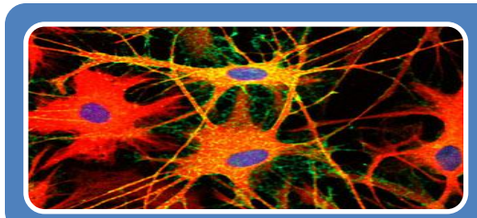

NEURO-ID Program: Theory of Change

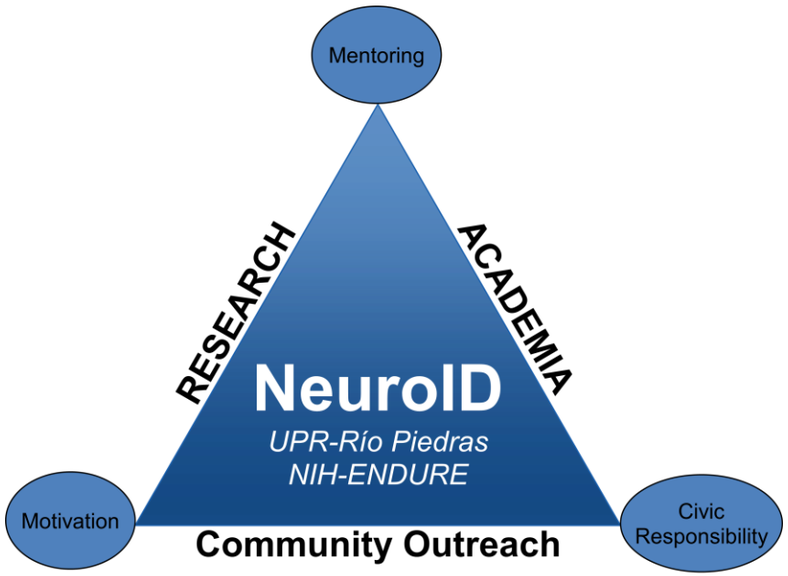

Figure 1. NeuroID is the integration of three training activities (Academic, Research and Community Outreach) embody in the philosophical concept of ***Research with Purpose***, having as expected outcomes increase motivation, civic responsibility and mentoring. This novel approach supplements the formal training program with activities that provide opportunities to engage the community and gain experience on transmitting the acquired knowledge**.**

Research with Purpose Key Components Description

THEORY: Motivation, Mentoring and Civic Responsibility			PRACTICE	
Key Components	Description (Literature Review)	Evaluation Instruments	**ACTIVITY**	
			Literature Review: Activities to Increase Motivation	**NeuroID Activities to Increase Motivation**

Motivation	• In general, **Motivation** is the internal state that arouses, directs, and sustains goal-oriented behavior. (Glynn, Taasoobhirazi, Brickman, 2009)
	
	• **Motivation to learn** refers to the disposition of students to find academic activities relevant and worthwhile and to try to derive the intended benefits from them (Brophy, 2004). (Glynn, Taasoobhirazi, Brickman, 2009)
	
	• In studying the **motivation to learn science**, researchers examine why students strive to learn science, how intensively they strive, and what beliefs, feelings, and emotions characterize them in this process. (Glynn, Taasoobhirazi, Brickman, 2009)
	
	What motivates students to learn in college sciences courses?
	The important motivational constructs being examined by researchers include: (Glynn & Koballa, 2006;)
	
	• intrinsic motivation
	• extrinsic motivation
	• personal relevance
		Science Motivation Questionnaire (SMQII)
		The SMQ II assesses five components of students' motivation to learn science in college or high school courses. The five components of motivation are:
		• Intrinsically Motivation
		• Extrinsic Motivation:
		  ○ Career motivation
		  ○ Grade Motivation
		• Self-determination
		• Self-efficacy
		
		Reliability: Cronbach's Alpha (.92)
		
		BACKGROUND:
		Glyn and Koballa (2006) developed the **Science Motivation Questionnaire (SQM)**. The questionnaire provides researchers with a tool for investigating students' motivation to learn science in college courses, the relationship of motivation to other student characteristics, and the interaction of motivation with instructional methods.
			Motivation to learn can be increased in the classroom.
			
			Intrinsic Motivation
			
			1. Explain or show **why learning** a particular content or **skill is important**
			2. Allow students some **opportunities** to select learning **goals and tasks**
			3. Create and/or **maintain curiosity**
			4. Provide a variety of activities and sensory stimulations
			5. Set **goals for learning**
			6. **Relate** learning to **student needs**
			7. Help student **develop plan of action**
				Intrinsic Motivation
				
				1. Explain or show why learning a particular content or skill is important
				• NeuroPizza Night
				• Technical workhops
				
				2. Allow students some opportunities to select learning goals and tasks
				• Development of Research Plan
				
				7. Help student develop plan of action
				• Professional Plan Development

	• self determination • self-efficacy • assessment anxiety ***Intrinsic motivation***, which involves learning science for its own sake (e.g., Eccles, Simpkins, & Davis-Kean, 2006).* ***Extrinsic motivation***, which involves learning science as a means to an end (e.g., Mazlo et al., 2002). * ***Personal relevance***, which is the relevance of learning science to students' goals (e.g., Cavallo et al., 2003).* ***Self-determination***, which refers to the control students believe they have over their learning of science (e.g., Black&Deci, 2000).* ***Self-efficacy***, which refers to students' confidence that they can achieve well in science (e.g., Lawson, Banks, & Logvin, 2007). * ***Assessment anxiety***, which is the debilitating tension some students experience in association with grading in science (e.g., Parker & Rennie, 1998).* *from (Glynn, Taasoobshirazi, Brickman, 2009) Source: • Motivation to Learn in College Science (Glynn & Koballa, 2006) • Science Motivation Questionnaire: Construct Validity with Noscience majors (Glynn, Taassoobshirazi, Brickman, 2009)	The **Science Motivation Questionnaire** was revised based on social cognitive theory and the results of an earlier exploratory factor analysis (Glynn et al., 2009). The following changes were made: • intrinsic motivation involved personal relevance (e.g., Learning science makes my life more meaningful), and • self-efficacy involved assessment anxiety (e.g., I worry about failing science tests), • **extrinsic motivation** was differentiated as **grade motivation** (e.g., Getting a good science grade is important to me) and **career motivation** (e.g., My career will involve science). The SQM II assesses intrinsic motivation, self-determination, self-efficacy, career motivation, and grade motivation. Source: Science Motivation Questionnaire II: Validation with science majors and nonsciences majors(Glynn, Brickman, Armstrong, Taassoobshirazi , 2011)	**Extrinsic Motivation** 1. Provide clear expectations 2. Give corrective feedback 3. Provide valuable rewards for simple learning tasks 4. Make rewards available 5. Allow opportunities for students to observe more correct exemplars 6. Allow for opportunities to engage in social learning activities 7. Provide for scaffolding of corrective feedback Source: Huitt, W. (2011). Motivation to learn: An overview. *Educational Psychology Interactive*. Valdosta, GA: Valdosta State University. http://www.edpsycinteractive.org/topics/motivation/motivate.html	**Extrinsic Motivation** 1-2. Provide clear expectations, Give corrective feedback • Academic Program (High expectations on courses performance) • Mentoring program • Supervised research experience (academic year and summer) 6. Allow for opportunities to engage in social learning activities • Community Outreach (Community Service, transmit scientific knowledge to community) • Local and National Poster presentations

	• Science Motivation Questionnaire II: Validation with science majors and nonsciences majors(Glynn, Brickman, Armstrong, Taassoobshirazi , 2011)		**Self Determination** *Increase Intrinsic Motivation by increasing self-determination (Glynn & Koballa, 2006) Opportunity to determine their educational activities (e.g. input into courses policies: selection of courses reading, paper topics, due dates)	**Self Determination** **TBD**

Key Component	Description	Evaluation Instrument	**Literature Review**: Activities to Enhance Mentoring	**NeuroID Activities to Enhance Mentoring**
Mentoring	• Within the context of higher education, the absence of a consistent definition of mentoring has been repeatedly recognized (e.g., Dickey 1996; Johnson 1989; Miller 2002; Rodriguez 1995). Existing definitions of mentoring offered have often been extremely broad or even lacking entirely. • For instance, Brown et al. (1999) and Murray (2001) broadly defined **mentoring** *as a one-on-one relationship between an experienced and less experienced person for the purpose of learning or developing specific competencies.* • Blackwell (1989) has defined **mentoring** in more specific terms stating that mentoring *''is a process by which persons of a superior rank, special achievements, and prestige instruct, counsel, guide and facilitate the intellectual and/or career development of persons identified as prote´ge´s'' (p. 9).* • Roberts (2000), approaching mentoring from a business perspective, has defined it *as ''a formalized process whereby a more knowledgeable and experienced person actuates a supportive role of overseeing and encouraging reflection and learning within a less experienced and knowledgeable person, so as to facilitate that person's career and personal development''* (p. 162). Source: Mentoring College Students: A critical review of the literature between 1990 and 2007 (Crisp & Cruz, 2009)	***College Student Mentoring Scale (CSMS)*** Nora and Crisp's (2007) mentoring theory has since been validated for representative samples of undergraduate students attending both a community college and a four-year institution using the **College Student Mentoring Scale** (CSMS) (Crisp, 2009). The **CSMS is a 25-item scale** that ask students to indicate the degree to which they perceived receiving various forms of support from one or more individuals (e.g., faculty, staff, family, peers) during college and measure 4 "latent construct": 1. psychological and emotional support, 2. degree and career support (*support for setting goals and choosing a career path*) 3. academic/ subject knowledge support 4. the presence of a role model Reliability: • psychological and emotional support (α = .885). • degree and career support (α=.99) • academic/ subject knowledge support(α=.89) • the presence of a role model(α=.84) Source: The Impact of Mentoring on the Success of	**General Strategies**(objectives related to Mentor) • provide professional guidance to trainees • provide leadership role model for trainees • share research relevant knowledge and experience with trainee • identify and resolve potential obstacles to trainees • guide trainee in conducting research responsibly • assist trainee to develop professional networks • enhance trainees' research and publication efforts • demonstrate/model how a trainee might develop greater initiative, increased independence, and self-reliance • MOU between NeuroID and Mentors **Mentor Activities** (Research Mentoring) • Meeting with trainee at	**Activities related to Mentoring** • Supervised Research Experience (academic year and summer off-site) • Mentoring program ○ Meetings Program Director ○ NeuroPizza Nights ○ Seminars ○ Networking (Local and International Conferences) ○ Graduate school application process

- **Gloria Crisp** defined mentoring as *" Support provided to college students that entails emotional and psychological guidance and support, help succeeding in academic coursework, assistance, examining and selecting degree career options, and the presence of a role model by which students can learn from and copy their behaviors relative to college going."*

Source: Conceptualization and Initial Validation of the College Students Mentoring Scale (CSMS, Crisp, G. 2009)

Mentoring: Theoretical Framework

Nora and Crisp (2007) developed a **theoretical framework** specific to undergraduate college students based on a review of mentoring theory from multiple disciplines including psychology, business, and PK-12 education. **The conceptual framework explains that the mentoring experiences of college students are comprised of four closely related forms of support that collectively form a holistic support system.** More specifically, the theory explains that college students perceive mentoring as several types of support:

(a) psychological and emotional support,
(b) degree and career support (*support for setting goals and choosing a career path*)
(c) academic/ subject knowledge support
(d) the presence of a role model

*__psychological and emotional support__ *involves a sense of listening, providing moral support, identifying problems and*

Community College Students. (Crisp, 2010)

http://muse.jhu.edu/login?uri=/journals/journal_of_college_student_development/v050/50.2.crisp.pdf

Additional Instruments:

Mentoring: Undegraduate Research

I. ROLE Survey

The ROLE survey is an assessment instrument for students in any field of research. The NSF ROLE supported work described here was funded in 2000 for an initial period of three years. The work produced both the ROLE survey (see Lopatto, D., 2003. The essential features of undergraduate research. *Council on Undergraduate Research Quarterly*, *24* (March), 139-142) and the qualitative research undertaken by Elaine Seymour and her colleagues at the University of Colorado (Seymour, E., Hunter, A-B., Laursen, S.L., & DeAntoni, T. 2004. Establishing the benetifs of research experiences for undergraduates in the sciences: first findings from a three-year study. *Science Education*, *88*, 493-534). More presentations and unpublished reports based on the ROLE survey and its correspondence with the qualitative research are presented below. Research with the **ROLE survey** was successful in capturing data that reflect the ***relationship of mentoring to student perceptions of learning*** in undergraduate research experiences. The ROLE

regularly scheduled times
- Encouraging trainee to develop professional skills
- Using research articles as training tools
- Discussing the process of managing research projects
- Having trainee assist mentors with research-writing
- Having mentor prepare trainee
- Ascertaining trainee's progress

Mentee Activities:
- investigate all relevant information for mentor candidates
- share responsibility with mentor to make mentoring relationship work
- ensure attendance at all regularly scheduled meetings
- document minutes of mentor meetings
- discuss and agree on goals and objectives
- respect the obligations and time commitments of mentor(s)
- respect the confidentiality of trainee/mentor discussions
- demonstrate professionalism and collegiality

providing encouragement, and establishing a supportive relationship in which there is mutual understanding and linking between the student and the mentor.

*__goal setting and career paths__, *represents the underlying idea that mentoring includes an assessment of the student's strengths, weaknesses, and abilities and assistance with setting academic as well as career goals.*

***academic subject knowledge support**, centers on advancing student's knowledge relevant to their chosen field.*

***the existence of a role model**, concentrates on the ability of the mentee to learn from the mentor's present and past actions as well as his or her achievements and failures.*

Source:

Mentoring College Students: A critical review of the literature between 1990 and 2007 (Crisp & Cruz, 2009)

Course-Embedded Mentoring for First-Year Students: Melding Academic Subject Support with Role Modeling, Psycho-Social Support, and Goal Setting (Henry, Huff, Sano-Franchini, 2011)

Mentoring: Undergraduate Researchers

- The term **mentor** seems appropriate in undergraduate research because it describes the optimal relationship between supervisor and student researcher. In every undergraduate science research program there is optimism that the relationship between the student and supervisor will assume a more significant status than just

survey has been modified to accommodate student respondents from any academic major or field of research. **By comparison, the SURE survey and CURE survey are more specialized for science education.**

Source:
http://web.grinnell.edu/science/ROLE/

II. SURE Survey

The Survey of Undergraduate Research Experiences (SURE) is a survey for undergraduates who have recently completed a summer undergraduate research experience. The survey, including introductory information and informed consent information, may be found at: http://web.grinnell.edu/sureiii/

Source:
http://www.grinnell.edu/academic/psychology/faculty/dl/surecure

- commit to learning the range of acceptable practices in the selected research profession

Source:
Responsible Conduct in Research Mentoring
http://ori.dhhs.gov/education/products/niu_mentorship/mentoring/working/working.html

Related to Mentoring Theoretical Framework (College Students Mentoring Scale, 2007)

- **Psychological and Emotional Support** involves a sense of listening
  - providing moral support,
  - identifying problems and providing encouragement,
  - establishing a supportive relationship in which there is mutual understanding and linking between the student and the mentor.

- **Goal setting and Career paths**,
  - assessment of the student's strengths, weaknesses, and abilities
  - assistance with setting

supervision. (Lopatto, 2010)

- **Much of the discourse on mentoring implies a personal relationship between one mentor and one student**. In undergraduate research the mentoring relationship is extended to all undergraduate participants, including first-year students. The mentoring relationship is also expanded to include the members of a working group of students. The mentoring of students of diverse ages and of groups of students may seem an overwhelming task.(Lopatto, 2010)

Source:

Science in Solution: The impact of Undergraduate Research on Student Learning (Lopatto, 2010)

academic as well as career goals.

- **Academic Subject Knowledge support**
  - Employing tutoring skills and focusing on subject learning

- **Existence of Role Model**
  - Mentor sharing life experiences and feelings to personalize and enrich the relationship (learn from mentor current's and past actions)

Source: Conceptualization and Initial Validation of the College Students Mentoring Scale (CSMS, Crisp, G. 2009)

Key Component	Description	Evaluation Instrument	Literature Review: Activities to Enhance Civic Responsability	NeuroID Activities to Enhance Civic Responsibility
Civic Responsability	• **Civic responsibility** means *active participation in the public life of a community in an informed, committed, and constructive manner, with a focus on the common good.* Source: A practical guide for Integrating Civic Responsibility into the curriculum. Paginas 16-17 • **Five dimensions of civic responsibility** are repeatedly discussed in higher education literature as key areas of this student citizenship development: 1. knowledge and support of democratic values, systems, and processes; 2. desire to act beneficially in community and for its members; 3. use of knowledge and skills for societal benefit; 4. appreciation for and interest in those unlike self; and 5. personal accountability (Association of American Colleges & Universities, 2002; Astin and Sax, 1998; Bowen, 1997; Boyte and Hollander, 1999; Colby, Ehrlich, Beaumont, and Stephens, 2003; Ehrlich and Hollander, 1999; Guarasci and Cornwell, 1997; Patrick, 1991)." **Source:** A new context for understanding civic Responsibility:	**Civic Responsibility Survey** **Pre and post** surveys measure student perceptions of civic responsibility, as expressed in statements such as "I like to help people, even if it's hard work" and "I feel like I can make a difference in my community." A Spanish version is available. According to CART, the survey has been piloted extensively and revised to keep only the most reliable items. There are three different levels for different age groups. Level 1 was designed for elementary grade students, Level 2 for middle school students, and **Level 3 for high school students.** **Sub Dimensions:** The survey may be **used in its entirety as a measure of civic responsibility**. Alternately, there are three clusters of questions. These include • **Connection to Community,** • **Civic Awareness, and** • **Civic Efficacy** Reliability (.73 to .93) **Source:** • Psychometrics and Analisis of the Scale: http://cyfernetsearch.org/search_evaluation_i	**General:** 1. knowledge and support of democratic values, systems, and processes; 2. desire to act beneficially in community and for its members; 3. use of knowledge and skills for societal benefit; 4. appreciation for and interest in those unlike self; and 5. personal accountability **A practical guide for Integrating Civic Responsibility into the Curriculum** Focuses on the practice of civic responsibility. Here we explore strategies that classroom teachers can use to integrate civic responsibility concepts and activities into their courses so that students come away with a greater understanding of what is expected of them as citizens in our society. These strategies, all of which can be used with service learning, range from one-time experiences or	• Community Service • Transmitting Knowledge to the Community • Neuroethics

	relating culture to Action at a research university, Thornton C. & Jaeger Research in Higher Education, Vol. 48, No. 8, December 2007. **Pagina 993-995** **Five dimensions of civic responsibility** 1. **knowledge and support of democratic values, systems, and processes** - this dimension includes aspects such as voting, understanding the laws that govern our country, and standing up for fundamental rights of all people. 2. **desire to act beneficially in one's community and for its members**. community can be broadly defined, encompassing a residence hall, campus, city, state, nation, or planet. This dimension of civic responsibility is often demonstrated through community service. 3. **responsible citizenship** is appreciation for and interest in others unlike oneself. To address this dimension, we often create venues that bring together students of diverse backgrounds, experiences, and beliefs. 4. **use of knowledge and skills for societal benefit**-which specifically addresses the ability to apply academic knowledge to societal issues and problems in need of solutions. This dimension differs from community service, which does not necessarily rely on an individual's disciplinary knowledge or talents. 5. **personal accountability**-focuses on how individuals consider the consequences of their actions on the lives of others and is broad in scope—from academic integrity to alcohol use, for example.	nstruments https://cyfernetsearch.org/additional_eval_civic • Scale Items and subscale psicometric: http://oregonmentors.org/library/evaluationtools/view/13/ http://cart.rmcdenver.com/instruments/civic_responsibility.pdf **Additional Instruments:** Integrating Civic Responsibility Guide • Civic Responsibility Assessment Rubric (for NeuroID staff) • Community Partner Evaluation(for the Non-Profit Orgnz) Source: A practical guide for Integrating Civic Responsibility into the Curriculum http://educationprogram.duke.edu/uploads/assets/IntegratingCivicResponsibility.pdf Pag.66-67	activities to multi-class or semester-long involvement **(Chapter 3)** Activities: (the guide includes a detailed description with objectives, requirement, duration, direction, reflection questions) 1. Pre-Service Assignment 2. Defining Service 3. Self-Inventory Matrix 4. Class Discusion on Civic Responsibility 5. Picture your community 6. Right vs Responsibilities 7. Dialogue vs Debate 8. Report on a Model Citizen 9. Higher Education's Role in Promoting Citizen 10. Panel of Local Engaged Citizens 11. Civic Engagement thought History 12. One-time Service Learning Activity 13. Forum on Civic Responsibility 14. Town Hall Meeting 15.Project Citizen Source: A practical guide for Integrating Civic Responsibility into the Curriculum	

	Source: Strategic Approaches to Civic Responsibility The Essential Role of Cocurricular Events (Courtney H. Thornton, Michael T. Tarrant, and Leah S. Williams, 2009)		http://educationprogram.duke.edu/uploads/assets/IntegratingCivicResponsibility.pdf	