

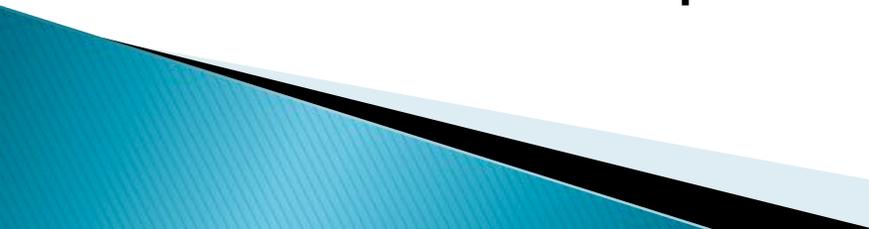
SENCER at TWU

Richard D. Sheardy
Professor and Chair
Chemistry and Biochemistry
Texas Woman's University

Texas Woman's University

- ▶ Largest public institution of higher education primarily for women in the country
 - ▶ Student population is about 15,700
 - ▶ 90% women
 - ▶ 25% hispanic
 - ▶ Many of these students are first family member in college
- 

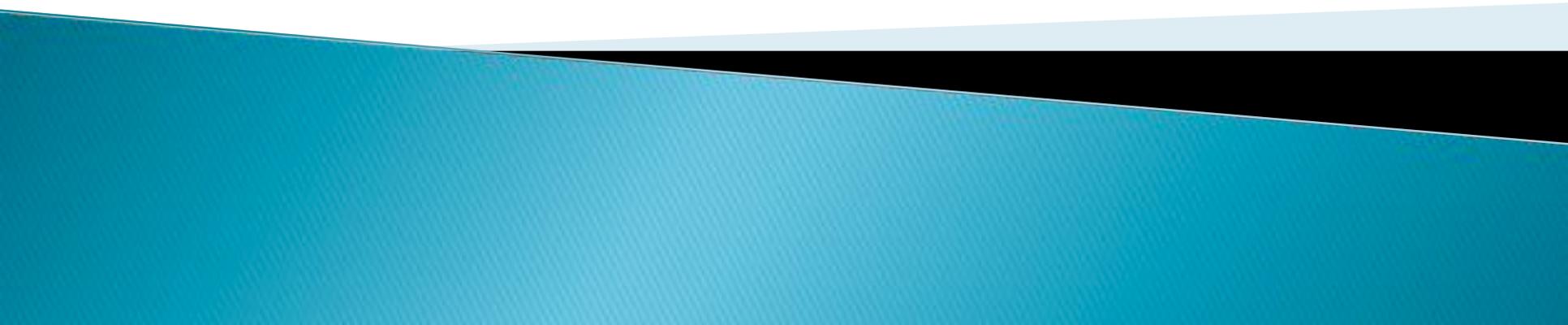
Chemistry and Biochemistry

- ▶ The Department of Chemistry and Biochemistry offers the ACS certified BS in Chemistry and in Biochemistry and the MS degree in Chemistry
 - ▶ Offer courses in chemistry (CHEM), physics (PHYS) and science (SCI)
 - ▶ All students at TWU must take 6 to 8 credits of “science” as a core requirement
 - ▶ Part of our new core focuses on teamwork and social responsibility
- 

Translating Science into Common Language:

SENCER and the Dual Poster Concept

Cynthia Maguire



TWU Dual Poster Project – Early Steps

- ▶ Non science majors created a handbook
 - ▶ Recruited students with existing science posters
 - ▶ Finished two poster pairs and surveyed undergraduate student responses to them
- 

Convincing Students

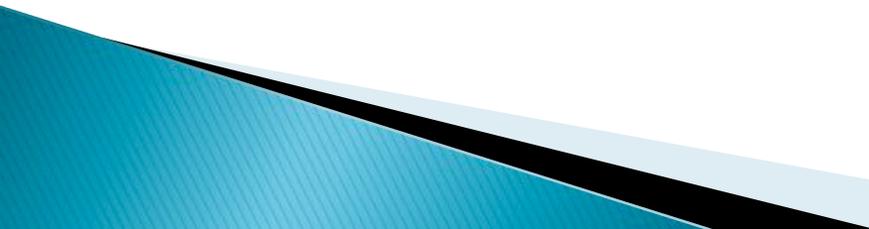
...and Faculty

- ▶ Must understand benefits to creating a dual poster
 - Potential funding
 - Skills for future teaching
 - Assurance of understanding
 - Working with other disciplines
 - Recruitment of new students
- ▶ Explain that dual poster isn't "dumbing down" their science

Title Revision

- ▶ List all words that may not be understood by your audience, followed by more common synonyms or a brief explanation
 - ▶ What is the purpose of your work? What impact could it have on the general public?
 - ▶ Create a new poster title considering your above answers.
 - ▶ Share your title with someone unfamiliar with your work. What is their response? Do they have a basic idea what your poster is about?
 - ▶ Are there any final changes you can make to your title?
- 

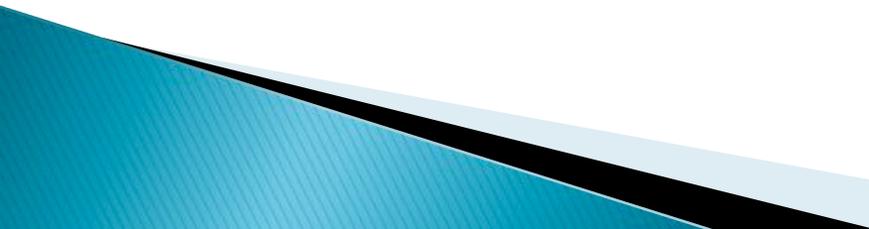
Abstract Revision

- ▶ Rewrite abstract without jargon.
 - ▶ Does your abstract still sound overly technical? Can the average person understand what you are studying? Rewrite your abstract again with these questions in mind.
 - ▶ Ask someone who is unfamiliar with your work to look at your abstract. Do they understand what you studied? Do they know why it is relevant to them? Rewrite your abstract a final time.
- 

Poster Body

- ▶ Allow students to test their wings
 - ▶ Keep look of original poster by retaining most charts and pictures
 - ▶ Explain all technical items
 - ▶ Summarize methods and expand results
- 

Conclusion

- ▶ Try to rewrite conclusion using the skills gained from the previous exercises. Focus on the impact of your work and steps that you would like your audience to take now that they understand it. Examples of steps could include: social or legislative actions, funding additional research or lifestyle changes
 - ▶ Share your conclusion with someone who is unfamiliar with your work. Do they understand what action you want them to take? Is there anything you can change? Write your final version.
- 



A Spectroscopic and Calorimetric Investigation of the Human Telomere DNA Sequence

Brenna A. Tucker¹, Sam G. Gabriel¹, C. Antonacci², and Richard D. Sheardy¹

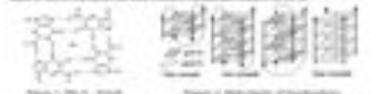
¹Texas Woman's University, Denton, TX 76204

²Seton Hall University, South Orange, NJ 07079

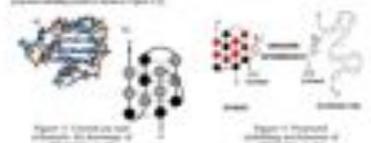


Introduction

Introduction text describing the study's purpose and background.



Text describing the experimental setup and methods used in the study.

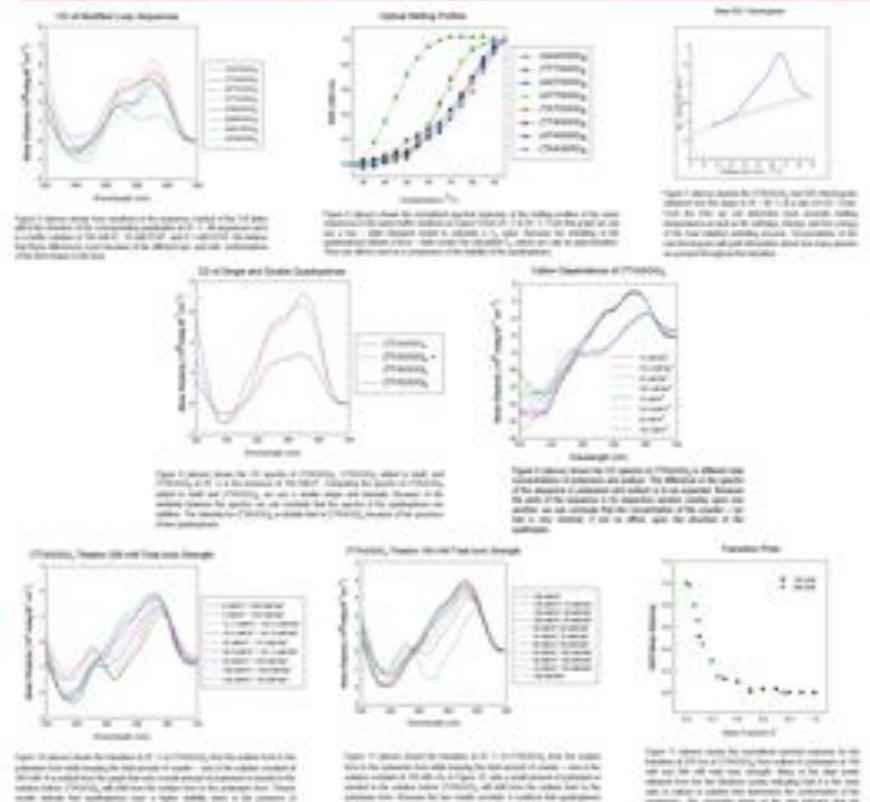


Text describing the results and conclusions of the study.

Methods

Methods text detailing the spectroscopic and calorimetric techniques used.

Results and Discussion



Conclusions

Conclusions text summarizing the key findings of the study.

Future Studies

Future Studies text suggesting directions for further research.

References

List of references cited in the paper.

Acknowledgements

Acknowledgements text thanking funding sources and collaborators.



Unusual DNA Structures and their Potential Role in New Cancer Therapies

Brenna A. Tucker¹, Sahmla Gabriel¹, Cosimo Antonucci², and Richard D. Sheardy¹

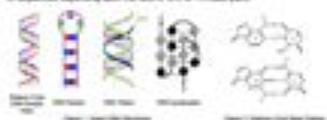
¹Texas Woman's University, Denton Texas, 76204

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Introduction

Deoxyribonucleic acid (DNA) is a nucleic acid, which is the genetic material that carries the instructions for the development and functioning of all living organisms and viruses. DNA is a long molecule that is made up of two strands that are twisted around each other to form a double helix. The strands are held together by hydrogen bonds between the nitrogenous bases. The bases are adenine, thymine, guanine, and cytosine. Adenine always pairs with thymine, and guanine always pairs with cytosine. This base pairing is what allows DNA to replicate itself. The structure of DNA is important because it determines how the genetic information is stored and passed on to the next generation.



Since 1953, several other DNA structures have been observed. Some of these structures have been found in living cells, while others have been found in synthetic systems. These structures include the A-DNA form, which is a compact, wide, and shallow helix; the Z-DNA form, which is a narrow, zig-zag helix; the G-quadruplex, which is a four-stranded structure; and the i-motif, which is a four-stranded structure. These structures are important because they can affect the way DNA is packaged and how it is accessed by the cell.

The unusual structures can be used to study the way DNA is packaged and how it is accessed by the cell. They can also be used to study the way DNA is repaired and how it is mutated. These structures are important because they can affect the way DNA is packaged and how it is accessed by the cell. They can also be used to study the way DNA is repaired and how it is mutated. These structures are important because they can affect the way DNA is packaged and how it is accessed by the cell.

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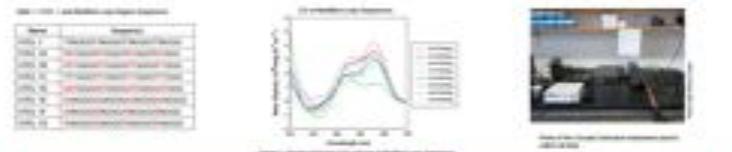
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Specific Aim 1

The sequence of the human genome is just one specific sequence out of many that exist in the human genome. One question that gets asked every time is whether the sequence of the human genome is "right" or "wrong" or "better" or "worse" than the sequence of other organisms. This question is important because it helps us to understand how the human genome is different from other organisms and how it might be different from the sequence of other organisms.

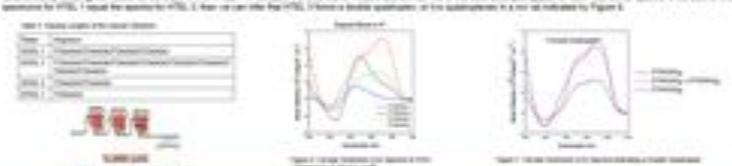
Figure 1 shows a possible difference in the sequence of the human genome. The difference between the human genome and the sequence of other organisms is that the human genome has a higher percentage of G-C pairs than other organisms. This difference is important because it might affect the way the human genome is packaged and how it is accessed by the cell.



Specific Aim 2

One of the ways that DNA is packaged is by forming a double helix. The double helix is a structure that is made up of two strands that are twisted around each other. The double helix is important because it allows DNA to be packaged in a compact way and to be accessed by the cell. The double helix is also important because it allows DNA to be replicated and passed on to the next generation.

Figure 2 shows a possible difference in the way that DNA is packaged. The difference between the human genome and the sequence of other organisms is that the human genome has a higher percentage of G-C pairs than other organisms. This difference is important because it might affect the way the human genome is packaged and how it is accessed by the cell.

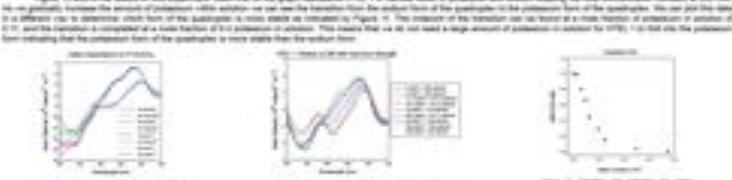


Specific Aim 3

One of the ways that DNA is packaged is by forming a double helix. The double helix is a structure that is made up of two strands that are twisted around each other. The double helix is important because it allows DNA to be packaged in a compact way and to be accessed by the cell. The double helix is also important because it allows DNA to be replicated and passed on to the next generation.

Figure 3 shows a possible difference in the way that DNA is packaged. The difference between the human genome and the sequence of other organisms is that the human genome has a higher percentage of G-C pairs than other organisms. This difference is important because it might affect the way the human genome is packaged and how it is accessed by the cell.

Figure 3 shows a possible difference in the way that DNA is packaged. The difference between the human genome and the sequence of other organisms is that the human genome has a higher percentage of G-C pairs than other organisms. This difference is important because it might affect the way the human genome is packaged and how it is accessed by the cell.



Methods

The methods used in this study were designed to study the way that DNA is packaged and how it is accessed by the cell. The methods included the use of X-ray crystallography, NMR spectroscopy, and molecular dynamics simulations. These methods allowed us to study the structure of DNA at the atomic level and to see how it changes over time.

The methods used in this study were designed to study the way that DNA is packaged and how it is accessed by the cell. The methods included the use of X-ray crystallography, NMR spectroscopy, and molecular dynamics simulations. These methods allowed us to study the structure of DNA at the atomic level and to see how it changes over time.

Conclusions

Building different structures and understanding the way that DNA is packaged and how it is accessed by the cell is an important part of understanding how the human genome works. The results of this study show that the human genome is different from other organisms and that it might be different from the sequence of other organisms.

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Acknowledgements

The authors would like to thank the National Science Foundation for their support of this research. We would also like to thank the Texas Woman's University for their support of this research. We would also like to thank the Seton Hall University for their support of this research.



Science, Society and Sustainability

A new undergraduate certificate



Important Requirements for an Undergraduate Certificate

- ▶ Requires 15 to 18 credits of upper division courses (3000 and 4000 level)
 - ▶ Must be an integrated and organized sequence of study
 - ▶ Students are responsible for all prerequisites
 - ▶ A project or practicum is suggested but not required
 - ▶ A Certificate is issued
- 

Certificate Program Objectives

- ▶ Define scientific, sociological and economic sustainability.
 - ▶ Evaluate a variety of sustainability issues, along with their risks and benefits.
 - ▶ Predict impacts of modern lifestyles on earth's material and energy resources.
 - ▶ Relate knowledge of scientific, sociopolitical and economic aspects of sustainability to a civic issue within the community.
 - ▶ Synthesize sustainable solutions to complex civic issues.
 - ▶ Communicate civic issues and sustainable solutions to the general public and policymakers.
- 

Science, Society and Sustainability Certificate Program

Foundation

Community
Conversation in
Sustainability

Building
Blocks

Natural Sciences
And
Mathematics

Arts, Humanities
and
Social Sciences

Government
and
Business

Synthesis

Building
Sustainable
Communities

Community Sustainability Project

Courses for the Certificate

- ▶ Foundation Course: A multidisciplinary, team taught course discussing all aspects of sustainability from scientific, sociological and economic points of view (3 credits in a 3000 level course)



Courses for the Certificate

- ▶ **Building Block Courses:** Students are required to take at least one 3000 or 4000 level course (3 credits each) in the three areas of focus (Natural Sciences and Mathematics, Arts, Humanities and Social Sciences, Government and Business) from a list provided by appropriate departments within Arts and Sciences. This total is a minimum of 9 credit hours.



Building Block Courses

- ▶ SCI 3033: Water in a Changing Environment
 - ▶ SCI 3133: Climate Change: A Human Perspective
 - ▶ BIOL 4293: Scientific Communication
 - ▶ BIOL 4582: Science in the Secondary Classroom
 - ▶ PSY 4183: Global Perspectives in Psychology
 - ▶ PHIL 3073: Bioethics
 - ▶ SOCI 3083: Population Dynamics
 - ▶ SOCI 3283: Principles of Geography
 - ▶ HIST 4233: Global Issues and Trends
 - ▶ BUS 3201: Business Principles of Community Service
 - ▶ DNCE 3383: Dance, Gender and Culture
 - ▶ MU 3713: Music and World Cultures
- 

Courses for the Certificate

- ▶ **Synthesis Course:**
This is a capstone seminar course in which students use the sum of their knowledge of sustainability to complete a civic engagement project. (3 credits, 4000 level course)

The Three Spheres of Sustainability



The Road to Green Chemistry at TWU

Incorporating civic engagement in
undergraduate research

Organic Chemistry at TWU

- ▶ Traditional two semester course for chemistry, biochemistry and biology majors
 - ▶ In the last three years, we have grown from 5 to 7 sections of 16 students in organic chemistry laboratory!
 - ▶ We offer a state of the art laboratory space with 8 student hoods each with a rotary evaporator
 - ▶ In the past five years, the department has brought in over a million dollars of teaching and research grade equipment and instrumentation
- 

Organic Chemistry Lab



The Catalyst to Green Chemistry at TWU

The 15th Annual Green Chemistry and Engineering Conference
(2010)

Presented poster about science education and civic engagement

Learned a lot about green chemistry in the undergraduate curriculum

Realized that teaching and using green chemistry in organic lab is a form of civic engagement

Next Steps

- ▶ Sarah Sutherland (a TA for organic lab) was awarded an NSF Travel Fellowship to the meeting the next year.
 - Sarah found many references to green chemistry experiments for organic lab
- ▶ David Caltrider (also a TA) was also awarded an NSF Travel Fellowship to the meeting last year (2013).
 - David continued to research for new experiments as we slowly started doing more green experiments
 - He presented a poster at this year's green chemistry meeting and will present his story at the national meeting of the ACS next week

Green Chemistry Experiments

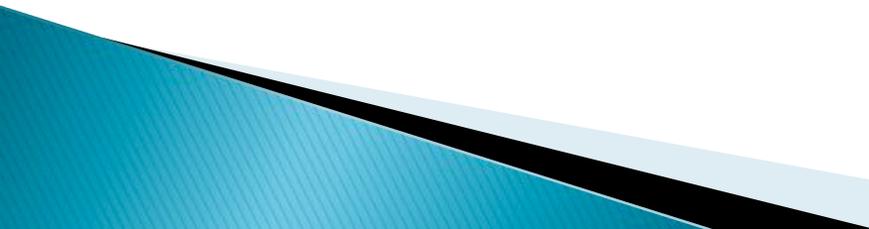
- ▶ Hydrobromination of alkenes
 - Used HBr/H₂O₂ instead of Br₂
- ▶ The Benzopinacol Rearrangement
 - Reaction catalyzed by sunlight
- ▶ The Diels–Alder cycloaddition
 - Carried out reaction in water instead of hexane

The Benzopinacol Reaction



Coming Soon

Microwave technology

- Can carry out reactions in minutes rather than hours
 - Can often carry out solventless reactions
 - ▶ David was present for demonstration
 - ▶ Proceeded on his own to try different reactions which he had found in the literature
 - ▶ Recommended some possibilities for the organic lab
- 

David's Poster



TEXAS WOMAN'S UNIVERSITY

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www.twu.edu

Charting a Green Path Ahead: Texas Woman's University's Journey to Sustainability

David Caltrider, Emily Springer, & Dr. Richard D. Sheardy

Department of Chemistry and Biochemistry

Abstract

Three years ago Texas Woman's University had to face the American Chemical Society's goal to become completely sustainable within 100 years. One year later, we had a sustainability framework meeting because most environmentally friendly sustainable laboratory equipment. This process involves a long period in this goal. Our sustainability program is a number of organic chemistry using economic "green" experiments, incorporating laboratory safety and green chemistry principles into the organic chemistry laboratory and making laboratory designed to be used in organic chemistry. Integrating laboratory safety into different laboratory classes and faculty research, and becoming self-sustainable our current goal: reducing environmental "footprint" and demonstrating sustainability through an interdisciplinary format that focus on factors of sustainability that affect laboratory work such as environmental and health of how to reduce environmental sustainability. Laboratory safety, which is a key to sustainable laboratory.

What We Have Done

Since the inception of Texas Woman's University's low-carbon footprint commitment, there has been a noticeable impact effect to increase our environmental sustainability and sustainability practices, as well as providing students greater laboratory safety and green chemistry.

1. Most cases of the air vents to bring fresh air into the laboratory and improve laboratory safety.
2. Turn down the electric power, turn off the lights, recycle, and use energy-saving light bulbs.
3. Specific to the organic chemistry laboratory, we have replaced equipment that are not so best on large quantities of waste, solvent usage, and time-consuming work.
4. Bought safety equipment for the students to work with, such as emergency eyewash, minimizing student waiting, and making sure all safety equipment.



What We are Doing

This past fall semester, we have implemented a number of new and existing green chemistry in this semester.

1. There is an ongoing effort to incorporate the 12 principles of green chemistry into the organic chemistry laboratory curriculum.
2. Most of the time, we are using the "greenest" of the green chemistry principles. This can be done by reducing the amount of reagents that are used and then replacing alternative experiments that are more environmentally friendly, which will reduce the waste generated in the laboratory.
3. The largest impact is making a green chemistry experiment that is becoming a "green" experiment.
4. In the organic chemistry lab, we are working on ways to reduce the amount of waste that is generated in the laboratory. This includes using more sustainable materials that are more environmentally friendly, which will reduce the waste generated in the laboratory.

Example Green Experiment

Microsynthesis of Benzophenone to Benzoin



This reaction is an interdisciplinary subject that involves the synthesis of benzoin from benzophenone. The reaction is a good example of green chemistry. It is a good example of green chemistry because it uses a catalyst that is easily prepared and can be used in any laboratory. When this experiment was run in our laboratory, the results were that the yield was high. In using the catalyst, it is safe and is often environmentally friendly. The experiment is a good example of green chemistry.

What We are Planning

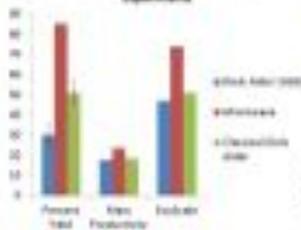
There have been a lot of work done to further the green chemistry movement at TWU. However, there is still a long way to go. There are many things that we are planning to do in the future.

1. Working on ways to reduce the amount of waste that is generated in the laboratory.
2. Researching and testing to see if there is a way to reduce the amount of waste that is generated in the laboratory.
3. Working on ways to reduce the amount of waste that is generated in the laboratory.

Microscale Chemistry

Microscale chemistry has become a new trend in the laboratory. It is a good example of green chemistry because it uses a catalyst that is easily prepared and can be used in any laboratory. When this experiment was run in our laboratory, the results were that the yield was high. In using the catalyst, it is safe and is often environmentally friendly. The experiment is a good example of green chemistry.

Green Metrics for Three Student Experiments



The chart shows the green metrics for three student experiments. The Y-axis is labeled 'Green Metric' and ranges from 0 to 100. The X-axis is labeled 'Experiment' and includes 'Percent Yield', 'E-factor', and 'E-factor'. The legend indicates: Green (100%), Yellow (75%), Red (50%), Blue (25%), and Grey (0%).

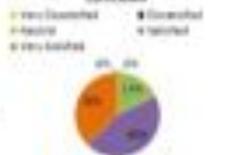
Future Research and Work

1. Organize the experiments.
2. There is a lot of work to do in the future. There are many things that we are planning to do in the future.
3. Working on ways to reduce the amount of waste that is generated in the laboratory.
4. Researching and testing to see if there is a way to reduce the amount of waste that is generated in the laboratory.
5. Working on ways to reduce the amount of waste that is generated in the laboratory.

Reaction by Students

Students in the organic chemistry laboratory were asked to complete a survey to see how they felt about the green chemistry experiments. The results were that the students were very positive about the green chemistry experiments.

Response to Green Chemistry Curriculum



The pie chart shows the response to the green chemistry curriculum. The chart is divided into four segments: 48% (Green), 22% (Yellow), 18% (Red), and 12% (Blue).

The chart shows the response to the green chemistry curriculum. The chart is divided into four segments: 48% (Green), 22% (Yellow), 18% (Red), and 12% (Blue).

Figure 1: Sample question of how green chemistry works.

Response to Question #1

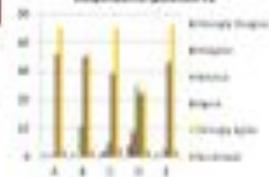


Figure 2: Response to question #1 (100%)

The figure shows the results of the student survey. The Y-axis is labeled 'Response' and ranges from 0 to 100. The X-axis is labeled 'Question #1' and includes 'A', 'B', 'C', 'D', and 'E'. The legend indicates: Always (100%), Often (75%), Sometimes (50%), Never (25%), and Not Sure (0%).

1. To see if the students are interested in green chemistry.
2. To see if the students are interested in green chemistry.
3. To see if the students are interested in green chemistry.

References

1. American Chemical Society, "Green Chemistry: The 12 Principles of Green Chemistry," *ACS Publications*, 2008.

2. American Chemical Society, "Green Chemistry: The 12 Principles of Green Chemistry," *ACS Publications*, 2008.

3. American Chemical Society, "Green Chemistry: The 12 Principles of Green Chemistry," *ACS Publications*, 2008.

Acknowledgments

The authors thank the Green Chemistry Center for providing the resources and support for this project. We also thank the students and faculty who helped us in our research.

Summary and Conclusions

- ▶ This project is an example of how a single student can get involved in a research project and have a very positive outcome for other students and for the community
 - ▶ David learned a lot of organic chemistry. (He graduated with his BA in Business and is now in his first year at UT Medical Branch in Galveston).
 - ▶ The organic lab students appreciated the green chemistry aspect of the course
 - ▶ We are making progress toward of goal of greener chemistry experiments at all levels of undergraduate laboratory experience because of his efforts
- 

Acknowledgements

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The Robert A Welch Foundation



And, last but not least:



Sarah Sutherland



David Caltrider