

Making an Effective Research Poster: Design advice and inspirations

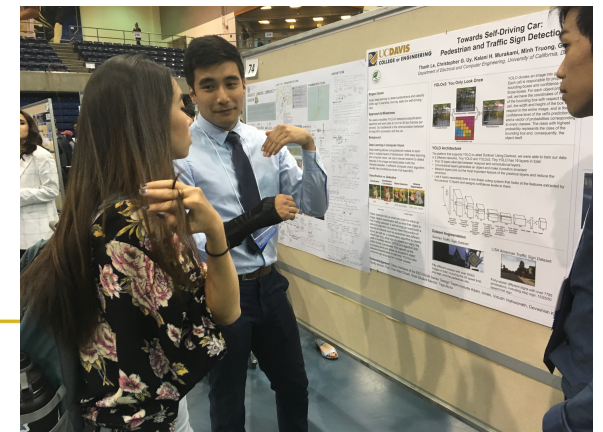
Prof Annaliese K. Franz
Faculty Director
Undergraduate Research Center



Why present a research poster?



- Great experience for first time presenters
- Experience presenting your research in a formal setting
- Standard format used at many professional meetings
- Get feedback from peers, faculty, and other experts
- Share ideas and learn from others
- Network in your area of study
- Enhance your resume





What is a Research Poster?

- A summary of research
- A way to share ideas and generate discussion
- A visual display
- Includes a mixture of text, graphs, pictures, tables, etc.



Purpose of a Research Poster?



- Video: How to Design a Research Poster Part I



<https://www.youtube.com/watch?v=WCKhmKeAXY0>



Goals of a Research Poster

Old Goal:

Summarize every part of my research and my entire research paper/thesis to get an A+

New Goal:

Teach as many people as possible something you learned and a key result in your research



Design of a Research Poster

The two golden rules of scientific poster design:

1. Don't put things on your poster that people ignore
2. People will ignore many/most things!

One of the key considerations for effective communication is the idea of "less is sometimes more". Think about how your design can feature more by having fewer words and making images larger.



Components of a Research Poster

- **Title (Use Big font, 10 words or less if possible)**
 - Authors and Institutional Affiliation (contact info)
 - **You do not need an Abstract** – *note that this may be rather “controversial” but my opinion that your poster IS an abstract a thus should actually include an abstract on it*
 - **Introduction/Background (with images!)**
 - **Methods (often with images!)**
 - **Results/Findings (with images!)**
 - **Discussion/Conclusions**
 - **Acknowledgements**
 - Grant funding, research programs, mentors, etc
 - **References**
-

**Remember that
posters may take
different formats**

Research Poster Templates



There are various templates on websites as a starting point

- Don't use too many words
- Make sure to have Images/graphs, etc!
- Check out some templates here:

<https://osf.io/6ua4k/>

<https://www.posterpresentations.com/free-poster-templates.html>



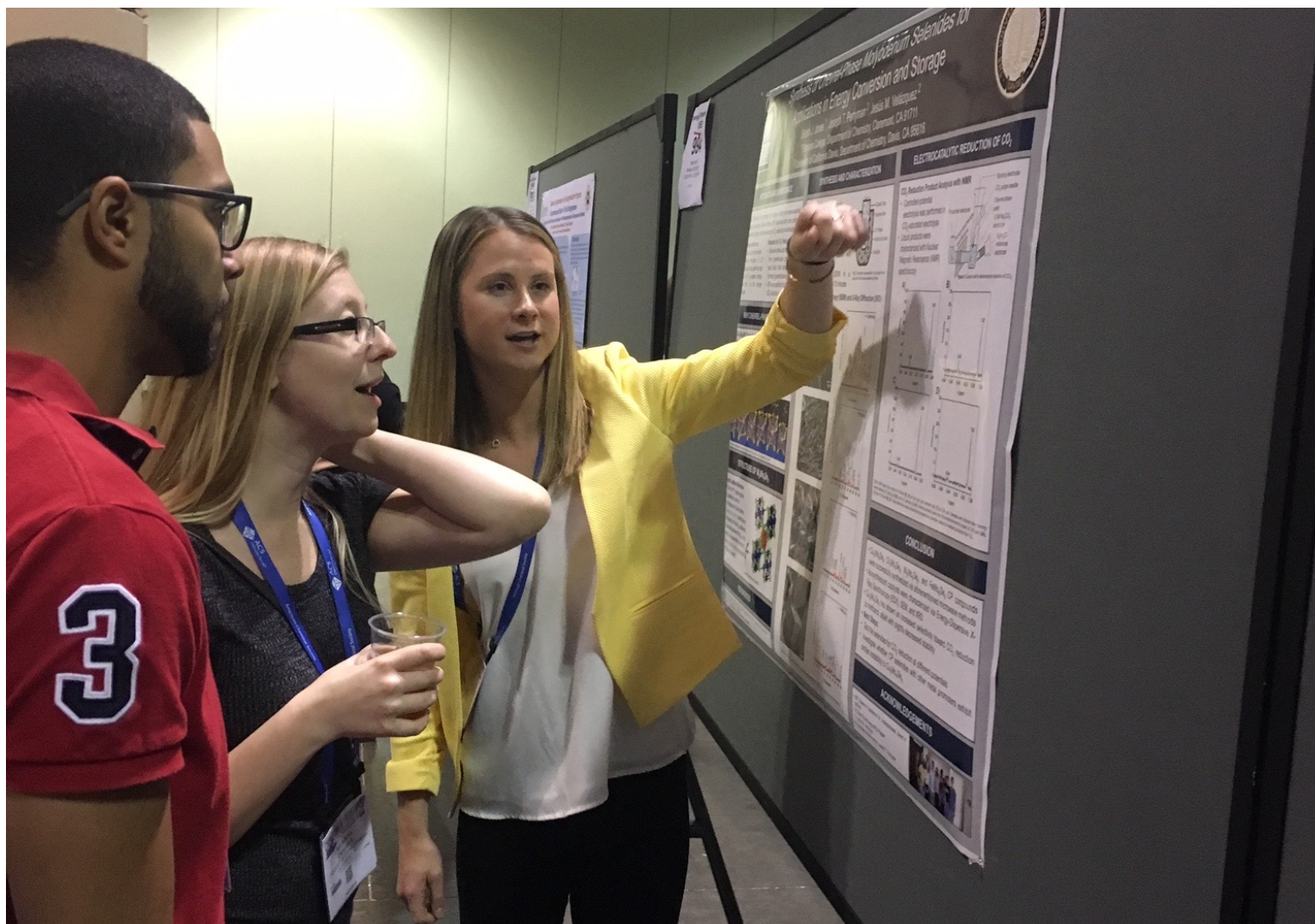
Research Poster Best Practices

- Video: How to Design a Research Poster Part II



https://www.youtube.com/watch?v=kD_zCBT3GUk

Examples of Research Posters



Examples of Research Posters



Neural Correlates of Natural Reading in Younger and Older Adults

Anyk Cajucum, Jessica E. Gould, and John M. Henderson

Research Question:

How do the brain areas involved in natural reading change with healthy aging?

Background:

Multiple neural models of the aging brain (Burgmans, 2013; Fennell, 2013) predict that older adults compensate for neural decline by recruiting other brain regions (Fennell, 2013; Burgmans, 2013; Fennell, 2013; Fennell, 2013). However, older adults have more experience with reading and vocabulary. Therefore, it is unclear if compensation is happening in the brain with natural reading in these models suggest.

Hypothesis:

- If older and younger adults have different brain regions involved in reading, this will be apparent in the neural compensation in reading.
- If older and younger adults have the same brain regions involved in reading, this will be apparent in the neural compensation in reading.

Methods:

Subjects (N=28, 18 older, 10 younger) read 4 natural text stories in the fMRI scanner while their eyes were tracked.

Each story had 11 paragraph trials and participants were told to read at their natural speed in the scanner (see our read).

Analysis:

Data were processed using SPM12, spatially normalized and registered to anatomical images in the scanner.

Subject-level voxel-wise multiple comparisons (FDR = 0.005).

Group-level voxel-wise multiple comparisons (FDR = 0.005).

Group-level voxel-wise multiple comparisons (FDR = 0.005).

Group-level voxel-wise multiple comparisons (FDR = 0.005).

Younger Adult Activations

Older Adult Activations

Both age groups have activated regions in the lower reading.

Positive Overlap

Negative Overlap

Positive activation is more common and distributed in younger adults than older adults.

Negative activation is more common and distributed in older adults than younger adults.

Discussion:

- Our data show that reading areas are maintained with healthy aging.
- However, the activation within these areas is less prominent, possibly because of decreased hearing or atrophy.
- These findings contribute to the understanding of healthy aging and may aid in the identification of potential abnormalities in cognitive aging, such as early detection of dementia and Alzheimer's disease.

Funding & References:

This work was supported by the National Institute of Health (NIH) through the National Institute of Mental Health (NIMH) (R01MH100000) and the National Institute of Aging (NIA) (R01AG045000). We thank the participants for their time and effort.

COMMENTS (11)

All Comments (11)

Autoplay

00:00 **Hailey Chatterton:** I love this, Anyk! And the fMRI images on your poster are super cool. How did you select your participants?

↪ **Anyk Cajucum:** Hi Hailey! Thank you so much for viewing my presentation. Basic eligibility requirements for participation are the following: righthanded, an English speaker who did not learn another language before 5 years of age, do not have a history of neurological or psychological disorders, and older participants had to be at least 65 years of age. There are many more screening questions involved however for this fMRI study! Hope that answers your question :)

00:33 **Priya Reddy:** Ve Very interesting!

02:41 **Elizabeth Hall:** Ni Nice results!

Gr Ni Ni Gr Be Co Ve Th

Text Video Audio Upload YouTube Library End Note

Add a text comment...

Examples of Research Posters



Effect of Prior Forage Experience on Response to Novel Feed in Dairy Calves

Chelsea R. Morrow, Blair C. Downey, and Cassandra B. Tucker
Center for Animal Welfare, Department of Animal Science, UC Davis

Background

- Calves in dairy exhibit abnormal oral behaviors which are reduced when offered forage from birth. This indicates that the absence of forage causes frustration.
- Farms often provide forage for the first time when calves are weaned from milk, leading to stress as calves must adjust to two major diet changes simultaneously.
- Access to forage from birth may be important to satisfy a behavioral need in calves and to improve adjustment to feed changes at weaning.

Objectives

Determine how exposure to foraging material from birth affects a calf's behavioral reaction to being offered a novel forage in the form of TMR (total mixed rations); a mixture of hay and grain)

Predictions

No prior experience with hay → Novel TMR → Latency to eat TMR, Time spent eating TMR, TMR intake

Prior experience with hay → Novel TMR → Latency to eat TMR, Time spent eating TMR, TMR intake

Methods

Day 0-49 (treatment groups):

- CON (n=8): no hay
- P HAY (n=8): hay in pipe
- B HAY (n=8): hay in bucket

Day 50 (Novel TMR introduced):

- Calves blocked inside hutch
- TMR added to bucket only and visible above rim
- Calves released and recorded for 30 minutes
- Behaviors scored continuously using BQARS

Results & Discussion

Latency to eat TMR

| Treatment | Time to first eat TMR (h) |
|-----------|---------------------------|
| CON | ~50 |
| P HAY | ~30 |
| B HAY | ~10 |

CON calves took significantly longer to start eating novel forage than B HAY calves ($P = 0.004$)

Time spent eating TMR

| Treatment | Proportion of time spent eating TMR |
|-----------|-------------------------------------|
| CON | ~0.5 |
| P HAY | ~0.4 |
| B HAY | ~0.3 |

CON calves spent significantly more time eating TMR than B HAY calves ($P < 0.001$) and tend to spend more time eating than P HAY calves ($p = 0.07$)

Conclusion

Calves with prior hay experience adapt better to novel forage introduced at weaning than calves with no prior hay experience, though this effect appears to be moderated by the presentation method of the hay

Thank you to Tucker lab, my mentors Blair Downey and Dr. Cassandra Tucker, the UC Davis Dairy Facility, and the many interns and staff who individually spent so far helping!

cmorrow@ucdavis.edu

COMMENTS (11)

All Comments (11)

Autoplay

04:16 **Lara Ibrahim:** Ni Nice visuals!

04:29 **Sharon Campbell-Knox:** The video comparing the two calves is really striking!

04:34 **Kristin Kiesel:** These videos are very convincing!

05:33 **Sarah Stinson:** Thanks for sharing your research. What do you think that the broader implications will be? Could these methods be applied to other species?

05:40 **Kristin Kiesel:** Great presentation and well-specified hypotheses! What are the implications as you stated that the control calves ate the hay eventually? Did you collect any other data such as vitals, weight gain, etc.?

Gr Ni Ni Gr Be Co Ve Th

Text Video Audio Upload YouTube Library End Note

Add a text comment...

Example of BAD Research Poster

What do you think should be fixed about this poster?



If you can read this you must be nocturnal...

Your name here, and names of others
Place the name of your institution here

| | | | |
|---|---|---|---|
| <h3>Abstract</h3> <p>Current research shows that plants communicate... Abstract text (unreadable)</p> | <h3>Results</h3>  | <h3>Results</h3>  | <h3>Discussion</h3> <p>Current research shows that plants communicate... Discussion text (unreadable)</p> |
| <h3>Introduction</h3> <p>Current research shows that plants communicate... Introduction text (unreadable)</p> | <h3>Methods & Materials</h3> <p>Current research shows that plants communicate... Methods & Materials text (unreadable)</p> | <h3>Methods & Materials</h3> <p>Current research shows that plants communicate... Methods & Materials text (unreadable)</p> | <h3>Conclusion</h3> <p>Current research shows that plants communicate... Conclusion text (unreadable)</p> |
| <h3>Questions</h3> <p>Current research shows that plants communicate... Questions text (unreadable)</p> | | | <h3>References</h3> <p>Current research shows that plants communicate... References text (unreadable)</p> |
| <h3>Hypothesis</h3> <p>Current research shows that plants communicate... Hypothesis text (unreadable)</p> | | | <h3>Acknowledgements</h3> <p>Current research shows that plants communicate... Acknowledgements text (unreadable)</p> |

Example of BAD Research Poster

What do you think should be fixed about this poster?



PIGS IN SPACE: EFFECT OF ZERO GRAVITY AND AD LIBITUM FEEDING ON WEIGHT GAIN IN CAVIA PORCELLIUS

Colin B. Purrington¹
6673 College Avenue, Swarthmore, PA 19081 USA

ABSTRACT:
One of the most important aspects of a growing organism is its ability to increase its mass. In Earth, where an organism is in a constant state of weight, weight is maintained through a balance of mass gain and loss. In space, where an organism is in a constant state of weightlessness, weight is maintained through a balance of mass gain and loss. The only way that an organism can increase its mass in space is by gaining mass through feeding. The purpose of this study was to determine the effect of zero gravity and ad libitum feeding on weight gain in *Cavia porcellus*. The results of this study will be presented at the 2010 meeting of the International Space Station, which will be held in Houston, Texas, USA. The results of this study will be presented at the 2010 meeting of the International Space Station, which will be held in Houston, Texas, USA.

INTRODUCTION:
The human space program started in the early 1960s with the intention of exploration of space and human activity there, which increased awareness of the need for a constant state of weightlessness. The need for a constant state of weightlessness was first realized in the early 1960s, when it was discovered that the human body is not adapted to a constant state of weightlessness. The need for a constant state of weightlessness was first realized in the early 1960s, when it was discovered that the human body is not adapted to a constant state of weightlessness.

MATERIALS AND METHODS:
The experiment was conducted in the International Space Station (ISS) during the STS-128 mission. The experiment was conducted in the International Space Station (ISS) during the STS-128 mission. The experiment was conducted in the International Space Station (ISS) during the STS-128 mission.

RESULTS:
The results of this study will be presented at the 2010 meeting of the International Space Station, which will be held in Houston, Texas, USA. The results of this study will be presented at the 2010 meeting of the International Space Station, which will be held in Houston, Texas, USA.

CONCLUSIONS:
The results of this study will be presented at the 2010 meeting of the International Space Station, which will be held in Houston, Texas, USA. The results of this study will be presented at the 2010 meeting of the International Space Station, which will be held in Houston, Texas, USA.

ACKNOWLEDGEMENTS:
I am grateful for generous support from the National Research Foundation, Space Plus One, and the High Frontier Space Association. I am grateful for generous support from the National Research Foundation, Space Plus One, and the High Frontier Space Association.

LITERATURE CITED:
NASA. 1998. Project STS-128. Science.gov. United States Government Printing Office, Washington, DC. 1-100. 2000. The International Space Station. NASA. 2000. The International Space Station. NASA. 2000. The International Space Station.

Example of Better Research Poster

What do you think should be fixed about this poster?



Active Video Game Use and its Effects on Sedentary Behaviors

Draycen D. DeCator, M.A., Yvette Ramirez, & Jocelyn Smith Carter, Ph. D.

DePaul University



Introduction

Despite a lot of research attention, the obesity epidemic in United States youth is a continuing problem (Centers for Disease Control and Prevention, 2012). The problem is receiving attention from researchers hoping to reverse the trend of increasing Body Mass Indices (BMI's). An area of focus revolves around the use of active video games (AVG's) to increase physical activity levels in youth (e.g., Maddison, Mhurchu, & Jull, 2012). Having an understanding of the way in which AVG's can help decrease BMI can lead to the creation of AVG's with an increased likelihood of being played, and can thus increase the number of youth that will benefit from the game.

Results from previous studies using AVG's have shown that children given an AVG spent less time playing sedentary video games and spent more time playing AVG's (Mhurchu et al., 2008). These children also had lower waist circumferences compared to the control group that did not receive an AVG. In a review by Active Healthy Kids Canada, the results did not support AVG's as a strategy to help children be more physically active (Chaput et al., 2013), but suggested that AVG's may help children to reduce sedentary time. Therefore, youth with high levels of baseline sedentary behaviors may benefit most from AVG use. The success of introducing AVG's will also likely depend on characteristics of the youth, such as temperament (Wu, Dixon, Dalton, Tudiver, & Liu, 2011). That is, the findings of these studies may have been mixed because of relevant variables not being taken into consideration such as baseline sedentary levels and temperament (e.g., surgency/high intensity pleasure seeking).

The current study researched: 1) whether sedentary time, AVG use, and levels of surgency predicted BMI, and 2) if any interactions were present.

Methods

The *Active Project (TAP) for Kids* is a broader research project being conducted by DePaul University and Rosalind Franklin University. TAP's aim has been to help understand what makes kids more likely to play active video games (AVG's), and how they can be encouraged to be more physically active through the use of AVG's.

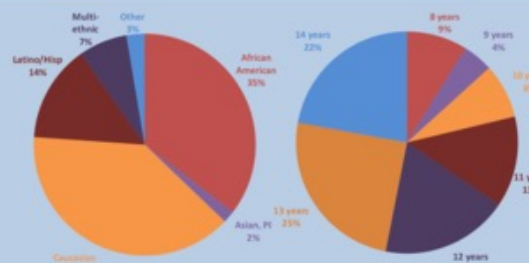
Participants

Participants in the current study consist of a subset of youth from the TAP for Kids project that had complete data for all study variables ($n = 96$). Participants for the study were youth between the ages of 8 and 14 from the Chicago area. The study measured sedentary time, AVG use, temperament, and BMI of each child.



Measures

- Sedentary time
 - Self-report
 - 6 items (3 tasks, weekdays and weekend days)
 - Combined for weekly average time
- AVG use
 - Self-report
 - Time during one week
- Temperament
 - Early Adolescent Temperament Questionnaire - Revised (EATQ-R; Rothbart, Ellis, Rosario Rueda, & Posner, 2003)
 - 6 items for surgency subscale
 - Example: "I would not be afraid to try a risky sport, like deep-sea diving"



Results

Data Analysis

Preliminary MANCOVAs were run to determine whether group differences existed (see Table 1). Hierarchical multiple regression was conducted to test the complete model (see Table 2)

Preliminary Analyses (Group Differences)

| | Gender | Agency |
|----------------|---------------------|------------------------|
| AVG use | $F(1, 92) = 0.002$ | $F(1, 92) = 7.82^{**}$ |
| Sedentary time | $F(1, 92) = 4.53^*$ | $F(1, 92) = 1.12$ |
| Surgency | $F(1, 92) = 0.01$ | $F(1, 92) = 2.53$ |
| BMIz | $F(1, 92) = 4.20^*$ | $F(1, 92) = 1.89$ |

Table 1. Preliminary analyses of group differences.
Note. Controlling for age; * $p < .05$; ** $p < .01$.



Figure 1. Bar graphs of significant group differences.

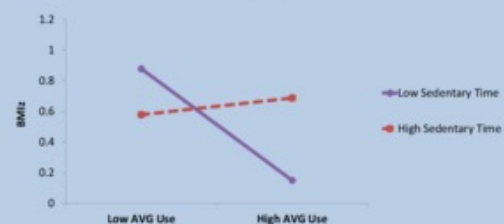


Figure 2. Simple slopes of interaction
Note. * Difference between slopes: $p < .05$.

Hierarchical Linear Regression Models

| Predictors | ΔR^2 | β at step | Final β |
|-------------------------|--------------|-----------------|---------------|
| Step 1 (R^2) | .11 | | |
| Child sex | | .22* | .19 |
| Child ethnicity | | .02 | .06 |
| Agency | | .12 | .17 |
| Surgency | | -.22* | -.21* |
| Step 2 (ΔR^2) | .01 | | |
| AVG use | | -.01 | -.15 |
| Sedentary time | | .08 | .04 |
| Step 3 (ΔR^2) | .04 | | |
| AVG x Sedentary time | | | .26* |

Table 2. Hierarchical Linear Regression Models Predicting BMIz.
Note. * $p < .05$.

Hierarchical multiple regression was used to examine surgency, AVG use, sedentary time, and AVG use moderated by sedentary time as predictors of BMIz (while controlling for sex, ethnicity, and agency of participation). A significant AVG use X sedentary time interaction was found ($\beta = 0.26, p < .05$). Additionally, surgency was found to be a significant independent predictor even when accounting for the AVG use X sedentary time interaction ($\beta = -0.21, p < .05$). However, a three-way interaction between AVG use, sedentary time, and surgency was found to be non-significant ($\beta = -0.03, ns$).

A simple slopes analysis was conducted to help interpret the significant interaction (Figure 2). The analysis showed that AVG use was most predictive of BMIz for youth with low sedentary tendencies, whereas children with high sedentary tendencies benefitted less from high AVG use. The differences between the slopes was found to be significant ($p < .05$).

Discussion

The current study provides support for AVG use as a predictor of BMIz, at least for youth with already low sedentary tendencies. Emerging intervention programs that seek to promote AVG use as a form of physical activity should take into account that the success of introducing AVG's will likely depend on already-established behaviors of the youth. However, the current study does not support a link between temperament and sedentary time or AVG use.

Future studies should examine the effect of introducing AVG's to youth longitudinally, to see if AVG use can lead to decreases in BMI or if the current findings are due to a confound variable predicting lower BMI, higher AVG use, and lower sedentary tendencies. In addition, there is a need to replicate the findings of the current study with populations in other areas, as the current results are limited to a predominantly Caucasian and African American population in the Midwest.

References

- Centers for Disease Control and Prevention. (2012). Trends in the prevalence of extreme obesity among US preschool-aged children living in low-income families, 1998-2010. *Journal of the American Medical Association, 308*(24), 2563-2565.
- Chaput, J. P., LeBlanc, A. G., McFarlane, A., Colley, R. C., Thivel, D., Biddie, S. J. H., ... Tremblay, M. S. (2013). Active Healthy Kids Canada's position on active video games for children and youth. *Pediatrics and Child Health, 18*(10), 529-532.
- Maddison, R., Mhurchu, C. N., and Jull, A. (2012). Active video games: The mediating effect of aerobic fitness on body composition. *The International Journal of Behavioral Nutrition and Physical Activity, 9*, 1-4.
- Mhurchu, C. N., Maddison, R., Jang, Y., Jull, A., Prapavessis, H., & Rodgers, A. (2008). Couch potatoes to jumping beans: A pilot study of the effect of active video games on physical activity in children. *International Journal of Behavioral Nutrition and Physical Activity, 9*(1), 9-12.
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Example of a Good Research Poster



Community Building Through Assessment: Creating a Culture of Practice



Sarah Jardeleza, Gabe Ording, Julie Libarkin: CENTER FOR INTEGRATIVE STUDIES IN GENERAL SCIENCE

COMMUNITY OF PRACTICE?

Can CISGS be transformed into a community of practice (Wenger 1998) through assessment?

WHY ASSESSMENT?

- Easy segue for scientists: assessment and evaluation are similar to experimentation and scientific processes
- Discipline-Based Education Research (DBER; NRC 2012)
- Continuous improvement of teaching and learning



Figure 1. Assessment cycle for continuous improvement.

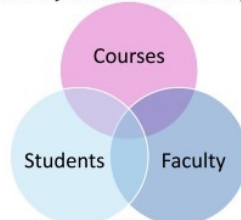


Figure 2. Structures for participation in CISGS program evaluation and continuous improvement.

Table 1. Faculty and student interaction with assessment process (% by AY for lunch meetings or semester for surveys).

| Semester | Student: Surveys | Faculty: Surveys | Faculty: Lunch Meetings |
|-------------|--|---------------------------------------|-------------------------|
| Spring 2011 | n/a ^{Early} ; 62% ^{Late} | 37% ^{An} ; 37% ^{In} | 67% |
| Fall 2011 | 39% ^{Early} ; 32% ^{Late} | 56% ^{An} ; 40% ^{In} | 61% |
| Spring 2012 | 33% ^{Early} ; 30% ^{Late} | 52% ^{An} ; 40% ^{In} | |
| Fall 2012 | 49% ^{Early} ; 41% ^{Late} | 39% ^{An} ; 30% ^{In} | 72% |
| Spring 2013 | 49% ^{Early} ; 37% ^{Late} | 41% ^{An} ; 38% ^{In} | |

OUTCOMES:

Jardeleza, S., A. Cognato, M. Gottfried, R. Kimbirauskas, J. Libarkin, R. Olson, G. Ording, J. Owen, P. Rasmussen, J. Stoltzfus, S. Thomas (accepted). Summer 2013. The Value of Community Building: One Center's Story of How the AAC&U VALUE Rubrics Provided Common Ground. Liberal Education - AAC&U Press; 99(3).



Global Learning VALUE Rubric Review:

1. Professional development related to rubrics
2. Collaborative iterative feedback for rubric improvement
3. Alignment of instructor's course goals with the rubric
4. Shared effective rubric-related instructional activities
5. Developed innovative rubric-related instructional activities
6. Improved community of practice with faculty across disciplinary boundaries.

Energy Concept Inventory:

- What is a set of concepts common across CISGS?
- Syllabus review, faculty discussion = Energy
- Research /Development
- AAAS Project 2061, etc.
- AOP • Survey Creation & Student Pilot Testing #1
- Administered survey during student orientation
- Angel • Survey Revision & Student Pilot Testing #2
- Administered survey early-course FS2012
- FLC • Faculty Feedback
- Item revision and creation
- Angel • Survey Revision & Student Pilot Testing #3
- Administered survey late-course FS2012

Example Question

Which of the following contain(s) energy?
CHOOSE ALL THAT APPLY.

- A) Rocks sitting on a hill
- B) Rocks rolling on a hill
- C) Rocks sitting on the ocean floor
- D) Rocks rolling on the ocean floor
- E) I do not know

Faculty DBER Projects:

1. Dr. Remke Van Dam – Weather, Climate, Water, and Communication



2. Dr. Jon Stoltzfus – Flipped REAL Classroom



3. Drs. Julie Libarkin, Stephen Thomas, Gabe Ording

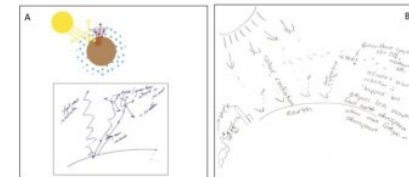


Figure 3. Ideal student and expert models of the greenhouse effect.

FUTURE STEPS

- Faculty Collaborative DBER AOP Assessments
- Coordinated embedded assessments
- Automated course reports for faculty as requested
- Continued Collaborative Publications
- Collaborative Grants

CITATIONS

- AAAS Science Assessment ~ Home. <http://assessment.aaas.org/>.
- National Research Council (2012) Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering.
- Wenger, E. (1998) Communities of Practice: Learning, Meaning, and Identity. Cambridge University Press.

Good Example of Research Poster

Think of what you will point to and say during your presentation



Inorganic Chemistry
CHED
1041
Wed, Mar 2
Monday, March 27, 2018
12:00:00 PM - 2:00:00 PM
© 2018

Synthesis and Characterization of 1T-MoS₂ Electrodes for CO₂ Conversion

Kevin E. Rivera Cruz¹, Forrest Hylar² and Jesús M. Velázquez²
¹Department of Chemistry, University of Puerto Rico, Cayey, PR, 00736
²Department of Chemistry, University of California, Davis, CA, 95616

Using Metal Dichalcogenides as Electrocatalyst

Goal: Synthesize and characterize the tetragonal phase Mo₂S₃ reduction of CO₂ to alcohols

Context: Recent research efforts on the electrochemical reduction of CO₂ to alcohols and hydrocarbons. Previous research has observed the hexagonal arrangement of MoS₂ electrocatalytic electrodes. Metallic 1T-MoS₂ presents a new arrangement of MoS₂ towards a specific liquid fuel product. Various active sites have been proposed for sites available for electrocatalytic CO₂ reduction.

Synthesis and Characterization

Hydrothermal Synthesis¹

1T-MoS₂ synthesis: MoO₃, Thiourea, Nanopure H₂O, 24 hrs at 200°C Furnace

Distorted 1T-MoS₂ synthesis: MoO₃, Thiourea, Nanopure H₂O, 12 hrs at 200°C Furnace

Figure 3. Schematic representation of Hydrothermal synthesis.

Scanning Electron Microscopy (SEM)

Figure 4. Characteristic Raman Spectra for A) 1T-MoS₂, with variations of Thiourea, B) Distorted 1T-MoS₂.

Figure 5. PXRD patterns of the synthesized MoS₂. A) Thiourea Excess 1T-MoS₂, B) Equimolar Thiourea 1T-MoS₂, C) Distorted 1T-MoS₂.

Figure 6. SEM micrographs of the synthesized MoS₂. A) Thiourea Excess 1T-MoS₂, B) Equimolar Thiourea 1T-MoS₂, C) Distorted 1T-MoS₂.

Electrochemical Reduction

Drop-Casting Deposition⁴

Evaporation of ethanol Under Vacuum

1T-MoS₂ in ethanol

GC-TCD

NMR

SEM analysis

Linear Sweep Voltammetry

Figure 7. The LSV scan was performed from 0.837 to -1.163 V vs. RHE potentials in a 0.1M Na₂CO₃ solution at a scan rate of 10.0 mV/s.

Controlled Potential Electrolysis

Figure 9. A) -0.563V vs RHE potential was applied to a 1T-MoS₂ on Glassy Carbon in a 0.1M Na₂CO₃ solution for a total of 20°C.

| Material | Potential vs RHE | NMR Analysis Species |
|---------------------|------------------|--|
| 1T-MoS ₂ | -0.563V | Methano Formate, Acetate, CO, 2-propanol, Hydrogen |

Conclusion and Future Work

1. Current 1T-MoS₂ was successfully synthesized. 1T-MoS₂ was successfully deposited on Glassy Carbon substrates for further electrochemical analysis.

2. Preliminary results show that 1T-MoS₂, deposited on glassy carbon at an applied potential of -0.563V vs RHE converts CO₂ to methanol, formate, acetate, and hydrogen.

Future Work includes:

- Improving yieldability by annealing.
- High resolution microscopy (e.g. TEM or STM) will be implemented to establish changes of morphology.
- Further study of potential to obtain a product distribution as a function of applied potential.
- Optimize the electrodeposited heavy atom-rich intercalated layered 1T-MoS₂.
- Optimize reaction of 1T-MoS₂ on carbon substrates.

References

1. A. Prasad, *Synthesis and Characterization of Layered MoS₂ as anode for Li-ion batteries*, *Journal of Power Sources* **2014**, *258*, 279-286.
2. H. P. S. Byrappa, *et al.*, *International Journal of Chemical Engineering Research* **2010**, *12*, 219-230.
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4. H. P. S. Byrappa, *et al.*, *International Journal of Chemical Engineering Research* **2010**, *12*, 219-230.
5. H. P. S. Byrappa, *et al.*, *International Journal of Chemical Engineering Research* **2010**, *12*, 219-230.
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NIH RISE

Examples of Research Posters



ORGANIC 110

ATM

Safer Solvents for Alkylolithium Reagents

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Abstract

Alkylolithium reagents are essential for a wide array of applications. They are often used as nonreactive groups for substitution reagents or as a nucleophilic group for nucleophilic addition. However, their use is associated with health hazards as they are highly flammable. Additionally, they are highly sensitive to air and moisture. Recently, we have developed a new class of alkylolithium reagents that are safer and more stable. These reagents are based on polyisobutylene (PIB) derivatives and have much lower flash points. They are also more stable to air and moisture. We have shown that these reagents are effective for a wide range of reactions. We have also shown that these reagents are effective for a wide range of reactions. We have also shown that these reagents are effective for a wide range of reactions.

Flammability of PAOs / Hexane

PAOs as Replacements for Activated Carbon

contaminated H₂O clean H₂O

clean PAO and PAO anchored extracting agent

sequestered contaminant in PAO

PAO Extraction Efficiency

| Impurity | Starting Concentration (ppm) | Concentration after Extraction (ppm) | Organic Extracted |
|-----------------|------------------------------|--------------------------------------|-------------------|
| Hexane | 900 | < 0.1 | > 99 % |
| Benzene | 500 | 3.4 | 99 % |
| Dichloromethane | 1450 | 72 | 95 % |
| Dibromomethane | 650 | 40 | 94 % |
| Methoxybenzene | 1500 | 142 | > 90 % |
| Phenylpropane | 1000 | 490 | 50 % |
| Perfluorooctane | 1300 | 770 | 30 % |
| Perfluorodecane | 1100 | 1100 | 17 % |

Recycling of PAO phase

Conclusions

- PAOs can be used as safer solvents for pyrophoric chemicals like *tert*-butyllithium
- PAOs serve as recyclable alternatives to activated carbon for water purification
- Phase anchored H-bonding reagents can increase the extraction efficiency of PAO extractants

Future Work

- PIB-co-solvents utilizing ionic interactions for water purification are being developed
- Functionalized PAOs are being tested for water purification
- Studies involving polarizing PAOs to create replacements for polar solvents is underway

Acknowledgements

We thank Welch Foundation, Chevron, ExxonMobil, and TPCO for their support.

This poster had multimedia with a tablet to show a video and samples attached as a visual – great for in person interactions

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SAFER ALKYLITHIUM REAGENTS

PAO EXTRACTION EFFICIENCY

Sequestered Trace Organic (%)

PIB-catechol (M)

Legend: Tetrahydrofuran, Perfluorooctanoic, Triethylamine, Nitrobenzene

SAFER ALKYLITHIUM REAGENTS

PAO EXTRACTION EFFICIENCY

Presenting Your Research



- Remember that you are the expert!
- Don't block your poster (in person or when recording on zoom, etc)
 - Especially if you have more than one presenter
- Treat your poster presentation like a conversation
 - Prepare a mini "presentation" but allow for questions
 - Think about what you will point to on your poster to support what you are saying
- Practice!
 - Prepare 1-2 sentences per section
 - Use the And-But-Therefore framework or other effective communication strategy

<https://www.youtube.com/watch?v=ERB7ITvabA4>



Presenting Your Research



- Prepare and practice for common open-ended questions
 - Tell me about your research...
 - How does this relate to the field?
 - How will this research impact your future research?
- Be enthusiastic about your work
 - Have more than one presenter?
- Practice projecting your voice
 - Have water
- Dress so you feel confident



QUESTIONS?

