STRENGTHS-BASED STEM PIPELINE INTERVENTIONS

Center for the Study of Higher & Postsecondary Education

FALL TERM 2015: Course#: EDUC 771
Time: Wednesday 4:00-7:00pm, Location: 2328 School of Education Building

Professor: Phillip J. Bowman, Ph.D.
Office: 2117 School of Education Building
Phone: (734) 647-8389
E-mail: pjbowman@umich.edu
Office Hours: By Appointment

COURSE OVERVIEW

This graduate seminar provides a better understanding of strengths-based pipeline interventions that broaden participation of underrepresented minority, women and first-generation (or low-income) students in Science, Technology, Engineering and Mathematics (STEM). Increasingly, exemplary STEM interventions at the K-12, undergraduate, and graduate/professional levels have gone beyond traditional approaches that focus on either the remediation of academic deficits or financial-aid strategies to reduce economic barriers. In addition, comprehensive strengths-based STEM interventions have multiple-components that also: (A) promote and develop personal strengths among underrepresented participants; (B) transform academic and social support environments to further promote their success, especially during critical transitions (e.g. high school-to-undergraduate, undergraduate-to-graduate studies, and advanced degrees-to-careers); and (C) address a range of systemic barriers that impede their successful outcomes.

This course has three major goals to help diversify STEM fields in the 21st century: (1) to acquaint students with policy-relevant literature on strengths-based approaches in education, psychology and other social sciences; (2) to examine emerging literature on effective strengths-based intervention strategies for major STEM target populations: (a) underrepresented minorities (e.g. MEYERHOFF SCHOLARS PROGRAM), (b) women (e.g. NSF-ADVANCE), and (c) first-generation students (e.g. CAROLINA COVENANT); and (3) to guide systematic inquiry that further clarifies core elements of strengths-based interventions promoting STEM higher education and career success among underrepresented populations. In addition to higher education, this seminar is also relevant to students in psychology, other social sciences and interdisciplinary fields interested in bridging strengths-based scholarship with STEM-related leadership roles in policy, administration, or professional practice within diversifying contexts.

Guided by a translational research agenda, this seminar will also highlight related findings from UM-based Diversity Research and Policy Program initiatives that focus on understanding interventions. One NIH-NIGMS-funded project bridges strengths-based scholarship with policy-relevant research on exemplary interventions to promote higher education opportunity, talent development, STEM career participation and national competitiveness. This policy-relevant study can help to clarify the unique strengths, support systems and barriers that differentiate intervention efficacy among underrepresented student populations.
COURSE REQUIREMENTS AND BASIS FOR EVALUATION

1. Weekly Seminar Participation/Article Reviews & Discussion (20%)
2. Selected Computer Data-based Literature Review/ Written & Oral (20%)
3. Selected Expert Informant Interview/ Assignment & Presentation (20%)
4. Final Seminar “Term” Paper (40%)

SOURCES

Required:


Other Major Sources:


Other readings are available on the Class C-Tools site and in class hand-outs.
Related Policy-Relevant Readings:


COURSE OUTLINE & WEEKLY READINGS:

Week 1-T – SEPT 9:  Introduction and Course Overview

1) Introductions
2) Overview of Syllabus, Major Sources and Class Logistics
3) Assignments & Hand-outs


Week 2 - Wed – SEPT 16: Required Core Readings


II. UNDERSTANDING STEM PIPELINE INTERVENTIONS: A Strengths-Based Approach?

A. Strengths-Based Perspectives in Psychology, Education & Beyond: From Deficits and Barriers “to” Multilevel Strengths Development

Week 3 – Wed – SEPT 23: Required Core Readings


B. “Understanding” Strengths-Based STEM Pipeline Interventions: Evaluation and Theory-Driven Research Paradigms

Week 4 – Wed – SEPT 30: Required Core Readings


II. STRENGTHS-BASED INTERVENTION STRATEGIES FOR MAJOR STEM POPULATIONS: Emerging Literature, Components, Issues and Directions

A. STEM PIPELINE INTERVENTIONS FOR UNDERREPRESENTED MINORITIES: MEYERHOFF SCHOLARS PROGRAM

Week 5 – Wed – OCT 7: Required Core Readings


B. WOMEN STEM PIPELINE INTERVENTIONS: NSF ADVANCE Program

Week 6 – Wed – OCT 14: Required Core Readings

1. **Transforming STEM Environments**: Eliminating Systemic Barriers and Bias


Week 7 – Wed – OCT 21: Required Core Readings

2. **Transforming Institutional Practices to Promote Access & Success**


**Week 8 – Wed – OCT 28: Required Core Readings**

3. **Comprehensive ADVANCE Support System:** *Promoting Personal Strengths Success*


**C. FIRST-GENERATION/LOW-INCOME STUDENTS IN STEM PIPELINE: The Exemplary NORTH CAROLINA COVENANT & Beyond**

**Week 9 – Wed – NOV 4: Required Core Readings**

1. **First-Generation/Low-Income Students and the North Carolina Covenant**


Week 10 – Wed – NOV 11: Required Core Readings

2. Class and Racial/Ethnic Intersections: The Gates Millennium Scholars Program


Week 11 – Wed – NOV 18: Required Core Readings

3. Class, Race & Gender Intersections: African American Females and Males in STEM


Overcoming the odds: Raising academically successful African-American young women. NY: Oxford University Press.


A. RETHINKING STEM PIPELINE INTERVENTIONS:
Understanding Multilevel Strengths, Barriers and Outcomes

Week 12 – Wed – NOV 25: Selected Readings

Week 13 – Wed – DEC 2: Selected Readings

Week 14 – Wed – DEC 9: Presentations, Reflections & Wrap Up

1. Need for A New STEM Pipeline Research Paradigm: Strengths-Based Talent Development in a Diversifying Nation, Phillip J. Bowman

2. Strengths-Based STEM Intervention and Evaluation Paradigm: The Meyerhoff Scholars Program and Beyond, Kenneth Maton, Mariano R. Sto. Domingo, Patricia Esparza, Rukiya Wideman, and Freeman A. Hrabowski

1. CORE ELEMENTS OF STRENGTHS-BASED PIPELINE INTERVENTIONS: Bridging Theory, Research, & STEM Intervention Efficacy

3. Understanding Personal Strengths, Strong Support and STEM Outcomes: Toward A Comprehensive Strengths-Based Approach to Intervention Efficacy, Phillip J. Bowman


5. Strong Faculty Mentoring Support & STEM Intervention Outcomes: A Multi-Dimensional Approach for Underrepresented Students, Phillip J. Bowman


7. Multilevel Cultural Strengths & STEM Intervention Outcomes: An Open-Systems Perspective on Underrepresented Students, Phillip J. Bowman & Angela Ebreo

II. OVERCOMING SYSTEMIC BARRIERS TO SUCCESSFUL STEM OUTCOMES: Strengths-Based Challenges for Underrepresented Students

8. Financial and Academic Barriers to STEM Intervention Success, Krystal Williams

9. Racial/Ethnic Barriers to STEM Intervention Success, Phillip J. Bowman & Angela Ebreo

10. Psychosocial Barriers to STEM Intervention Success, Angela Ebreo & Hillary Kolb

11. Racial Consciousness, Identity & STEM Intervention Outcomes, Robert Jagers, Karryll Winborne & Phillip J. Bowman

12. Gender, Ethnicity & Successful STEM Intervention Outcomes: Integrating Self-Authorship and Social-Cognitive Perspectives, Michelle Randolph & Phillip J. Bowman


II. METHODOLOGICAL AND POLICY ISSUES FOR THE 21st CENTURY: Strengths-Based Intervention Research and Global Challenges


15. Bridging Strengths-Based Scholarship with Policy-Relevant STEM Intervention: Challenges, Opportunities, and Strategies for the 21st Century, Phillip Bowman & Edward St John
SELECTED HAND-OUTS
ARTICLE/CHAPTER REVIEW GUIDELINES

TYPE: Critical Essay

ANNOTATOR:

TOPIC:

CITATION:

CENTRAL THESIS OF ARTICLE:

SUMMARY:

EVALUATION AND IDEAS:

TYPE: Review Article

ANNOTATOR:

TOPIC:

CITATION:

AREA OF RESEACH REVIEWED:

MAJOR CONCLUSIONS:

EVALUATION AND IDEAS
TYPE: Survey Study

ANNOTATOR:

TOPIC:

CITATION:

CENTRAL TOPIC OF THE SURVEY:

SAMPLE:

INSTRUMENT:

RESULTS:

CONCLUSIONS:

EVALUATION AND IDEAS:

________________________________________________________________________

TYPE: Experimental Study

ANNOTATOR:

TOPIC:

CITATION:

HYPOTHESES:

METHOD:

RESULTS:

CONCLUSIONS:

EVALUATION AND IDEAS:
EXAMPLE

TYPE: Survey Study

ANNOTATOR: Amanda Johnson

TOPIC: Perceived academic stress and coping strategies


HYPOTHESES

1. Academic stress perceptions are predicted by objective academic load variables.
2. Perceived academic stress, objective academic loads and demographic characteristics are correlated with the types of coping strategies adopted by students.
3. Academic loads predict the use of task-oriented coping strategies, academic stress perceptions predict the use of emotion-oriented coping strategies and demographic characteristics predict the use of avoidance coping strategies.

METHOD

A sample of 283 college students matriculating at national colleges and universities in Israel completed questionnaires in regard to their perceived stress, actual academic loads and subsequent coping strategies.

RESULTS

In regard to the first hypothesis, the results confirm that academic stress perceptions can be predicted from objective academic loads. A Pearson correlation analysis showed that certain coping strategies were significantly related to perceived academic stress. However, avoidance was positively correlated with academic stress, but the correlation was not significant. The third hypothesis considered each of the three coping strategies as dependent variables and academic loads, stress perceptions and demographic characteristics as independent variables. Each of the coping strategies was significantly predicted by the independent variables. Overall, the results suggest that the greater the level of academic stress experienced, the more students tend to manage it through emotion-oriented coping strategies.

CONCLUSION

Academic stress perceptions and academic loads had significant and unique effects on students’ coping strategies. Individuals ponder their stressful circumstances and act based on how they interpret and perceive situations consistent with their customary behavioral patterns. If the situation is not resolved and the perception of stress remains, stronger emotional and affective reactions are evoked.
EVALUATION AND IDEAS

It is interesting to compare and contrast this study to related issues highlighted by (Bowman, 2006) in his review article on Role Strain and Adaptation Issues in the Strength-Based Model: Diversity, Multilevel, and Life-Span Considerations. Studies cited in the Bowman piece highlight how race-related socialization functions with racial/ethnic identity, ethnic-achievement orientations, and other personal strengths to help promote youth motivation and resiliency despite stressful barriers. These role strain and adaption findings as well as related studies in regard to race-related socialization (Bowman and Howard, 1985) were very salient for me. Admittedly, my particular demographic was not reflected in the Kariv/Heiman research and so my observations should not be considered critical of their results, discussion and subsequent conclusions.

The issues of role strain and task-oriented versus emotion-oriented coping strategies resonate for me because I have been on a significant odyssey in my attempt to navigate barriers in the academic environment. I came to realize that my best approach for success in the environment was, as Claude Steele counseled his children, to ‘lighten up on the politics, get the best education you can, and move on… realize that to do this you have to learn from people who part of yourself tells you are difficult to trust.’ Wow. It was true to my experience. Thankfully, to relieve the dysphoria I did have the comfort of going home every evening.

I found myself reflecting on intergenerational sources of resiliency for me: (1) the proactive messages regarding ‘virtues of racial pride, ethnic achievement, strategic responses to racism, racial egalitarianism and self-development’ (Bowman, 2006) from my parents; and (2) the activism and reputations of their parents and other significant extended family members to encourage myself to be tenacious. It was this intergenerational family legacy that I came to realize accounted for my resiliency and refuse-to-give-up attitude. In addition, the support of my daughters, particularly one who was also matriculating at U of M concurrently; my ‘family-like friendship network’ and church were also vital and empowering in my pursuit consistent with the studies cited in the Bowman piece.

I can’t help but wonder sometimes why so much research is required to justify obvious solutions. I think I would like to see the academy become more prescriptive. There does seem to be movement in that direction.
Table 1

Traditional Deficit vs. Strengths-Based Approaches to Successful STEM Pipeline Intervention Outcomes: Major Concepts and Relationships

<table>
<thead>
<tr>
<th>DEFICIT-BASED</th>
<th>STRENGTHS-BASED</th>
</tr>
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<tbody>
<tr>
<td><strong>External</strong></td>
<td><strong>Multilevel</strong></td>
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<td></td>
<td><strong>Systemic</strong></td>
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<td><strong>Barriers</strong></td>
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<td><strong>CAUSAL</strong></td>
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<td><strong>FACTORS</strong></td>
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<td><strong>Internal</strong></td>
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<td>|</td>
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<tr>
<td><strong>Personal</strong></td>
<td><strong>Deficiencies</strong></td>
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<tr>
<td><strong>UNSUCCESSFUL</strong></td>
<td><strong>v</strong>s.</td>
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<tr>
<td><strong>OUTCOMES</strong></td>
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</tbody>
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Adapted From:
### Table 2

<table>
<thead>
<tr>
<th>RSCA – Prince-Embury</th>
<th>NCQ – Sedlacek</th>
<th>Personal Level Strengths - Bowman</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sense of Mastery</strong></td>
<td>Long Term Goals</td>
<td>Path-Goal Motivation</td>
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<tr>
<td></td>
<td>Positive Self-Concept</td>
<td>Salient Role Self-Efficacy</td>
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<tr>
<td></td>
<td>Knowledge in a Field</td>
<td>Career-Related Efficacy</td>
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<tr>
<td><strong>Emotional Reactivity</strong></td>
<td>Realistic Self-Appraisal</td>
<td>Resilient Problem-Solving</td>
</tr>
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<td></td>
<td>Handling the System</td>
<td>Diversity Commitment</td>
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<tr>
<td><strong>Sense of Relatedness</strong></td>
<td>A Strong Support Person</td>
<td>Perceived Social Support</td>
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<td></td>
<td>Leadership Experience</td>
<td>Leadership Commitment</td>
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<td></td>
<td>Community Involvement</td>
<td>Service Commitment</td>
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</table>

Adapted From:
Table 3
Comparison of Major Concepts in ETS®PPI and Related Assessment Systems

<table>
<thead>
<tr>
<th>ETS®PPI (Prince-Embrey – RAS)</th>
<th>Sedlacek – NCQ</th>
<th>Bowman – SAS</th>
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</thead>
<tbody>
<tr>
<td><strong>KNOWLEDGE/INTEGRITY</strong></td>
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<tr>
<td><em>(Sense of Mastery)</em></td>
<td>Long Term Goals</td>
<td>Path-Goal Motivation</td>
</tr>
<tr>
<td></td>
<td>Positive Self-Concept</td>
<td>Academic Efficacy</td>
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<tr>
<td></td>
<td>Knowledge in a Field</td>
<td>Career Efficacy</td>
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<tr>
<td><strong>RESILIENCE/COMMUNICATION</strong></td>
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<tr>
<td><em>(Emotional Regulation)</em></td>
<td>Realistic Self-Appraisal</td>
<td>Res. Problem-Solving</td>
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<td></td>
<td>Handling the System</td>
<td>Diversity Commitment</td>
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<tr>
<td><strong>TEAMWORK/ORGANIZATION</strong></td>
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<tr>
<td><em>(Sense of Relatedness)</em></td>
<td>A Strong Support Person</td>
<td>Social Support</td>
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<td></td>
<td>Leadership Experience</td>
<td>Leadership Commitment</td>
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<td>Community Involvement</td>
<td>Service Commitment</td>
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Adapted From:
Table 4
A Comparison of Sedlacek’s Non-Cognitive Predictors and Major Variables within Bowman’s Strengths-Based Approach to Intervention Efficacy

<table>
<thead>
<tr>
<th>Sedlacek’s Non-Cognitive Predictors</th>
<th>Bowman’s Strengths-Based Approach</th>
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<tbody>
<tr>
<td><strong>I. INTERVENTION AND SOCIAL PSYCHOLOGICAL STRENGTHS</strong></td>
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<tr>
<td>NONCOGNITIVE PREDICTORS</td>
<td>SOCIAL-COGNITIVE STRENGTHS</td>
</tr>
<tr>
<td><strong>A. Intervention Support:</strong> Strong Formal and Informal Support System</td>
<td>-Strong Intervention Participation</td>
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<tr>
<td>-A Strong Support Person</td>
<td>-Strong Formal Intervention Support</td>
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<tr>
<td>-Strong Informal Intervention Support</td>
<td>-Multilevel Cultural Strengths: Etics/Emics</td>
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<td><strong>B. Personal Resources:</strong> Strong Social-Cognitive Motivation</td>
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<tr>
<td>-Long Term Goals</td>
<td>-Path-Goal Strivings</td>
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<tr>
<td>-Positive Self-Concept</td>
<td>-Academic &amp; Global Self-Efficacy</td>
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<tr>
<td>-Knowledge Acquired in a Field</td>
<td>-Career-Related Talent/Efficacy</td>
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<tr>
<td>-Realistic Self-Appraisal</td>
<td>-Resilient Problem-Solving/Attributions</td>
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<tr>
<td><strong>C. Social Resources:</strong> Strong Social-Cognitive Engagement</td>
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<tr>
<td>-Community Involvement</td>
<td>-Community Service Commitment</td>
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<tr>
<td>-Leadership Experience</td>
<td>-Generative Leadership Commitment</td>
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<tr>
<td>-Handling the System</td>
<td>-Identity/Consciousness Commitments</td>
</tr>
<tr>
<td><strong>II. STRESSFUL STUDENT ROLE STRAIN MODERATORS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>A. Objective Student Role Barriers</strong></td>
<td></td>
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<tr>
<td>-Academic Barriers: SAT/ACT/GPA</td>
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<tr>
<td>-Financial Barriers: SES/Poverty/Aid Eligible</td>
<td></td>
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<tr>
<td>-Status-Related Barriers: Racial-Ethnic/Gender</td>
<td></td>
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<tr>
<td><strong>B. Subjective Student Role Appraisals</strong></td>
<td></td>
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<tr>
<td>-Role Threats: Discouragement/Self-Blame/Stereotype</td>
<td></td>
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<tr>
<td>-Role Stress: Conflict/Overload/Ambiguity/Distress</td>
<td></td>
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<tr>
<td><strong>III. SUCCESSFUL INTERVENTION OUTCOMES</strong></td>
<td></td>
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<tr>
<td><strong>A. Academic Achievement Outcomes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>B. Higher Education Plans/Outcomes</strong></td>
<td></td>
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<tr>
<td><strong>C. Career Plans/Outcomes</strong></td>
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<tr>
<td><strong>D. Psychosocial Development Outcomes</strong></td>
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</tbody>
</table>

# Strengths-Based Role Strain—Adaptation Approach to Intervention Efficacy: Basic Concepts and Related Variables in NIH-NIGMS Research Projects

<table>
<thead>
<tr>
<th>STRENGTHS-BASED ROLE STRAIN &amp; ADAPTATION CONCEPTS</th>
<th>RELATED VARIABLES</th>
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</thead>
<tbody>
<tr>
<td><strong>I. SHORT-TERM &amp; LONG-TERM OUTCOMES</strong></td>
<td></td>
</tr>
<tr>
<td>A. SHORT-TERM RESEARCH CAREER-RELATED PLANS</td>
<td>“Intended Outcomes”</td>
</tr>
<tr>
<td>B. LONG-TERM RESEARCH CAREER-RELATED BEHAVIORS</td>
<td>“Behavioral Milestones”</td>
</tr>
</tbody>
</table>

| **II. OBJECTIVE INTERVENTION PROGRAMS**          |                   |
| A. INTERVENTION PROGRAM PARTICIPANTS v. CONTROLS | “Experimental Designs” |
| B. INTERVENTION PARTICIPATION MEASURES          | “Non-Experimental Designs” |

<table>
<thead>
<tr>
<th><strong>III. STUDENT ROLE STRAIN &amp; ADAPTATION VARIABLES</strong></th>
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<tbody>
<tr>
<td>A. STUDENT ROLE STRAIN</td>
<td></td>
</tr>
<tr>
<td>1. <strong>Objective Role Barriers: Risky Systemic Obstacles</strong></td>
<td>(Contextual Problems)</td>
</tr>
<tr>
<td>a. Racial/Ethnic/Gender-Related Barriers</td>
<td>“Minority/Gender Visibility”</td>
</tr>
<tr>
<td>b. Financial Barriers: Poverty/Economic Status</td>
<td>“SES/Low-Income/1st Gen”</td>
</tr>
<tr>
<td>2. <strong>Subjective Role Stress: Risky Cognitive Appraisals</strong></td>
<td>(Perceived Threats)</td>
</tr>
<tr>
<td>a. Race/Ethnic/Gender Stress</td>
<td>“Stereotype Threats”</td>
</tr>
<tr>
<td>b. Financial Stress</td>
<td>“Financial Aid Concerns”</td>
</tr>
<tr>
<td>c. Academic Stress</td>
<td>“Academic Climate”</td>
</tr>
<tr>
<td>B. ADAPTIVE SOCIAL PSYCHOLOGICAL STRENGTHS</td>
<td></td>
</tr>
<tr>
<td>1. <strong>Strong Organizational Support: Program Resources, Relationships &amp; Opportunities</strong></td>
<td>“Program Processes”</td>
</tr>
<tr>
<td>a. Strong Formal Support: Multiple Components</td>
<td>“Sense of Belonging”</td>
</tr>
<tr>
<td>b. Strong Informal Support: Lab/Staff/Peers/Family</td>
<td>“Mentoring &amp; Coaching”</td>
</tr>
<tr>
<td>c. Strong Faculty Mentoring Support: Multiple Roles</td>
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<tr>
<td>2. <strong>Social-Cognitive Motivation</strong></td>
<td>“Psychological Processes”</td>
</tr>
<tr>
<td>b. Path-Goal Motivation</td>
<td>“Interest in Science”</td>
</tr>
<tr>
<td>c. Resilient Problem-Solving/Personal Resiliency</td>
<td>“Resilience/Self-Determination”</td>
</tr>
<tr>
<td>3. <strong>Social-Cognitive Engagement</strong></td>
<td>“Participant Attributes”</td>
</tr>
<tr>
<td>a. Leadership Commitment</td>
<td>“Research Team Experiences”</td>
</tr>
<tr>
<td>b. Service Commitment</td>
<td>“Communal Goals/Acculturation”</td>
</tr>
<tr>
<td>c. Diversity Commitment</td>
<td>“Cultural Competence/Conflicts”</td>
</tr>
</tbody>
</table>
Figure 1
Adapted From: