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Assessing and Improving a Post-Post-Baccalaureate Research Education Program (IPREP) for Underrepresented Populations

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Presentation posted here: <https://irds.iupui.edu/reports-presentations/conference-presentations/index.html>



Presentation Overview

1. IPREP Program Overview
2. Assessment Methods
3. Assessment Results
4. Use of Assessment Results
 - What Learned Based on Assessment: What is Working Well
 - Improvements Made Based on Assessment Results
5. Discussion and Questions





IUPUI

IPREP
POST-BACCALAUREATE
RESEARCH EDUCATION PROGRAM

Indiana University-Purdue University
Indianapolis



IPREP Mission and Purpose

- The mission of IPREP is to increase the number of Ph.D. graduates who are underrepresented in the biomedical and behavioral sciences.
- The program was designed to help underserved students obtain the research experience and professional skills needed to gain admission to and be successful in competitive biomedical and behavioral science Ph.D. programs.



Targeted Programs

1. Medical Neuroscience
2. Addictions Neuroscience
3. Biomedical Engineering
4. Clinical Psychology
5. Human Performance
6. Basic Medical Sciences
 - Microbiology
 - Musculoskeletal and Cell Biology
 - Pharmacology
 - Physiology



IPREP Cohorts

2019-2020



2018-2019



2017-2018



2016-2017



IPREP Fellows Receive

- An intensive year-long mentored research experience in a cutting edge lab at IUPUI, the major health and life sciences campus in Indiana
- A personalized professional development plan geared toward successful admission to a competitive biomedical or behavioral science graduate program
- A competitive salary with healthcare and other benefits
- Opportunities to improve on skills needed to be successful in academic and professional life
- Support for travel to national research meetings
- Assistance with application to select graduate programs in biomedical and behavioral sciences
- Preparation to take the Graduate Record Examination (GRE)
- Opportunity to learn and practice interviewing skills for graduate programs



IPREP Program Provides Intensive Training

- Critical thinking skills
- Professional enrichment
- Scientific writing and effective communication
- Career development and professionalism
- Responsible conduct of research and research ethics
- Literature searching and citation management
- Research rigor and reproducibility, among other topics



Key Program Components

1. Fellows (students) are matched with faculty mentors that provide opportunities for the IPREP students to strengthen professional skills needed to thrive in a competitive biomedical research Ph.D. programs.
2. Faculty mentors engage in professional development opportunities to strengthen their skills in developing inclusive positive research environments so that students from historically marginalized groups feel a sense of belonging and self-efficacy perceptions necessary to be successful in competitive Ph.D. programs.



Fostering a Sense of Belonging and Self-Efficacy Programming for Minoritized Students

1. Fellow sense of belonging is reinforced with social events with program alumni, peer mentoring activities, and campus administration/faculty leaders.
2. Fellows participate in several layers of programming to increase self-efficacy including:
 - Institutional programming from the IUPUI Graduate Office and graduate student organizations
 - Professional development workshops based on the National Research Mentoring Network (NRMN) Entering Research Mentee Training curriculum
 - Institutional mindfulness resources and activities to combat anxiety, depression and stereotype threat
 - Attendance at local, regional, and national conferences with an emphasis on preparing minority STEM students for graduate school



IPREP: The Indiana University-Purdue University Indianapolis Post-Baccalaureate Research Education Program

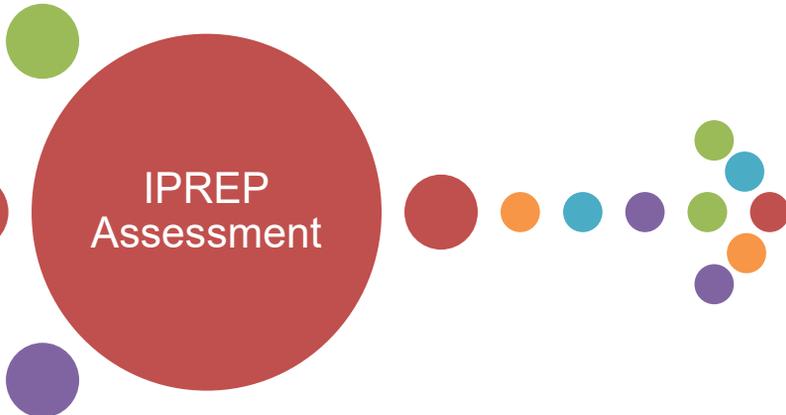
Summative Evaluations



Mentors



Formative Evaluations



Summative and Formative Methods

Summative

- Monitoring of Recruitment Numbers, Scholarly Work, Applications to Graduate School, Enrollment in Graduate School Programs, Completion of Ph.D., Employment in Biomedical and/or Behavioral Science Field
- Assessment of Learning Gains (Direct and Indirect)
- Data collected to determine if Fellows are significantly enhancing their functional research skills, gaining self-efficacy in conducting independent research and gaining commitment to their field.
- Maintaining Dataset to Monitor Fellows' Progress Over Time
- Assessing Impact on Institutions' Numbers of URM in Biomedical and/or Behavioral Sciences Ph.D. Programs
- Preparing Annual Reports Assessing Attainment of All Objectives and Outcomes
- External Evaluator Visits

Formative

- Interviews and Focus Groups
- Questionnaires from multiple sources (Fellows, Faculty Mentors, and Executive Committee members)
- On-Going Interactions with Faculty Mentors and Fellows
- Faculty Mentors' Ongoing Formal and Informal Feedback Directly to Fellows on Progress and Areas in Need of Improvement
- Advisory Committee Meetings
- Monthly Executive Committee Meetings



Specific Outcomes Evaluated

Recruitment

- At least 4 post-baccalaureate URM individuals who earned undergraduate degrees in STEM fields within the last 36 months and have had adequate academic preparation plus a strong desire to advance themselves in the biomedical and behavioral sciences will be selected in Year 1, 6 in Year 2 and 3.
- Data will be collected on students' demographic characteristics and application materials.

IDP Development

- 100% of the participants will develop an Individualized electronic Personal Development Plan that will showcase their academic progression and experience gained.

Knowledge and Skills

- Participants' knowledge and skills will be rated in the following areas: Critical Thinking, Writing, Research/Laboratory Skills, and Career Development.
- Instruments will be developed to assess degree to which participants have the knowledge and skills to successfully navigate Ph.D. programs to the completion of advanced degrees.



Specific Outcomes Evaluated

Research or Scholarly Activities

- Each program participant will have completed at least 2 research or scholarly activities during the PREP year (e.g. had a paper or poster submitted and accepted to a research conference in one of the five targeted PhD programs; submitted a quality research paper to a peer-reviewed journal; had a research manuscript accepted in a peer reviewed journal).
- Once admitted to a Ph.D. program, we will collect data from institutions and participants to determine if there was an increase in the quality of research output of their underrepresented students.

Admitted to Ph.D. Program

- Admitted to Ph.D. Program in Biomedical and/or Behavioral Sciences
- 90% or the PREP students will apply a high quality PhD program.
- 75% will be admitted to and enroll in these programs.

Completion of Ph.D. Subsequent Work in Field

- 75% percent of those enrolled will finish Ph.D. degrees within 6-8 years after participating in PREP.
- After 10 years, 90% percent of the students who obtained their Ph.D.s will obtain postdoctoral positions or employment within 2 years of obtaining their degrees.



Longer-Term Outcomes Evaluated

Impact on Institutions and IUPUI

- Number and percentage of URM in PhD programs at PREP institutions and IUPUI.
- Each year we will carefully review the number and percentage to ensure that we reach the doubling after 4-8 years of the PREP.
- Carefully monitor this data based on the baseline data to ensure adequate progress.

Impact on Faculty

- Significant increase in the number of scholarly research manuscripts co-authored with URM PREP and admitted URM graduate students for the faculty members in the five targeted programs at IUPUI.

Institutionalize and Disseminate

- The Internal Evaluator will collect, analyze, and report data to inform the Institutional Advisory Committee and senior leadership in deciding which elements of the PREP should be institutionalized.
- The most effective components will be institutionalized.
- At least 3 conference presentations and 2 peer reviewed education research manuscripts will be submitted and accepted to ensure adequate dissemination of the information on the PREP program effectiveness.



Assessment Results

Attaining Intended Outcomes

1. 34 students admitted to the program.
2. 89% (25/28) success rate - number of students who have been admitted to competitive Ph.D. programs in biomedical and behavioral science fields.
3. Presentation to the Assessment Institute and preparing manuscripts for peer-reviewed publications in appropriate diversity education journals.



2014 – 2018 Fellows' Pre-Post Questionnaire

(N=24)

Research, Presentation and Lab Skills

ITEM	TIME	MEAN	SD
Designing a scientific experiment	PRE	3.88	1.36
	POST	4.71	1.12
Displaying a thorough grasp of relevant research methods and being clear about how these methods apply to the research project being undertaken	PRE	4.17	1.47
	POST	5.33	0.64
Knowing the proper steps to ensure the ethical treatment of animals and/or human subjects in research	PRE	4.29	1.71
	POST	5.50	0.59
Using and understanding professional and discipline-specific language	PRE	3.91	1.41
	POST	5.41	0.73
Preparing a proposal for a scientific conference presentation or poster	PRE	3.83	1.40
	POST	5.00	1.14
Giving oral presentations about scientific research findings to diverse audiences	PRE	4.13	1.65
	POST	5.13	0.90

The response scales: 1=Very Low Level of Comfort; 2= Low Level of Comfort; 3= Slightly Low Level of Comfort; 4= Slightly High Level of Comfort; 5= High Level of Comfort; 6= Very High Level of Comfort.

Note: Significantly different based on paired samples t-test results $p < .01$



2014 – 2018 Fellows' Pre-Post Questionnaire

(N=24)

Research, Writing and Lab Skills

ITEM	TIME	MEAN	SD
Preparing scientific articles for peer-reviewed publications	PRE	3.13	1.08
	POST	3.92	1.18
Properly identifying and/or generating reliable data	PRE	3.83	1.55
	POST	5.08	0.83
Giving oral presentations about scientific research findings to diverse audiences	PRE	4.13	1.65
	POST	5.13	.900
Proper record keeping required for laboratory research	PRE	4.79	1.22
	POST	5.42	.654
Writing clearly and effectively in discipline-specific formats	PRE	3.87	1.42
	POST	4.87	1.01

The response scales: 1=Very Low Level of Comfort; 2= Low Level of Comfort; 3= Slightly Low Level of Comfort; 4= Slightly High Level of Comfort; 5= High Level of Comfort; 6= Very High Level of Comfort.

Note: Significantly different based on paired samples t-test results $p < .01$



2014 – 2018 Fellows' Pre-Post Questionnaire

(N=24)

Confidence and Persistence

ITEM	TIME	MEAN	SD
Using time well to ensure work gets accomplished by deadlines	PRE	4.25	1.48
	POST	5.17	0.96
Displaying a high level of confidence in ability to meet challenges	PRE	4.42	1.50
	POST	5.42	.083
Not getting discouraged by set-backs and unforeseen events	PRE	4.58	1.28
	POST	5.38	0.97
Showing flexibility and a willingness to take risks and try again	PRE	4.96	1.12
	POST	5.46	0.66

The response scales: 1=Very Low Level of Comfort; 2= Low Level of Comfort; 3= Slightly Low Level of Comfort; 4= Slightly High Level of Comfort; 5= High Level of Comfort; 6= Very High Level of Comfort.

Note: Significantly different based on paired samples t-test results $p < .01$



Faculty Mentors' Retrospective Pre-Post Questions (N = 21)

Use Direct Evidence of Student Work When Deciding on Ratings

ITEM	TIME	MEAN	SD
Conducting independent, scholarly research.	BEGINNING	2.71	1.35
	CURRENT	4.10	0.89
Scientific writing skills.	BEGINNING	3.10	1.17
	CURRENT	3.90	0.97
Preparing a proposal for a scientific conference presentation or poster.	BEGINNING	2.80	1.06
	CURRENT	4.25	0.97
Giving oral presentations about scientific research findings to diverse audiences.	BEGINNING	2.80	1.11
	CURRENT	4.05	0.89
Preparing scientific articles for peer-reviewed publications.	BEGINNING	2.53	1.07
	CURRENT	3.58	0.77
Behaving with a high level of collegiality and ethical responsibility.	BEGINNING	4.38	1.43
	CURRENT	5.00	1.18
Displaying a thorough grasp of relevant research methods and being clear about how these methods apply to the research project being undertaken.	BEGINNING	2.84	1.34
	CURRENT	4.26	1.05
Persistently working at his/her career goal(s) even if she/he gets frustrated.	BEGINNING	4.05	1.47
	CURRENT	4.86	1.35
Knowing the steps to take to gain admissions to a competitive, research intensive Ph.D. program in the biomedical or behavioral sciences.	BEGINNING	3.33	0.97
	CURRENT	5.00	1.14

The response scales: 1=Very Low Level; 2=Low Level; 3=Slightly Low Level ; 4=Slightly High Level; 5= High Level; 6= Very High Level Note: **Significantly different based on paired samples t-test results $p < .01$**



Fellows' Expectations for Faculty Mentoring and Peer Relationships – PRE

Major Themes: Relationships, Supportive, Constructive Criticism, Clear Expectations, Guidance

- “I would my mentor to provide guidance, help me challenge myself, and show me the skills required to be a successful graduate student. I would like my peer relationships to be supportive and long lasting.”
- “I want a mentor that can be one-one mentor that guide me in my first step as a researcher and give me the opportunity to work independently as well in a group. Want to be able to have a good relationship with all the members of the lab, that we can work in collaboration. A mentor that can help me select a good program and school as well a possible mentor that I can stay in the institutions and complete my PhD program.”
- “I expect to develop a strong and professional relationship with my mentor and be able to refer to him for my professional development. As for my peer relationships, I expect to be able to count on them for assistance, guidance, and support.”
- “I expect my mentor to present opportunities for me to take advantage of. I also expect my mentor to provide constructive criticism as well as guidance while in the iprep program. I expect my peers to serve as a source of comfort and support as we build relationships through shared experiences.”
- “To meet frequently and be very clear about expectations from one another both on a day to day level and for the year To experience a sense of community where we all support one another in our endeavors.”
- “Honesty, constructive criticism, opportunities, exposure to more of the graduate world, patience as I learn and develop.”

Fellows' Experiences With Faculty Mentoring and Peer Relationships - POST

- “I had a great experience learning from my faculty mentor and from my graduate student mentor in my lab. Both played critical roles in everything I achieved and learned while I was in the program.”
- “Extraordinary.”
- “My mentor relationship has vastly improved and gotten stronger over the course of the IPREP program. I have developed a strong relationship with my mentor and been able to accomplish tasks in an effective manner due to this. It has created a great learning environment, but also made working in lab a lot more enjoyable. I have also developed great relationships with other faculty members that have encouraged, supported, and aided me throughout my time in IPREP.”
- “My mentor was eager to help me grow in any area identified as a weakness. She allowed me to set my own goals and helped me set realistic time frames to achieve them. My IPREP peers served as a source of accountability and reassurance. They were supportive and share resources that they knew would be beneficial to my growth.”
- “My experiences were extremely positive; I am not sure if this is an indication of how much of a good fit my mentor and I have or a reflection of the IPREP program itself and the kind of mentors it selects. My peers, for the most part, seemed to express similar sentiments.”
- “I established a great relationship with my PI and moreover with the post-docs in the lab who are readily available. During this short time I have learned very useful techniques that I can apply in any lab. My peers have been wonderful as well, we have become great friends and I haven't had any issues with any of the other fellow ever. This experience has allowed for me to learn so much about psychology because the majority of the fellows research in that field.”

Fellows' Skills Gained from and Benefits of IPREP Program: Qualitative Results

Major themes: Scientific Writing Skills, Collaboration, Time Management, Communicating/Presenting, Confidence

- “I gained skills in networking, writing, and communicating.”
- “Better communication, scientific writing. How to conduct and independent research.”
- “Further developing and refining my scientific writing skills has been a great benefit to me during the IPREP program. I am in the process of writing two manuscripts that will hopefully progress to being published. It has been a steep learning curve, but well worth it.”
- “Time management, critical thinking, scientific writing and skills in statistical analysis.”
- “Interacting with and networking with faculty members. Public speaking and poster presenting skills.”



Confidence to Be Successful in Competitive Ph.D. Programs



“More confidence in my own ability to complete a doctorate program, effective communication when I am trying to “sell” myself as a possible candidate for a program and discuss my research with different audiences, professional development, a lot on establishing a healthy mentorship and a foundation for scientific writing.”



Advice from Former Fellows Based on Alumni Survey Results

Describe what components were missing from the IPREP program that would have helped you make a better transition to/meet the demands of graduate school:
Cohorts 2014, 2015, 2016, and 2017 (N=17; Response Rate=81%)

- “I was a bit unprepared for the intensity and pace of the coursework. However, it is a big time sink and implementing coursework into IPREP would pull time away from gaining research experience.”
- “IPREP could have facilitated a better transition in to graduate school with exposure to more challenging coursework.”
- “Taking a graduate level statistics course would have been very helpful”
- “Longer lab rotations to help decide labs, interview prep.”
- “I think that there was not a lot of time for those who were not too sure what they wanted to do yet in research. Given the short time, I feel it was hard for those needing to rotate in order to see what they want to research and what they want out of research.”



Advice from Former Fellows Based on Alumni Survey Results

Describe what components were missing from the IPREP program that would have helped you make a better transition to/meet the demands of graduate school:
Cohorts 2014, 2015, 2016, and 2017 (N=17; Response Rate=81%)

- “I believe that an **interdisciplinary approach** to lab techniques would have proved more advantageous. That is, though I mastered the skills necessary for my field and specific topic of study, learning about techniques in other fields would prove useful in fostering collaborations.”
- “I think that I was well prepared with the demands of graduate school. I do feel as though there should be a **more structured GRE prep class** and an emphasis on why certain assignments are required. We had to do an **independent goal sheet [IDP]** and had to revisit it every few months, but no one emphasized what that should look like. Some of the meetings I had with my PIs felt pointless. It's important to know why we needed to write everything down. I understand now, and actually write down all of my goals, however, I think it's important to talk to students about the advantages of doing so. Sometimes, you need to voice what you need and want in order to make it happen.”



Alumni Specific Components of the IUPUI IPREP Program that Helped them make a more Successful Transition and Meet the Demands of Graduate School

- “Having the **day-to-day experience of being in a lab**, running experiments, troubleshooting, **presenting** your findings.”
- “Being able to attend a **professional development course and a graduate level course** allowed me the opportunity to experience the **time management** needed to balance lab and classes.”
- “**Support from several faculty** was encouraging. Being able to **meet with faculty, not in my field**, gave me different perspectives of what other PIs would require in lab settings. This helped me when **preparing for interviews.**”
- “Gaining a research experience and scientific **communication skills.**”
- “**Work ethic** instilled by the program and making the transition to living in another state.”



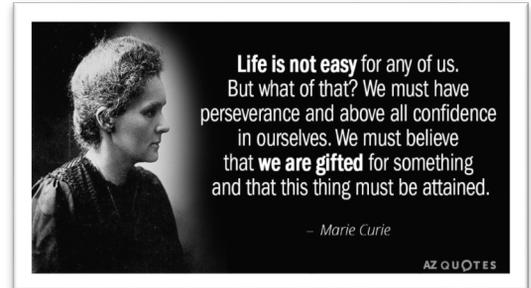
Alumni Specific Components of the IUPUI IPREP Program that Helped them make a more Successful Transition and Meet the Demands of Graduate School

- “First were **journal clubs**. As an IPREP fellow were required to present on papers in our field. .. These experiences helped me learn and articulate the frameworks of respected researchers. It also helped me develop a **more critical lens** when evaluating others’ research. The **rigorous amounts of reading/writing that my PI required** also helped me develop in my writing and comprehension. Lastly **IPREP provided a stipend for Fellows as well as financial support for travel and professional development**. Being able to focus on research full time without worrying about the financial burden helped me tremendously.



Alumni Comments on Specific Components of the IUPUI IPREP Program that Helped them make a more Successful Transition and Meet the Demands of Graduate School

- “My **intensive involvement in research** helped me make a successful transition to the **demands of graduate school**. The **several research hours that I was involved in my lab** help me prepare for the research demands of graduate school. It gave me a sense of what was expected of me. It gave me the **confidence** that I could meet the expectations of my principal investigators. The journal club meetings also increased my knowledge in **thinking like a scientist**. The mentorship was also helpful in increasing my research knowledge.”



Alumni Accomplishments Based on Survey Results N= 17 Cohorts 2014, 2015, 2016, and 2017

of Alumni
Participated In/Listed
As An Author of Since
Entering Graduate
Program

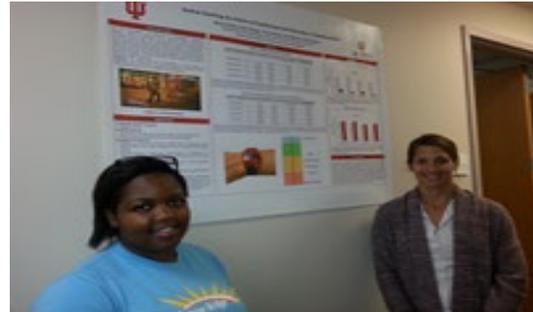
Abstracts 7

Presentations at
scientific meetings
of your
professional
societies 9

Refereed
publications 2

Book chapters 1

Other (please
specify) 0



IPREP Fellows Success

- UNC Chapel Hill
- University of Oklahoma
- IUPUI
- Illinois Institute of Technology
- University of Massachusetts
- Wake Forest
- University of Chicago
- Cal State North Ridge
- IU School of Medicine MD/PhD
- University of Texas
Southwestern
- UAB
- University of Connecticut
- UA Tuscaloosa
- Vanderbilt
- University of Miami
- University of Central Florida
- University of Illinois Chicago
- University of Florida
DPT/PhD
- Georgia Tech
- North Carolina State
- LSU



Use of Assessment Results

Assessment Results Indicate Program Strengths

- Met objectives (Recruited 6; 6 in Ph.D. Programs Graduate Programs Most Recent Cohort)
- Growing list of Campus Faculty Mentors and Improvements in Mentor Training (e.g., working with under-resourced students)
- Quality Faculty Mentor–Fellow Relationships
- Gains in Research, Presentation and Writing Skills
- Gains in Understanding How to Work Effectively and Collaborate with Others
- Gains in Confidence Levels and Willingness to Persist in Face of Difficulties
- Cohort Model and Peer Support
- Opportunities for Lab Experience
- Fellows' Career Development
- Acceptance Rates to Ph.D. Program and Career Goals Fulfilled
- Use of Program Evaluation Data to Make Improvements

Areas Improved Based on Assessment Results

- Recruitment Processes and Website Improved
- More Intentional Focus on Needs of Minoritized Fellows/Students and Diverse Learning Strategies (enhancing sense of belongingness and self-efficacy)
- Enhanced Focus on Fellow Development of Peer Support Networks (ongoing)
- IPREP Requirements vs. Research and Paper/Publication Focus
- Scientific Writing Skills and Preparing Manuscripts for Peer Review
- Implemented Strategies for Preparing Fellows for Rigorous and Demanding Graduate-Level Course Work
- Individualized Personal Development Plans
- Improved Communication to Faculty Mentors (e.g., about IPREP requirements and Fellows' assignments)
- Improved Communication and Connections to Alumni



Questions and Discussion

