projects and having fun in the process Science Fair Projects For Dummies is a science fair survival guide for budding scientists at every grade level **College Biology Learning Exercises & Answers** Textbook Equity, 2014-08-22 This textbook is designed as a quick reference for College Biology volumes one through three It contains each Chapter Summary Art Connection Review and Critical Thinking Exercises found in each of the three volumes It also contains the COMPLETE alphabetical listing of the key terms black white version College Biology intended for capable college students is adapted from OpenStax College's open CC BY textbook Biology It is Textbook Equity's derivative to ensure continued free and open access and to provide low cost print formats For manageability and economy Textbook Equity created three volumes from the original that closely match typical semester or quarter biology curriculum No academic content was changed from the original See textbookequity.org/tbq_biology This supplement covers all 47 chapters College Biology Volume 1 of 3 Textbook Equity, 2014-08-15 Chapters 1-17 See Preview for full table of contents College Biology adapted from OpenStax College's open CC BY textbook Biology is Textbook Equity's

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Parliamentary Debates New Zealand. Parliament, 1926

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Experimental Design in Psychology M. Kimberly MacLin,2023-12-22 This text is about doing science and the active process of reading learning thinking generating ideas designing experiments and the logistics surrounding each step of the research process In easy to read conversational language Kim MacLin teaches students experimental design principles and techniques using a tutorial approach in which students read critique and analyze over 75 actual experiments from every major area of psychology She provides them with real world information about how science in psychology is conducted and how they can participate Recognizing that students come to an experimental design course with their own interests and perspectives MacLin covers many subdisciplines of psychology throughout the text including IO psychology child psychology social psychology behavioral psychology cognitive psychology clinical psychology health psychology educational school psychology legal psychology and personality psychology among others Part I of the text is content oriented and provides an overview of the principles of experimental design Part II contains annotated research articles for students to read and analyze New sections on how to critically evaluate media reports of scientific findings in other words how to identify fake news authorship guidelines and decisions survey research methods and AI tools have been included Further expanded information on the Open Science movement and on ethics in research and methods to achieve clarity and precision in thinking and writing are included This edition is up to date with the latest APA Publication Manual 7th edition and includes an overview of the bias free language guidelines the use of singular they and an ethical compliance checklist This text is essential reading for students and researchers interested in and studying experimental design in psychology

Accessing the General Curriculum Victor Nolet,Margaret J.

McLaughlin,2005-06-01 Featuring updated strategies for fitting special education into frameworks created by standards and assessments this indispensable resource shows teachers how to achieve expected results with all students **Food Processing Technology** United States. Office of Education,1967 To assist school administrators and teachers to plan new programs **Advanced Topics in Forensic DNA Typing: Interpretation** John M. Butler,2014-07-28 Advanced Topics in Forensic DNA Typing Interpretation builds upon the previous two editions of John Butler s internationally acclaimed Forensic DNA Typing textbook with forensic DNA analysts as its primary audience Intended as a third edition companion to the Fundamentals of Forensic DNA Typing volume published in 2010 and Advanced Topics in Forensic DNA Typing Methodology published in 2012 this book contains 16 chapters with 4 appendices providing up to date coverage of essential topics in this important field Over 80 % of the content of this book is new compared to previous editions Provides forensic DNA analysts coverage of the crucial topic of DNA mixture interpretation and statistical analysis of DNA evidence Worked mixture examples illustrate the impact of different statistical approaches for reporting results Includes allele frequencies for 24 commonly used autosomal STR loci the revised Quality Assurance Standards which went into effect September 2011

Snapshots of Research Richard D. Hartley,2010-10-20 Immerse your students in contemporary and classic scholarly research and readings from the major branches of the criminal justice system This text reader is a comprehensive cutting edge overview of the main research methods used in the fields of criminology and criminal justice Snapshots of Research offers a wide range of modern research examples as well as several classic articles including a broad range of readings from the four major branches of the criminal justice system policing courts law juvenile justice and corrections that are relevant to career paths students may be interested in pursuing **Empirical Philosophy of Science** Susann Wagenknecht,Nancy J. Nersessian,Hanne Andersen,2015-06-12 The book examines the emerging approach of using qualitative methods such as interviews and field observations in the philosophy of science Qualitative methods are gaining popularity among philosophers of science as more and more scholars are resorting to empirical work in their study of scientific practices At the same time the results produced through empirical work are quite different from those gained through the kind of introspective conceptual analysis more typical of philosophy This volume explores the benefits and challenges of an empirical philosophy of science and addresses questions such as What do philosophers gain from empirical work How can empirical research help to develop philosophical concepts How do we integrate philosophical frameworks and empirical research What constraints do we accept when choosing an empirical approach What constraints does a pronounced theoretical focus impose on empirical work Nine experts discuss their thoughts and empirical results in the chapters of this book with the aim of providing readers with an answer to these questions Scientific Argumentation in Biology Victor Sampson,Sharon Schleigh,2013 Develop your high school students understanding of argumentation and evidence based reasoning with this comprehensive book Like three guides in one Scientific Argumentation in Biology combines theory practice and biology content It starts by giving you

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Scientific Method Randall K. Noon, 2009-04-27 Most failure or accident investigations begin at the end of the story after the explosion after the fire has been extinguished or after the collapse In many instances information about the last event and the starting event is known reasonably well Information about what occurred between these endpoints however is often unclear confusing and perhaps contradictory Scientific Method Applications in Failure Investigation and Forensic Science explains how scientific investigative methods can best be used to determine why and how a particular event occurred While employing examples from forensic engineering the book uses principles and ideas applicable to most of the forensic sciences The author examines the role of the failure investigator describes the fundamental method for investigation discusses the optimal way to organize evidence and explores the four most common reasons why some investigations fail The book provides three case studies that exemplify proper report writing contains a special chapter profiling a criminal case by noted forensic specialist Jon J Nordby and offers a reading list of resources for further study Concise and illustrative this volume demonstrates how the scientific method can be applied to failure investigation in ways that avoid flawed reasoning while delivering convincing reconstruction scenarios Investigators can pinpoint where things went wrong providing valuable information that can prevent another catastrophe **Diagrammatic Representation and Inference** Peter Chapman, Gem Stapleton, Amirouche Moktefi, Sarah Perez-Kriz, Francesco Bellucci, 2018-06-07 This book constitutes the refereed proceedings of the 10th International Conference on the Theory and Application of Diagrams Diagrams 2018 held in Edinburgh UK in June 2018 The 26 revised full papers and 28 short papers presented together with 32 posters were carefully reviewed and selected from 124 submissions The papers are organized in the following topical sections generating and drawing Euler diagrams diagrams in mathematics diagram design principles and classification reasoning with diagrams Euler and Venn diagrams empirical studies and cognition Peirce and existential graphs and logic and diagrams

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