How To Make a Research Poster

Dr. Jeremy Lessmann

Director, Office of Undergraduate Research

Importance of the Poster

- Purpose of the poster:
  - Final or partial culmination of your research work
  - Provide a brief background (BIG picture), your methods or approach to doing the research, as well as results and conclusions
  - Can lay the groundwork for presenting at a national conference
  - Can be posted on the website for future researchers to view

Brainstorm…. Take 10 minutes

what should be on a poster?

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Content of a Poster

- Title
- Authors – who should be listed?
- Affiliation (yourself and other authors)
- Introduction/Abstract
- Figures/Photos with captions
- Methods/Procedures – pictures are great!
- Tables/graphs
- Conclusions and Discussion or Results
- Acknowledgement to sponsors (funding and others)
- References (if needed)

Other suggestions and ideas

- Check out the tips section online posters.wsu.edu/ or surca.wsu.edu/participants/poster-presentations/
- Get your poster reviewed by all co-authors before printing – and give them enough time to review it
- Check the size limit before you start – Every conference is different

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Other tips…

- Sometimes you are not "done" with your project…This is fine. Do your best with what you have, and bring more results to the poster symposium, or present future steps.
- Don't forget to acknowledge your funding source.
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Nuts and Bolts of getting it printed

- Create the poster in Powerpoint
- Look at it at 100% size
  - Look at images, do they show up?
  - Are all of your text boxes complete?
  - Any Greek Symbols? Check them
- If printed on campus (CougPrints) – you can upload the file on their website. Check their deadlines for submission.
- Make sure you have a method to pay for it – either Purchase order or internal request or ?
- Pick up your poster and Check it (before the day of)

Additional Resources

- www.ncsu.edu/project/posters/
- colinpurrington.com/tips/academic/posterdesign
- www.colorschemer.com/online.html

If attending a meeting…

- Practice your poster with lab mates, peer mentors, advisor, etc.
- Practice your poster with roommates or others outside of your field
- Look at the rubric for the meeting, if your poster will be judged

Looking for posters online…

- WSU library archive of posters – SURCA
  - https://research.libraries.wsu.edu/xmlui/discover
- Summer Research programs at WSU
  - LAR: http://lar.wsu.edu/ugrad_reu.html
  - Smart Environments: http://reu.eecs.wsu.edu/past_projects.html
  - NARA SURE: https://nararenewables.org/posters/#toc-summer-undergraduate-research-experience-sure-

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Characterization and Modification of Asphalt With Epoxy Resins Synthesized From Pyrolysis Oil, a Derivative of Lignocellulosic Biomass

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Introduction

Asphalt is an important commodity that has a vital purpose in civic infrastructure, both in urban and rural communities alike. Polymer-modified asphalt has become a popular topic of interest due to the advantageous property modifications provided by its polymer components. Such alterations include increased moisture resistance, higher tensility, better resistance to long-lasting deformation, greater elasticity, and lower temperature susceptibility. In this study, asphalt was modified with an epoxy resin synthesized from pyrolysis oil (a derivative of lignocellulosic biomass). Typically, in commercial and industrial settings, epoxy resins are formed by treating bisphenol-A with chloromethyloxirane (epichlorohydrin). Lignocellulosic biomass, namely lignin, houses similar hydroxyl environments like those found in bisphenol-A, and thus can be used as a substitute.

Overall Process Flowchart

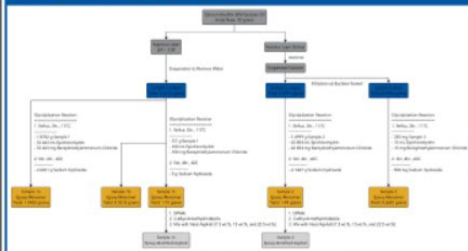

Figure 1. Flowchart delineating the overall process of asphalt modification via pyrolysis oil.

Reaction Scheme

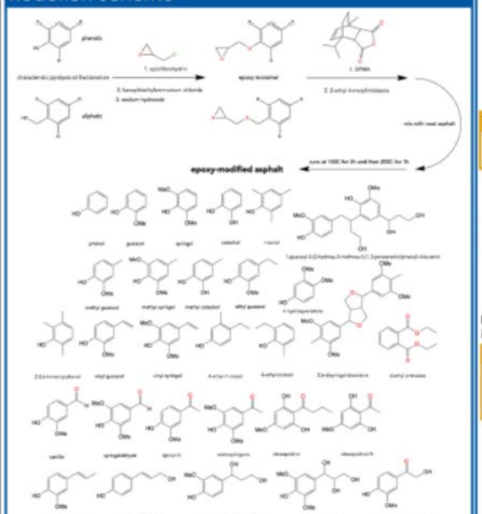

Figure 2-3. Reaction scheme and an extensive list of pyrolysis fractionations.

Experimental Methods

Three separate samples were obtained from extraction and separation processes performed on the starting pyrolysis oil solution. The phenolic and hydroxymethyl functional groups belonging to the pyrolysis oil fractionations in these samples were reacted with epichlorohydrin as follows: 350 mg of sample, 10 mL of epichlorohydrin, and 10 mg of benzyltriethylammonium chloride were combined and set to reflux for 4 hours at 117°C. The mixture was then cooled to 60°C, 500 mg of sodium hydroxide was added, and stirring occurred for 3 hours. The remaining epichlorohydrin was evaporated, leaving the desired epoxy monomer. The epoxy monomer was then mixed with the Diels-Alder adduct produced from the reaction between dipentene and maleic anhydride (DPMA) using 1wt.% 2-ethyl-4-methylimidazole as a catalyst. The mixture was then combined with neat asphalt at different concentrations: 7.5 wt.%, 15 wt.%, and 22.5 wt.%, respectively. The epoxy-modified asphalt was then cured at 150°C for 2 hours and then 200°C for 1 hour. **Note**: The glycidylization reaction was performed on all of the samples in the same numerical ratios as described.

Analytical Methods and Results

Gas Chromatography & Mass Spectroscopy

A ThermoScientific Focus GC was used in concordance with a ThermoScientific ITQ 1100 to estimate the highest probable fractionations in the pyrolysis oil samples.

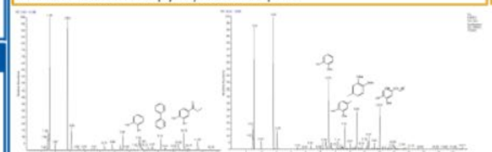

Figure 4-5. GC-MS peaks indicating the most probable pyrolysis oil fractionations.

Differential Scanning Calorimeter

A non-isothermal TA Instruments 2920 Modulated DSC was used under a nitrogen atmosphere to test if the epoxy monomers could be successfully cured.

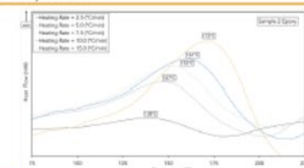

Figure 10. DSC curves for Sample 2 at 5 different heating rates.

Thermal Gravimetric Analysis

A TA Instruments SDT Q600 was used to evaluate the thermal stability and degradation behavior of the pyrolysis oil samples.

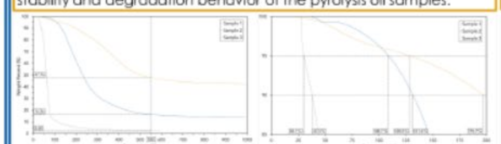

Figure 6-7. TGA graphs showing thermal stability and degradation. Char yield is indicated in Fig. 6 and $T_{5\%}$ and $T_{10\%}$ are indicated in Fig. 7.

Fourier Transform Infrared Spectroscopy

A ThermoScientific Nicolet Nexus 670 FT-IR was employed to test samples before and after epoxidization in order to determine if the glycidylization reaction was successful.

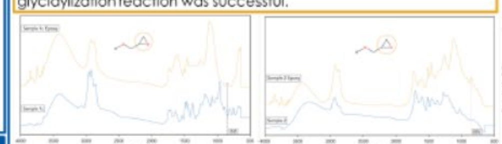

Figure 8-9. FT-IR peaks for before and after glycidylization. Both figures are marked to show peak changes that show epoxide ring formation.

Rheology

A TA Instruments Discovery HR-2 Hybrid Rheometer was used to test the viscoelastic properties of the epoxy-modified asphalt.

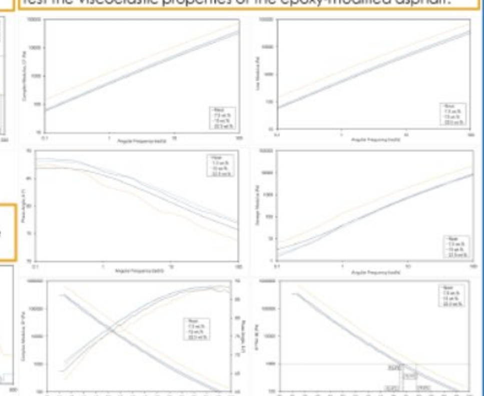

Figure 11-16. Rheology test results for both angular frequency and temperature.

Conclusions

According to the rheology test results, the epoxy-modified asphalt exhibits greater viscoelastic properties, specifically the asphalt containing 22.5 wt.% of the epoxy/DPMA mixture.

References

1. Pandey, M., & Kim, C. (2010). Lignin Depolymerization and Conversion: A Review of Thermochemical Methods. Chemical Engineering & Technology Chem. Eng. Technol., 34 (1), 29-41.
2. Rahman, A., El-Shafie, M., & Kholy, S. (2012). Modification of local asphalt with epoxy resin to be used in pavement. Egyptian Journal of Petroleum, 139-147.
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Acknowlegements

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- Maika Bui for her assistance in the lab
- Michelle White for coming to the lab to take photographs of the equipment

Profiles of Social Relationships for Low-Income Youth in Physical Activity Based Positive Youth Development Programs

Sarah Ullrich-French [1], Meghan H. McDonough[2], Dawn Anderson-Butcher[3], Anthony Amorose[4]
[1]Washington State University [2]Purdue University [3]Ohio State University [4]Illinios State University

Introduction

Positive Youth Development
Positive youth development (PYD) programs are aimed at providing youth with resources to foster growth in personal and social assets and address barriers to well-being (Benson et al., 2006; Holt, 2008). PYD programs have the potential to be especially important to low income populations who have limited resources and are often disadvantaged in multiple areas (e.g., Kroenke, 2007; Votruba-Drzal, 2006). Physical activity settings are excellent PYD contexts because they are linked to improved physical and psychosocial health, and provide involved, interactive, emotional, and social context for teaching life skills (Hellison et al., 2008; Fraser-Thomas et al., 2005).

Role of Social Relationships
Social relationships play an important role in the experience and outcomes of PYD programs (Benson et al., 2006). Physical competence, social competence, and support from program staff positively predict changes in physical self-worth, global self-worth, attraction to physical activity, and hope across a four-week summer program (Ullrich-French, McDonough, & Smith, under review). Leader support has also been linked to continued participation in the same summer PYD program (Ullrich-French & McDonough, under review). A positive relationship with a caring adult is a crucial element facilitating PYD (Gano-Overway et al., 2009; Catalano et al., 2004). Research with low-income youth has also showed that autonomy support from teachers and parents predicts physical activity behavior and motivation (Vierling, Standage, & Treasure, 2007).

Purpose

This study examined (1) whether participants in summer physical activity based PYD programs have distinct profiles of social relationship variables (leader support, autonomy support, and belonging), and (2) whether profile groups differ in psychosocial outcomes that PYD programs aim to address.

Methods

Participants: Low- income youth in 2 summer PYD programs:

Program A: N = 243
M_{age}= 10.87, SD = 1.38
49% female
40.7% Hispanic, 35.8% White, 9.5% Black, 5.8% Asian, 6.6% Multi-racial; 1.6% Other

Program B: N = 298
M_{age}= 12.00, SD = 1.61
45% female
1.7% White, 78.8% Black, 1.4% Asian, 11.5% Multi-racial, 3.4%Native American; 3% Other

Procedures and Measures
PYD program participants completed questionnaires at the beginning and end of the program on the following:

Social Relationship Measures:
Leader Support (Cox & Williams, 2008; Goodenow, 1993)
Autonomy Support (Standage, Duda, & Ntoumanis, 2005; Williams & Deci, 1996)
Belonging (Anderson-Butcher & Conroy, 2002)

Psychosocial Outcome Measures:
Physical Competence (A: Harter, 1985; B: Amorose, 2002)
Social Competence (A: Harter, 1985; B: Anderson-Butcher, Iachini, & Amorose, 2008)
Social Responsibility (Anderson-Butcher et al., in progress)

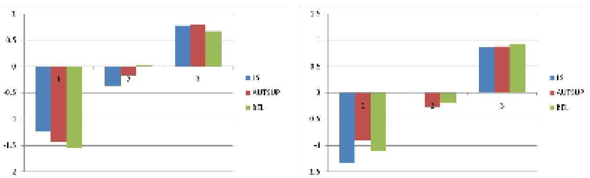
All measures demonstrated adequate internal consistency reliability ($\alpha > .70$).

Data Analysis
Hierarchical cluster analysis was performed with standardized scores of the social relationship variables at the end of the program to help determine the most appropriate cluster solution. Next, non-hierarchical cluster analysis was conducted using initial cluster centers identified from hierarchical analysis specifying a three cluster solution. This procedure was conducted with program A, then verified with program B data.

A MANOVA was conducted to examine differences between the clusters on social responsibility, social competence, and physical competence variables at the end of the program.

Results

Cluster Analysis
Three distinct profiles emerged. Consistent solutions were obtained with and without outliers, therefore complete samples were used. Program B data confirmed the three profiles.



Program A Program B
Figure 1. Three Cluster Solution

Profiles were labeled (1) "*negative*" (A: n = 54; B: n = 74) with relatively low scores on all social relationship variables, (2) "*average*" (A: n = 73; B: n = 107) with average scores on all social relationship variables, and (3) "*positive*" (A: n = 116; B: n = 112) with high scores on all social relationship variables.

Table 1. Profile Descriptive Statistics

	1 (negative)		2 (average)		3 (positive)	
Program A	**M (SD)**	**z**	**M (SD)**	**z**	**M (SD)**	**z**
LDRSUP (1-5)	2.86 (0.65)	-1.24	3.63 (0.46)	-0.36	4.63 (0.41)	0.77
AUT SUP(1-7)	3.45 (0.91)	-1.43	5.20 (0.78)	-0.17	6.53 (0.43)	0.79
BEL(1-5)	2.90 (0.72)	-1.55	4.34 (0.55)	0.04	4.92 (0.22)	0.67
Program B						
LDRSUP (1-5)	2.85 (0.71)	-1.33	3.42 (0.64)	0.31	4.43 (0.53)	0.86
AUT SUP(1-7)	3.07 (0.99)	-0.91	4.34 (0.84)	-0.27	5.91 (0.70)	0.88
BEL(1-5)	2.67 (0.64)	-1.11	3.90 (0.51)	-0.20	4.66 (0.36)	0.94

MANOVA
There was a significant multivariate effect (Pillai's Trace = .44, $F(6, 478)$= 22.40, $p < .01$, η^2= .22). Follow-up analyses revealed significant ($p < .01$) profile differences of small to moderate magnitude (see Table 2). Results were largely confirmed with program B (Pillai's Trace = .36, F (6, 588) = 21.47, $p < .01$, η_p^2 = .18.

Table 2. MANOVA Cluster Outcome Differences

		Program A		Program B	
Outcome	Cluster	M	SD	M	SD
Social Competence		$\eta_p^2 = .08$		$\eta_p^2 = .33$	
	Negative	2.73^a	0.63	3.24^a	1.00
	Average	3.12^b	0.64	3.72^b	0.64
	Positive	3.22^b	0.71	4.46^a	0.43
Social Responsibility		$\eta_p^2 = .40$		$\eta_p^2 = .26$	
	Negative	3.38^a	0.77	3.42^a	0.96
	Average	4.28^b	0.62	3.92^b	0.66
	Positive	4.63^a	0.50	4.50^a	0.53
Physical Competence		$\eta_p^2 = .11$		$\eta_p^2 = .09$	
	Negative	2.66^a	0.67	3.86^a	0.85
	Average	2.88^a	0.59	4.22^b	0.75
	Positive	3.19^b	0.59	4.45^b	0.64

Conclusions

•Although distinct "positive", "average", and "negative" social experience profiles emerged, the labels for clusters are relative and not in absolute terms. Participants had relatively high scores on the social relationship variables.

•However, profiles were significantly different on outcome variables, suggesting that small to moderate differences in social relationships in PYD programs may affect psychosocial outcomes that these programs aim to improve.

•Consistent findings across two independent PYD programs support generalizability of profiles and differences.

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Wildfire Hazards: An Analysis of Duration, Cost, and Size*

Jude Bayham† Jonathan Yoder‡ School of Economic Sciences, Washington State University

Motivation

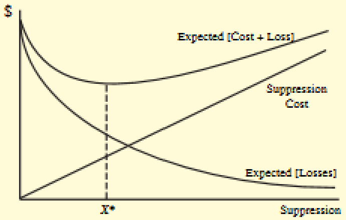
- Wildfire suppression expenditures have exceeded $2 billion per year over past decade
- Better understanding of suppression behavior over the course of a fire leads to more efficient wildfire management
- Wildfire often studied as a set of single outcomes (i.e., cost and size), neglecting the allocation decisions within a fire that drive those outcomes

Objectives of Study

- Develop a theory of wildfire suppression and to motivate the empirical hazard model
- Estimate joint hazard (frailty) model that accounts for correlation in three wildfire outcomes: duration, total cost, and final fire size

Theory of Wildfire Suppression

The wildfire management team chooses suppression effort to minimize suppression costs and losses to values at risk over the course of the fire.



Theory *cont.*

- Managers face tradeoff between two forms of suppression effort: 1) designed to mitigate overall fire growth and 2) protect values at risk
- Fires fought in a dynamic uncertain environment where managers accrue information and revise action plan
- Fire managers may divert suppression effort from overall containment to protecting specific assets at the expense of fire duration, total cost, and size.

Hazard Framework

- Focused on the time (accumulation of cost or area) until a wildfire is contained
- **Hazard rate** $h(t|\mathbf{x})$ is the probability that a fire is contained in the next interval of time (cost, or area) conditional on not yet having be contained
- **Survival function** $S(t|\mathbf{x})$ represents the proportion of fires expected to last longer than time t conditional on variables $\mathbf{x}$
- Unobservable differences between fires arise from variation in management and geography and are allowed to be correlated across fire outcomes duration, cost, size

Data

- Wildfire data from incident status reports filed by firefighters intermittently throughout the course of a fire. U.S. fires from 2001 to 2008.
- Housing data from 2010 U.S. Census

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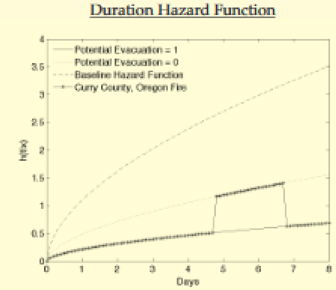
Results

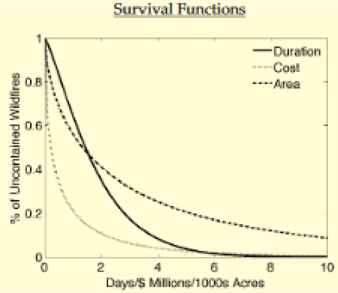
The percent effect of one unit change in covariate on the baseline hazard rate. Lower hazard implies larger expected outcome.[a]

Covariate (units/baseline)	Duration	Cost	Area
Threatened OutBuildings (1000s of Structures)	-36.80	-79.68*	-96.59***
Threatened Residential (1000s of Structures)	-58.42***	-87.14***	-89.49***
Potential Evacuation (No Evacuation)	-55.42***	-76.66***	-79.81***
Home Value <20 mi. ($ Billions)	-0.28**	-0.30*	-0.34***
Fatalities	-21.79***	-26.88***	-22.65**
Wind (100 mph)	-5.56	-16.82	-89.54***
Resource Scarcity (100,000 Acres)	0.00	-0.06**	-0.15***
Cause Lightning (Human)	-52.66***	-17.28***	-37.24***
Year (2001=0)	-4.09***	-2.70*	-2.07**
Washington & Oregon (Southern US)	15.90	-52.59***	-23.72*
California (Southern US)	99.84***	-55.42***	11.09

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$; 10,321 observations on 3,829 fires

[a] For example, when 1000 residential structures become threatened, the duration hazard of containment falls by 58% which implies a longer expected duration.





- Increased values at risk (i.e., evacuation) reduce the hazard rate and imply longer, larger, and more costly expected fires consistent with theory.
- Resource Scarcity is aggregate fire activity in a region over the monthly average (instrument for opportunity cost). Higher resource scarcity implies larger and more expensive fires.
- California fires cost more despite shorter and smaller fires relative to those in the Southern U.S. Result likely due to high density of high value homes.
- Model may be integrated with tools currently used to predict wildfire spread to provide probabilistic information on economic outcomes

HealthWISE: Engaging Student Pharmacists in Elementary School Science Education

Lisa J. Woodard, PharmD, MPH, Judith S. Wilson, MA, James Blankenship, PhD,
Raymond M. Quock, PhD, Marti Lindsey, PhD, Janni J. Kinsler, PhD

INTRODUCTION

Service-learning is an important curricular tool to help student pharmacists develop the knowledge, skills and attitudes needed for practice.[1] It positively impacts the health and wellness of the communities served.[2]

The U.S. Department of Education has identified that America's schools are not producing students with the science excellence required for global economic leadership and homeland security in the 21st century.[3] America's youth lack both *proficiency* and *interest* in science.[4] Student pharmacists who engage in service-learning in elementary classrooms can be an antidote for both the lack of proficiency and interest in the students they serve.

To address these needs, a one-credit elective course was designed allowing student pharmacists to integrate academic and clinical skills with principles of community health promotion and prevention while strengthening science education in elementary schools. Elementary students were taught the *Using Live Insects* curriculum focused on insects for the 2nd grade, and *Immunization Plus* curriculum focused on immunology for the 5th grade.

OBJECTIVES

The goals of the HealthWISE program were to:

1. Prepare student pharmacists to develop skills to communicate and collaborate with others.
2. Prepare student pharmacists to promote health improvement, wellness and disease prevention.
3. Prepare student pharmacists to provide mentorship to improve the profession and influence the next generation of pharmacists.
4. Improve health science education for elementary school students.

METHODS

A quasi-experimental pre-test/post-test research design was used to assess whether elementary student's science knowledge and attitudes changed as a result of the curricula. Four different intervention conditions were implemented with lessons taught by (1) teachers only, (2) student pharmacists only, (3) teachers + student pharmacists, or (4) no intervention – control group. Elementary school teacher satisfaction with the curricula and student pharmacist performance and learning were assessed using questionnaires and reflective writing assessments.

The Institutional Review Boards at the University of Pacific, Washington State University, and the University of Arizona determined this study was exempt from review.

CONCLUSION

HealthWISE is a viable approach to reach out to communities to bring the expertise of student pharmacists into elementary school education. Student pharmacists improve communication skills and promote wellness and professional mentorship. Elementary school teachers value the student pharmacist knowledge and professionalism. Elementary school children improve science knowledge from the student pharmacist lessons.

RESULTS/DISCUSSION

Elementary Student Knowledge and Attitudes Toward Science

- 281 2nd grade students participated.
- 264 5th grade students participated.
- Knowledge increased significantly from pre-test to post-test for all intervention groups.
- Attitude towards science increased significantly only for the teacher only intervention group with the 2nd graders.
- Demographic characteristics (gender, age, race, language spoken/read) did not predict post-test knowledge gain.

Classroom Teacher Satisfaction with the Curriculum and Student Pharmacist Performance

- Teachers were generally satisfied with curricula, 100% said they would implement again in their classrooms.
- Features of the curricula they liked best: student pharmacist enthusiasm, children's books. Features of the curricula they liked least: too short, some lessons confusing.
- Teachers were satisfied with student pharmacist performance. Comments included: communicated well, impressed with white coats/professionalism, enthusiastic, well-prepared, good role models.
- Classroom teacher quotes:
  "I think it is very important for students to see that there are wonderful careers in math and science. The student pharmacists were a great example of this."

Student Pharmacist Learning

- Student pharmacists felt they were successful in achieving the outcomes of the elective course including: improved communication, promoting health and wellness, professional mentorship.
- Student pharmacists are prepared for lifelong service in STEM education in their communities.
- Student quotes:
  "From this experience, I have become a better communicator."
  "I hope I have left a positive influence on the lives of my students."
  In working with English language learners – "This experience reminded me of the difficulties of communication because as pharmacists we must educate and communicate effectively to our patients."

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