IOWA STATE UNIVERSITY
Community College Leadership Program
Office of Community College Research and Policy

Transfer students in STEM majors:
Socialization factors that influence academic and social adjustment

National Institute for the Study of Transfer Students
Creating Pathways for STEM Transfer Student Success
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Dimitra L. Jackson and Frankie Santos Laanan

Introduction

An abundance of literature exists regarding the underrepresentation of women in STEM fields. However, this underrepresentation of women in STEM continues to be a concern even with the increase of women obtaining baccalaureate degrees. Although women currently account for at least half of the baccalaureate degrees awarded in most industrialized countries, they continue to be significantly underrepresented in science and technology (NSF, 1994; Stolte-Heiskanen et al., 1991). While community colleges are being recognized as pathways for preparing individuals to pursue baccalaureate degrees in STEM areas at 4-year universities and colleges (Starobin & Laanan, 2005), little research has been conducted that focuses on the socialization factors of women at community colleges and how this socialization influences academic and social transfer adjustment in STEM areas (A. K. Bragg, 1976).

Purpose

The purposes of this study were to examine the socialization factors of community college transfer students in Science, Technology, Engineering and Mathematics (STEM), and to examine the socialization factors that impact the academic and social adjustment of community college transfer students in STEM majors.

Research Questions

- What are the background characteristics of ISU community college transfer students pursuing bachelor degrees in STEM majors at ISU by gender?
- Are there statistically significant differences in the community college and university experiences by gender?
- What background characteristics and community college and ISU experiences predict **social** and **academic** adjustment for community college transfer students in STEM majors at ISU?

Literature Review
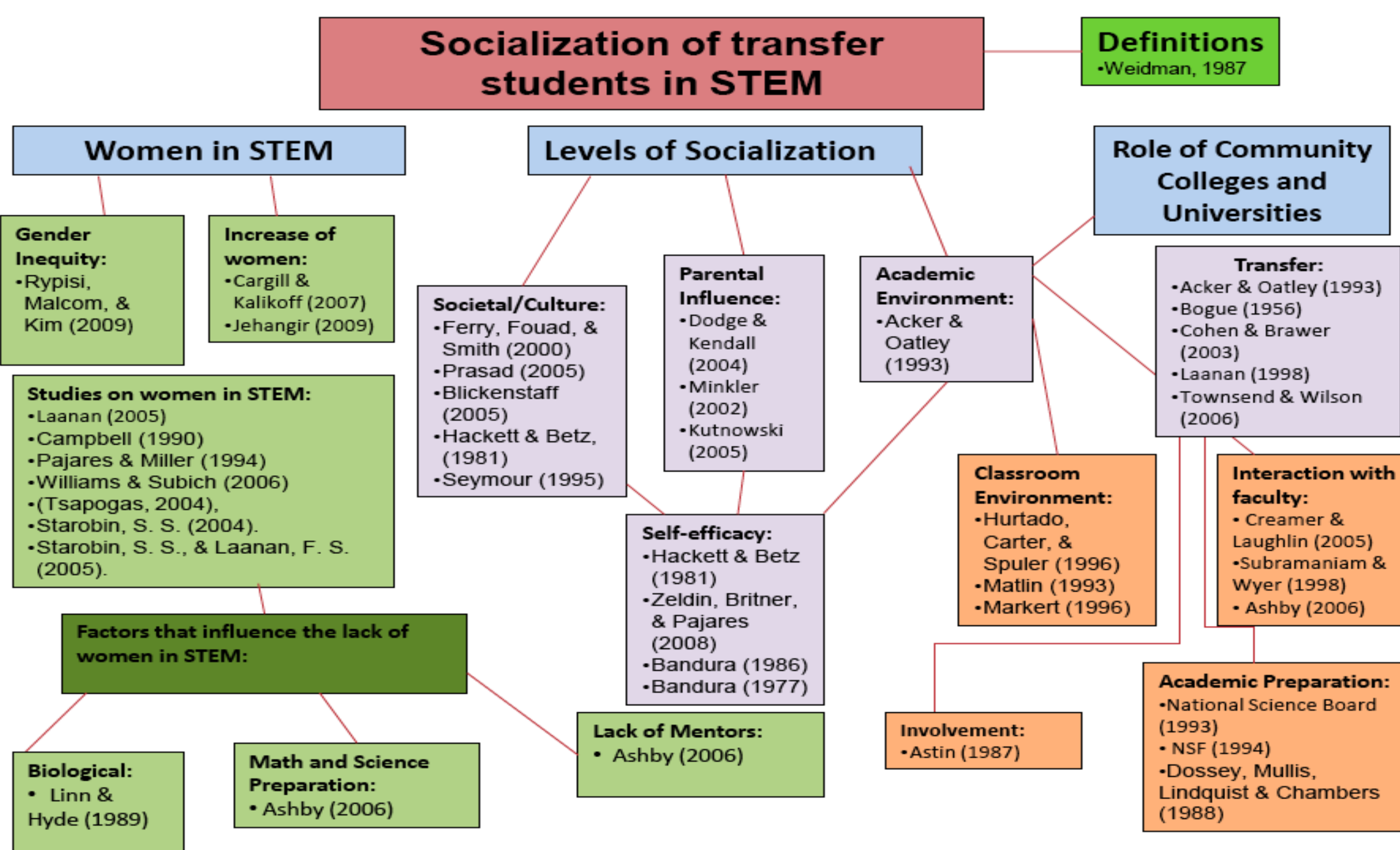
Methodology and Data Analysis

Quantitative research design
- Survey research design, more specifically an *ex post facto* research design
- Iowa State University-Transfer Student Survey (ISU-TSS)

Data Analysis
- Statistical Package for Social Sciences (SPSS)
- Descriptive Statistics (Frequencies and percentages)
- Exploratory Factor Analysis (EFA)
- Inferential Independent-samples T-test
- Hierarchical Multiple Regression

Theoretical Framework

- **Astin's (1984) Theory of Student Involvement**
  The amount of physical and psychological energy that the student devotes to the academic experience.

- **Weidman's (1987) Socialization Theory**
  - As "the process by which persons acquire the knowledge, skills, and dispositions that make them more or less effective members of their society," and is "considered to be a lifelong process" (Brim, 1996, p. 3, as cited in Weidman, 1987, p. 11).

- Levels of socialization
  - ➤ Background (gender, parental influences, non-collegiate influences)
  - ➤ Academic environments (Community college and university - mentors and advisors, faculty, classroom environments, clubs and organizations).

Results

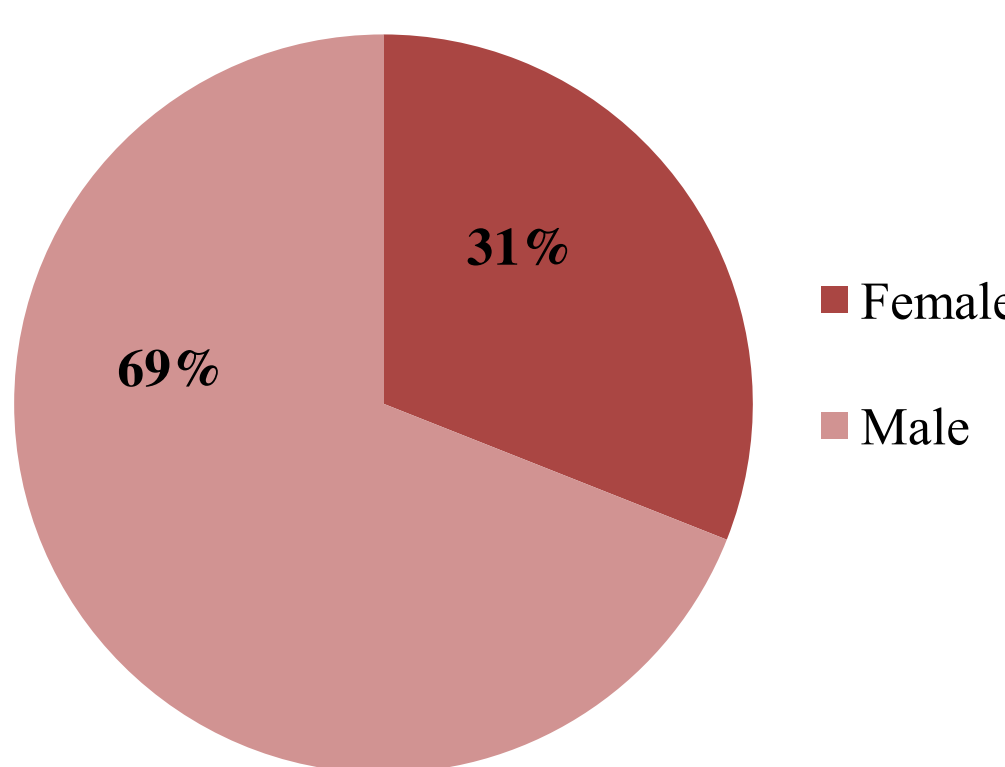### Background Characteristics

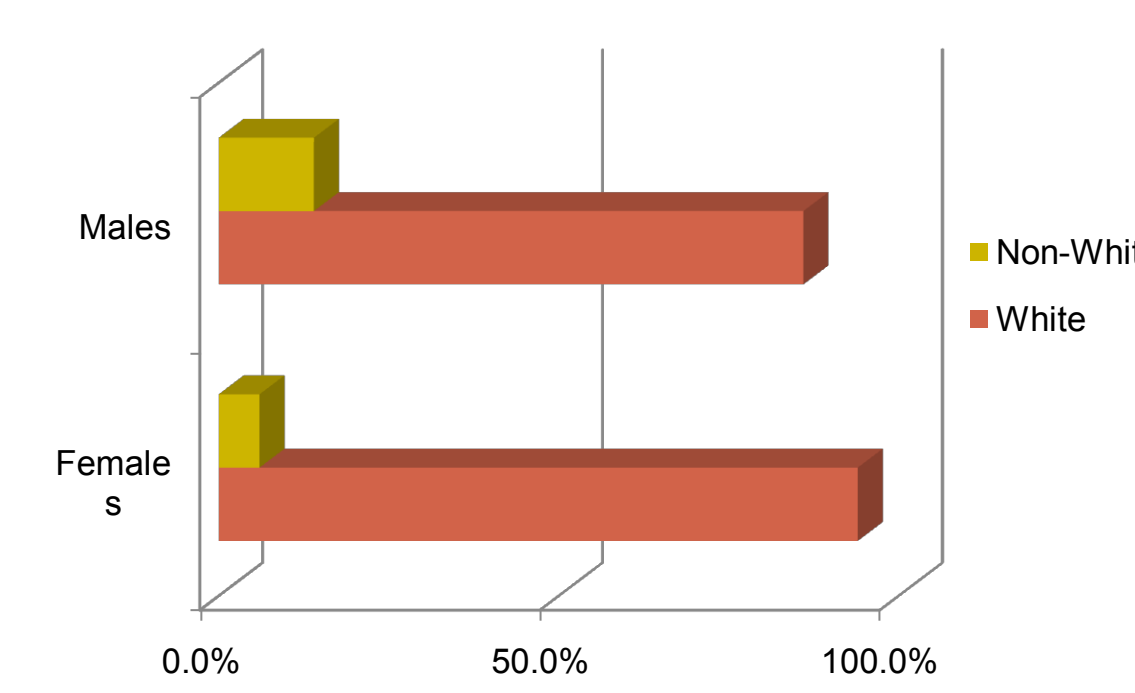**Figure 1. Gender**

Figure 2. Ethnicity
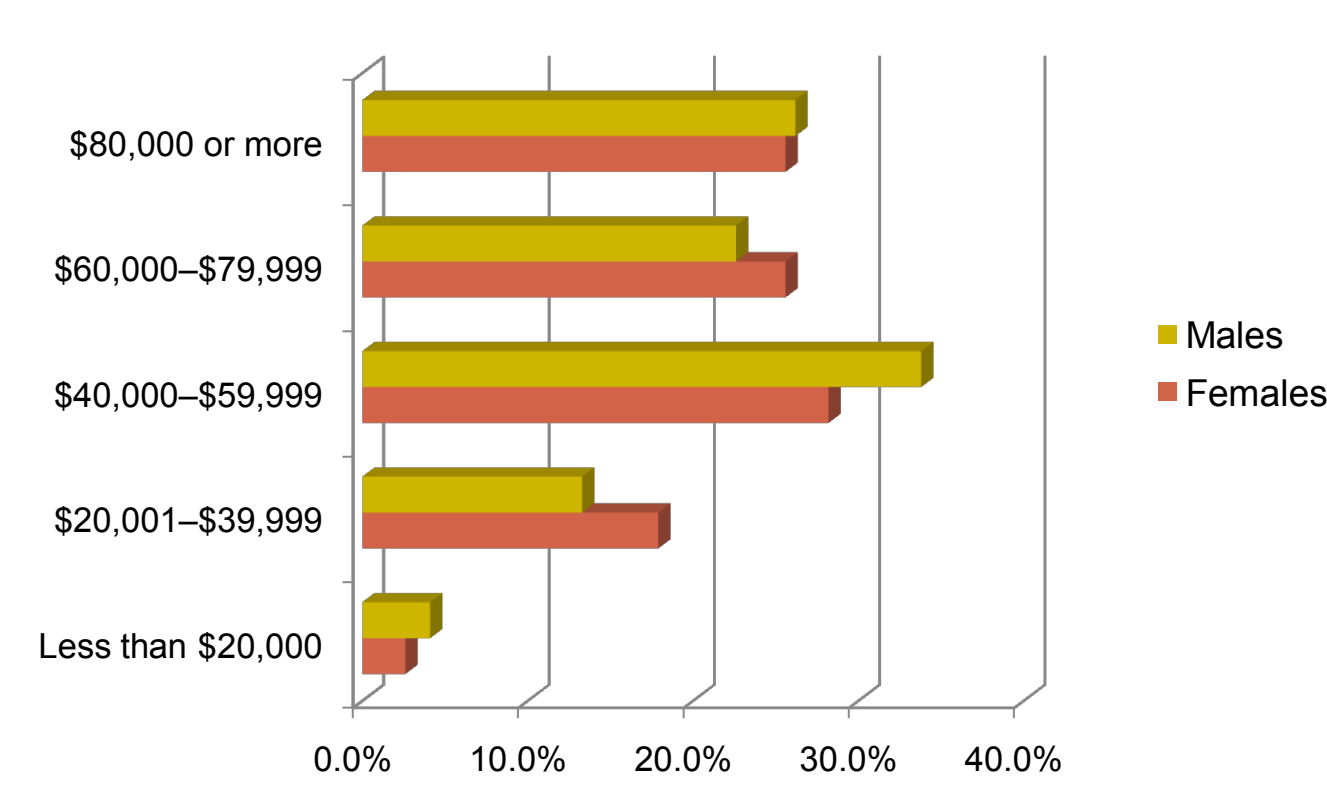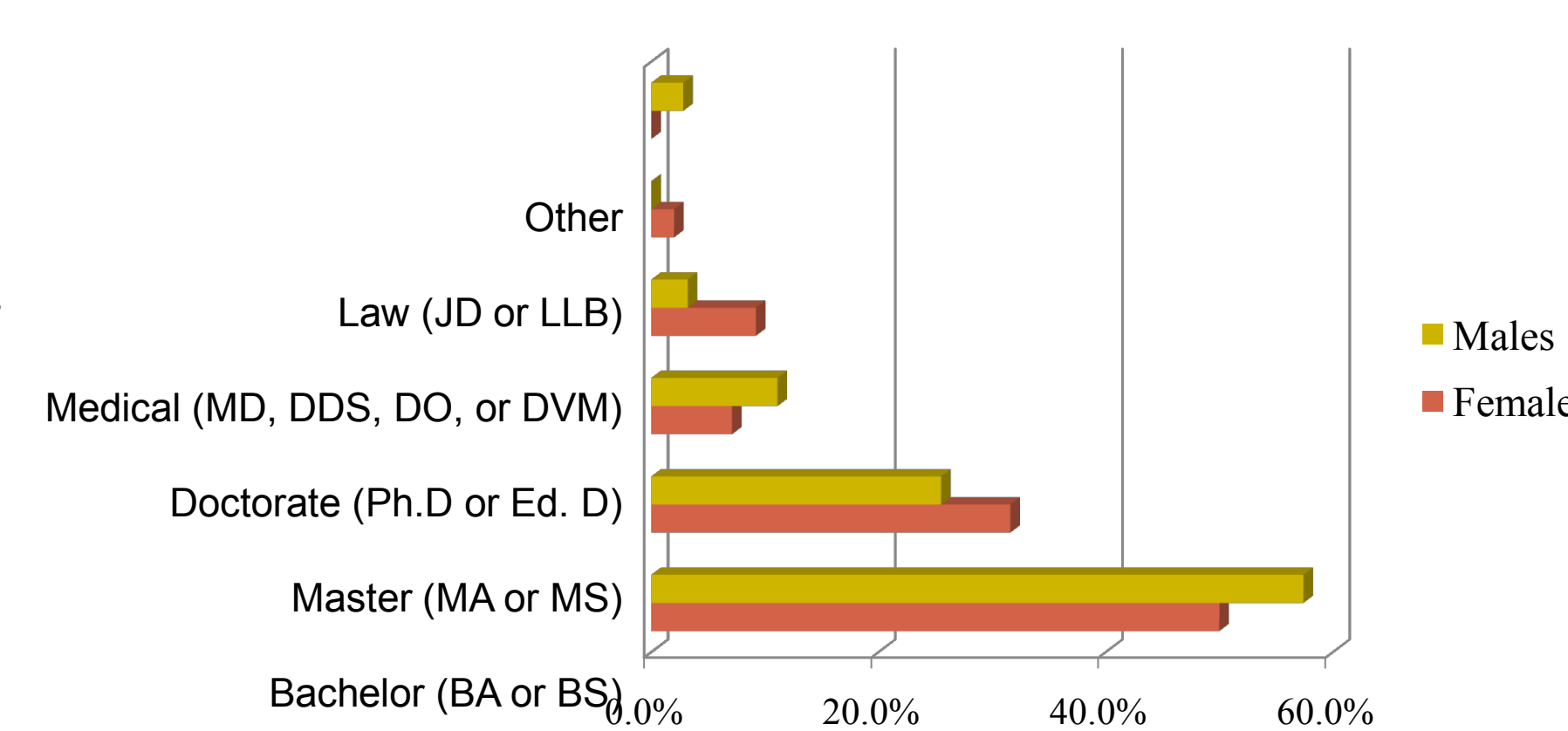

Figure 3. Parental income level

Figure 4. Highest academic degree intended to obtain

Inferential Independent-samples T-test

Table 1. Means, Standard Deviations, and T test Results for Community College Experiences

	Female		Male					Confidence interval	
Community college experiences	M	SD	M	SD	t	df	p	Lower	Upper
Transfer semester credit hours	63.46	27.00	57.99	18.49	2.10	318	.03*	.04	10.58
Transfer GPA	3.31	0.48	3.16	0.51	2.56	318	.01*	.04	.28
Academic advising	3.03	0.93	3.03	0.90	0.07	286	.94	-.22	.24
Experience with faculty	3.08	0.75	2.95	0.80	1.35	284	.18	-.063	.34
Course learning	3.50	0.54	3.30	0.64	2.45	280	.01*	.039	.36
General courses	3.20	0.67	3.15	0.69	0.56	290	.58	-.122	.22
Transfer process	3.23	0.70	3.19	0.68	0.56	293	.58	-.12	-.13
Hours spent studying and preparing for class	1.87	0.92	1.86	1.12	0.04	294	.97	-.26	.27

Table 2. Means, Standard Deviations, and T Test Results for University Experiences

	Female		Male					Confidence interval	
University experiences	M	SD	M	SD	t	df	p	Lower	Upper
ISU GPA (as of fall 2009)	3.02	0.74	2.83	0.90	1.78	181.63	.077	-.02	.40
Experience with faculty	2.74	0.81	2.63	0.80	1.00	270	.32	-.10	.32
General perception of course learning	3.45	0.61	3.40	0.66	.61	269	.54	-.12	.22
General perception of transfer student (negative)	2.80	0.72	2.87	0.67	-.75	268	.46	-.25	.11
Influential reasons for attending:									
Reputation	3.01	0.79	3.05	0.81	-.37	264	.71	-.24	.17
Financial	3.21	0.82	2.82	0.95	3.33	279	.00*	.16	.63
Community college advisor, friend, and ISU advisor	2.05	0.83	2.04	0.81	.06	281	.95	-.20	.21
Overall satisfaction	3.52	0.67	3.59	0.56	-.87	130.25	.39	-.24	.09
General perception of faculty	3.25	0.73	3.05	0.73	1.96	272	.05*	-.00	.38

Results Cont.

Table 3. Predictors of Community College Transfer Student Academic Adjustment to ISU

	Standardized regression coefficients		
Variable blocks	Model 1	Model 2	Model 3
Background variables (block 1)			
Father's highest level of education	.052	.102	.086
Gender	-.157*	-.175*	-.183*
Highest degree intended to obtain	-.118	-.086	-.075
Community college experiences (block 2)			
Community college GPA		.130	.079
Transfer semester hours		-.188*	-.164*
Associate's degree obtained		.084	.096
Hours spent studying/preparing for class		.119	.093
Academic advising		.040	.076
Experience with faculty		.365**	.228*
Course learning		-.160	-.080
General courses		-.096	-.060
Transfer process		-.176*	-.149*
University experiences (block 3)			
Influential reasons for attending–financial			-.109
General perception of faculty			-.109*
Negative general perception of transfer students			.336**
ISU GPA (As of F09)			.061
R	.190ᵃ	.442ᵇ	.595ᶜ
R²	.036	.196	.354
ΔR²	.021	.144	.297

Table 4. Predictors of Community College Transfer Student Social Adjustment to ISU

	Standardized regression coefficients		
Variable blocks	Model 1	Model 2	Model 3
Background variables (block 1)			
Father's highest educational level	.016	.029	.029
Parents' household income level	-.147*	-.145*	-.139*
Gender	.019	.053	.083
Highest academic degree intended to obtain at any college	.033	.071	.064
Community college experiences (block 2)			
Hours spent studying and preparing for classes		-.027	-.032
Academic advising		.137*	.163**
Course learning		-.113	-.157*
Transfer process		.319**	.257**
University experiences (block 3)			
Influential reasons for attending–financial			.214**
General perception of course learning			.143
General perception of faculty			-.027
Experience with faculty			-.092
Overall satisfaction with ISU			-.044
General negative perception of transfer students			-.171*
R	.150ᵃ	.388ᵇ	.481ᶜ
R²	.023	.151	.231
ΔR²	.003	.115	.173

Conclusion

Although female students are entering post-secondary education environments with previous science and mathematical knowledge and experiences and are academically prepared in these areas, the role of faculty and academic advisors are extremely important in the adjustment process. Additionally, the continued encouragement of female students to participate in classroom environments and become involved in campus organizations is essential to their overall positive adjustment and socialization process. Encouraging students to interact with faculty at the university and transfer as many credit hours as possible is also important during the adjustment process. In addition, assisting students in researching prospective institutions during the transfer process and understanding their value to the university is vital in the academic and social adjustment process.

Implications for Future Research

- Conduct longitudinal studies that follows students from early grade school throughout their postsecondary education/pre-collegiate hobbies.

- Seek qualitative information that is needed at every stage of the student's socialization to understand how students are interpreting their socialization. Understanding this interpretation early in the socialization process will highlight success factors as well as adjustments that may need to be made.

- It is also beneficial to conduct studies on past community college transfer students who are currently in a STEM career to assess their early socialization processes.

- Conduct qualitative research on STEM and Non-STEM students to understand the socialization similarities and differences among these two groups.

- Explore faculty perceptions of transfer students.

- Explore the socialization experiences of females of color in STEM majors.

Transfer students in STEM majors: Socialization factors that influence academic and social adjustment

Dimitra L. Jackson, Ph.D., Postdoctoral Research Associate
Educational Leadership and Policy Studies
Iowa State University

Frankie Santos Laanan, Ph.D., Associate Professor
Educational Leadership and Policy Studies
Iowa State University

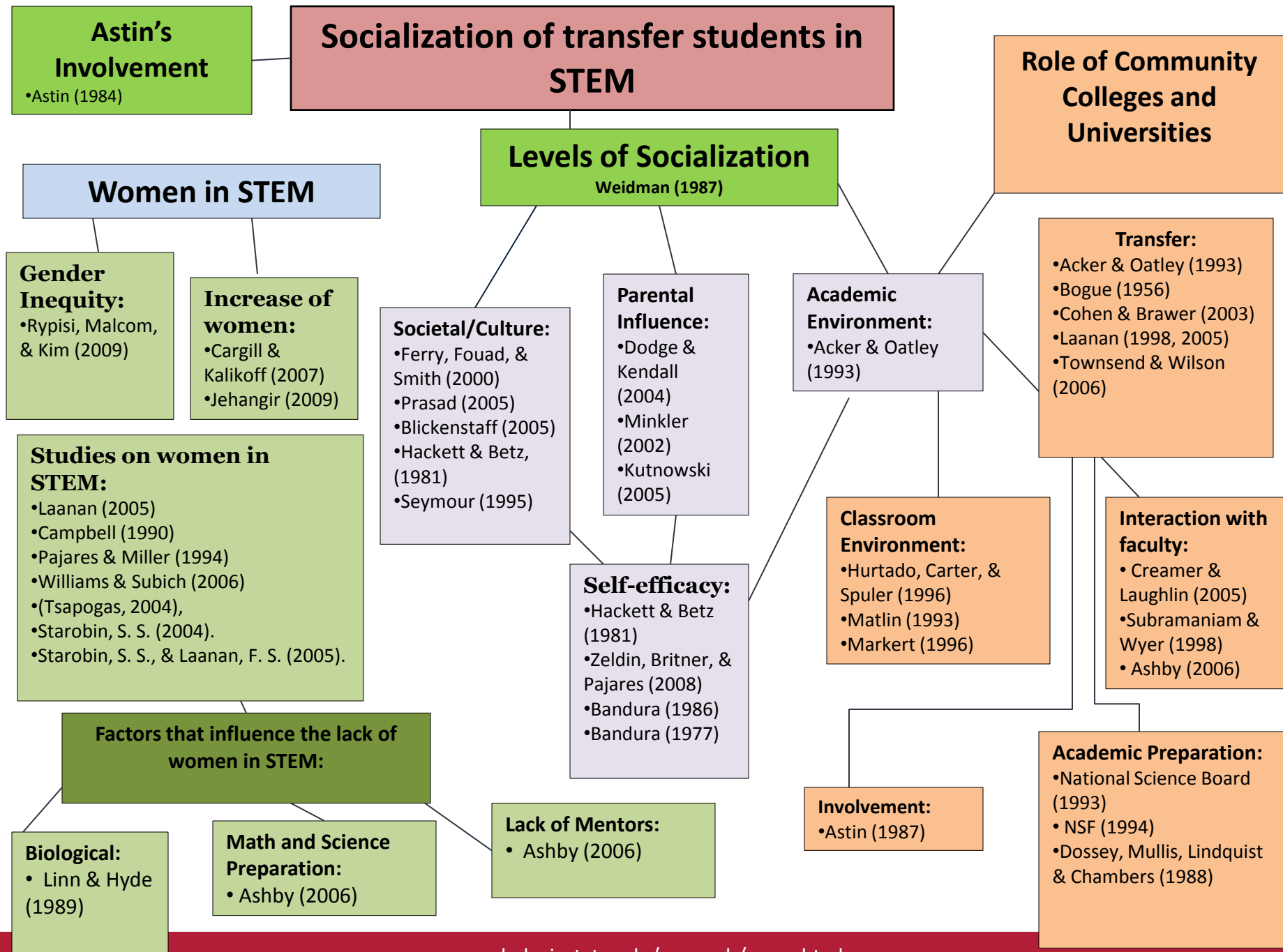OFFICE OF COMMUNITY COLLEGE RESEARCH & POLICY

Background

- The United States has been the world leader in the global science, technology, engineering, and mathematics (STEM) enterprise and has had the reputation of having the most educated workforce in the world (National Governors Association, 2007).

- In order for the United States to continue to recruit domestically for individuals to meet the needs of the nation for scientists and engineers, the nation needs 400,000 new graduates in STEM fields by 2015 (Jones).

- Increasing the number of students, females in particular
  – Will provide a "diversity of perspectives in the search for knowledge and solutions to human problems" and will aid in "the ability to see questions and answers from many perspectives [which] will help make scientific explanations more robust and complete" (Blickenstaff, 2005, p. 383).

- Community colleges have been recognized as one of the leading institutions assisting in increasing the number of individuals pursuing bachelor degrees in STEM areas (Berger & Malaney, 2003).

Problem

- Lack of women pursuing advanced degrees and careers in STEM fields;

- Little research currently exists on the socialization of community college transfers, more specifically women, in STEM in the community college and university setting;

- There is a dearth of literature on the impact on socialization on the academic and social adjustment of transfer students.

Astin's Involvement
•Astin (1984)

Socialization of transfer students in STEM

Role of Community Colleges and Universities

Levels of Socialization
Weidman (1987)

Women in STEM

Gender Inequity:
•Rypisi, Malcom, & Kim (2009)

Increase of women:
•Cargill & Kalikoff (2007)
•Jehangir (2009)

Societal/Culture:
•Ferry, Fouad, & Smith (2000)
•Prasad (2005)
•Blickenstaff (2005)
•Hackett & Betz, (1981)
•Seymour (1995)

Parental Influence:
•Dodge & Kendall (2004)
•Minkler (2002)
•Kutnowski (2005)

Academic Environment:
•Acker & Oatley (1993)

Transfer:
•Acker & Oatley (1993)
•Bogue (1956)
•Cohen & Brawer (2003)
•Laanan (1998, 2005)
•Townsend & Wilson (2006)

Studies on women in STEM:
•Laanan (2005)
•Campbell (1990)
•Pajares & Miller (1994)
•Williams & Subich (2006)
•(Tsapogas, 2004),
•Starobin, S. S. (2004).
•Starobin, S. S., & Laanan, F. S. (2005).

Self-efficacy:
•Hackett & Betz (1981)
•Zeldin, Britner, & Pajares (2008)
•Bandura (1986)
•Bandura (1977)

Classroom Environment:
•Hurtado, Carter, & Spuler (1996)
•Matlin (1993)
•Markert (1996)

Interaction with faculty:
• Creamer & Laughlin (2005)
•Subramaniam & Wyer (1998)
• Ashby (2006)

Factors that influence the lack of women in STEM:

Involvement:
•Astin (1987)

Academic Preparation:
•National Science Board (1993)
• NSF (1994)
•Dossey, Mullis, Lindquist & Chambers (1988)

Biological:
• Linn & Hyde (1989)

Math and Science Preparation:
• Ashby (2006)

Lack of Mentors:
• Ashby (2006)

Purpose

- The purpose of this study was to:

  – Understand the background, Iowa community college and ISU socialization factors of transfer students in STEM;

  – Examine the socialization factors that impact the academic and social adjustment of transfer students; and

  – Understand how female transfer students describe their overall socialization experiences in STEM majors.

Research Questions

Quantitative

- What are the background characteristics of Iowa community college transfer students pursuing bachelor degrees in STEM majors at ISU by gender?

- What are the community college and university experiences of ISU community college transfer students pursuing bachelor degrees in STEM majors at ISU by gender?

- Are there statistically significant differences in the community college and university experiences by gender?

- What background characteristics and community college and ISU experiences predict social and academic adjustment for community college transfer students in STEM majors at ISU?

Qualitative

- How do female community college transfer students describe their overall socialization experiences in STEM majors?

Theoretical Frameworks

- Astin's (1984) Theory of Student Involvement
  The amount of physical and psychological energy that the student devotes to the academic experience.

- Weidman's (1987) Socialization Theory
  – As "the process by which persons acquire the knowledge, skills, and dispositions that make them more or less effective members of their society," and is "considered to be a lifelong process" (Brim, 1996, p. 3, as cited in Weidman, 1987, p. 11).

  – Levels of socialization
    - Background
      – Gender, parental influences, non collegiate influences
    - Academic environments
      – Community college and university
        » Mentors and advisors, faculty, classroom environments, clubs and organizations.

Significance

- The increase in domestic individuals, more specifically female students in STEM majors is essential to the economy.

- Community colleges play a vital role in providing pathways for transfer students who desire to transfer to 4-year institutions in pursuit of bachelor degrees.

- It is essential that the environment in which women engage during their undergraduate academic path be examined in order to fully understand the environmental factors in which women are being fostered and exposed regarding STEM areas.

- This study seeks to add to current literature regarding the socialization undergraduate women in STEM; more specifically transfer students.

Methodology

- **Quantitative research design**
  - Survey research design, more specifically an *ex post facto* research design
    - An *ex post facto* study "moves from outcomes to predictors, not from predictors to outcomes" (Light, Singer, & Willett, 1990, p. 135). In other words, the design of such a study causes the researcher to "reason backwards" (Light et al., p. 135) by focusing on the outcome group, which in this case are students who are in STEM majors.
  - Iowa State University-Transfer Student Survey (ISU-TSS)

- **Qualitative component**
  - Open-ended survey questions
  - 1 hour, semi-structured interviews
    - 5 female transfer students
  - Phenomenological interviewing as "a specific type of in-depth interviewing grounded in the theoretical tradition of phenomenology
  - Interview protocol
  - Audio recorded and transcribed

Conceptual Framework
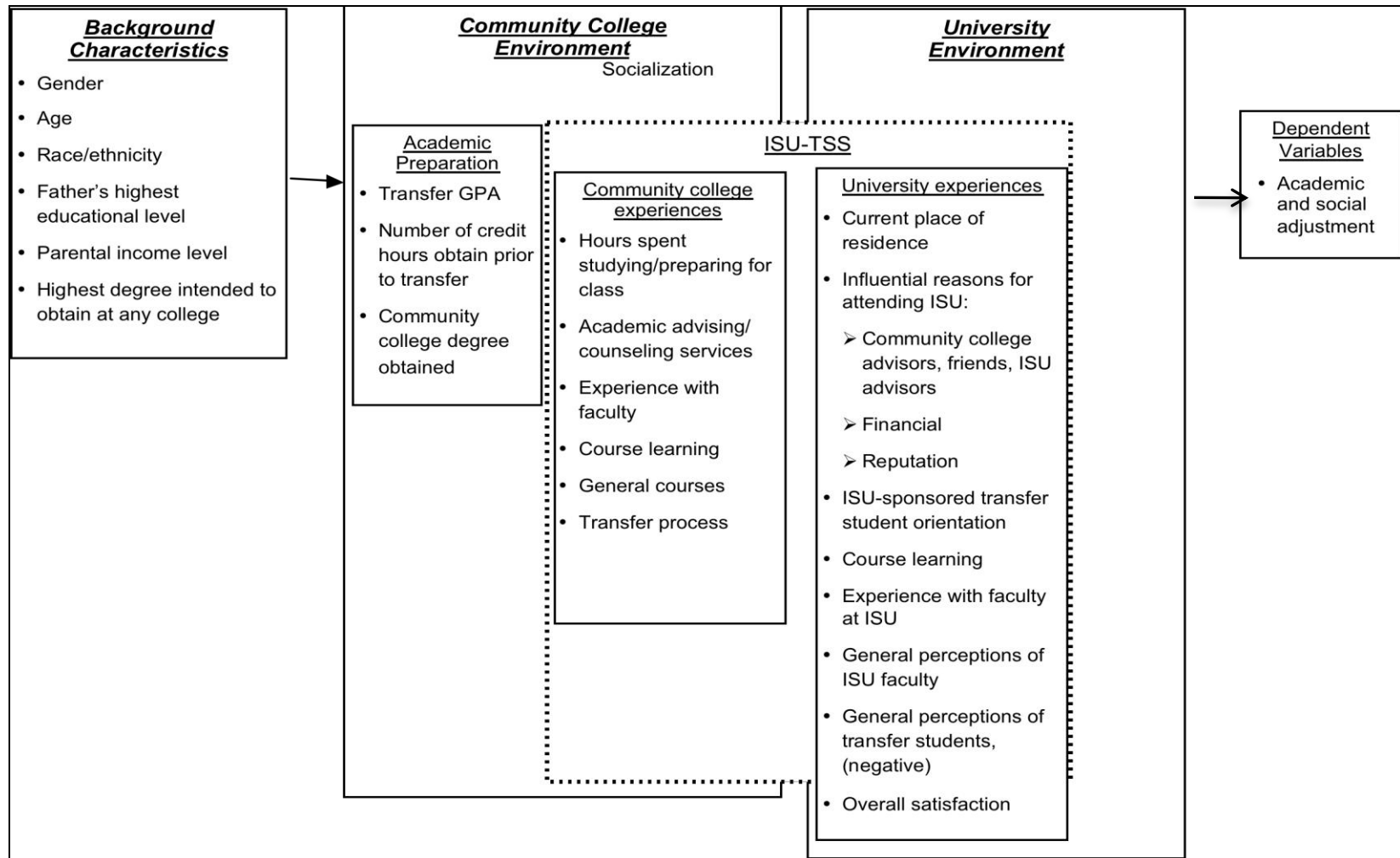
Figure 2. **Hypothetical conceptual framework of undergraduate socialization for community college transfer students**

Survey Instrument

- ISU–TSS
  - Administered through Qualtrics
  - 132-item survey was revised from the L-TSQ survey (Laanan, 1998)
  - Survey questions and open-ended responses

  - **Background information section**
    - Current place of residence, gender, age, ethnicity, highest academic degree intended to obtain, as well as parents' highest level of education and parents' total household income last year.

  - **Community college section**
    - Number of hours per week studying and working at a job and what degree, if any, was received, perception of general courses at the community college, academic advising/counseling services at the community college, the transfer process, course learning, learning skills, and experience with faculty.

  - **University section**
    - Number of hours per week working at a job, student's reasons for attending ISU, what reasons influenced them to attend ISU, as well as information regarding course learning, experience with faculty, general perceptions of ISU, the adjustment process, and college satisfaction.

Data Analysis: Quantitative

- **Statistical Package for Social Sciences (SPSS)**

- **Descriptive Statistics**
  - Frequencies and percentages were reported to show the background characteristics of the sample.
  - The frequencies, percentages, and percent differences were reported to show the community college and university experiences of the students.

- **Exploratory Factor Analysis (EFA)**
  - Exploratory factor analysis was used as a data reduction technique. Constructs were developed among factors with high correlation.

- **Inferential Independent-samples T-test**
  - Independent sample t tests were conducted to compare the mean scores of two groups' (gender) on their community college and university experiences.

- **Hierarchical Multiple Regression**
  - Multiple regression models were used to estimate the coefficient for the various independent variables used to best predict the value of the dependent variables (social adjustment and academic adjustment).

Data Analysis: Qualitative

- ## Qualitative component
  - 1 hour, semi-structured interviews
  - **The data were analyzed in two phases:**
    - **First**, narrative approach (Clandinin & Connell, 2000) was used to tell each participant's individual story and to uncover subtle nuances in order to gain a deeper understanding of how female transfer students described their overall socialization experiences.

    - **Second**, themes were developed across all five individual interviews (Creswell 2009) analysis in qualitative research (open-ended questions and interviews).
      - Reading through all the data to "get a sense of the whole," (Creswell, 2009, p. 186).
      - Coding is a processing of organizing into "chunks or segments of text before bringing meaning to information" (Rossman & Rallis, 1998). The "codes will be allowed to emerge during data analysis" (Creswell, 2009, p.187).
      - Descriptions were generated from the coding process
      - Data were interpreted

Context

- **Iowa State University**

  – Land-grant institution that is internationally recognized for research programs.

  – Research I institution in the Midwest.

  – An international, prestigious university that enrolls nearly 28,000 students.

  – ISU is classified as Very High Research Institution (Carnegie Classification).

  – More Iowa high school graduates and transfer students enroll at ISU than at any other higher education institution in Iowa.

Context

Table 1.

Fall Semester New Transfer Students by Type of Transfer College at Iowa State University

Transfer college type	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Iowa Area Community Colleges	902	922	930	903	883	848	835	869	948	945
Iowa 4-year public										
Univ. of Iowa	68	51	70	47	38	54	60	57	41	49
Univ. of Northern Iowa	63	68	42	42	49	43	30	31	39	43
Subtotal	131	119	89	89	87	97	90	88	80	92
Iowa 4-year private	145	158	150	110	108	109	106	130	114	115
Iowa 2-year private	23	23	13	14	6	9	5	6	5	2
Non-Iowa (U.S.)	422	422	409	355	321	291	296	303	299	313
Foreign	101	109	104	66	39	75	56	65	81	70
Total	1,724	1,753	1,724	1,537	1,444	1,429	1,388	1,461	1,527	1,537

Note. Source: Iowa State University, 2009; beginning in 2002, transfer admissions include

undergraduate only; prior to 2002, undergraduate and first professional were included.

Sample

- Students who transferred to ISU from Fall 2006 to Spring 2009 were identified by the Registrar's office at ISU.

- E-mail invitations were sent to 2,811 transfer students during Spring 2009, Fall 2009, and Spring 2010.

- 858 students responded, which yielded a response rate of 31%.

- **Delimitation**
  - **Quantitative**
    - Iowa community college students who transferred to ISU during Fall 2006- Spring 2009.
      - pursuing bachelor's degrees in STEM majors at Iowa State University.
    - N=320; 37% of the total responses of 858
      - 99 females
      - 221 males

  - **Qualitative**
    - Female survey participants who expressed an interest via the survey
    - Five female interview participants

Background Characteristics

Age
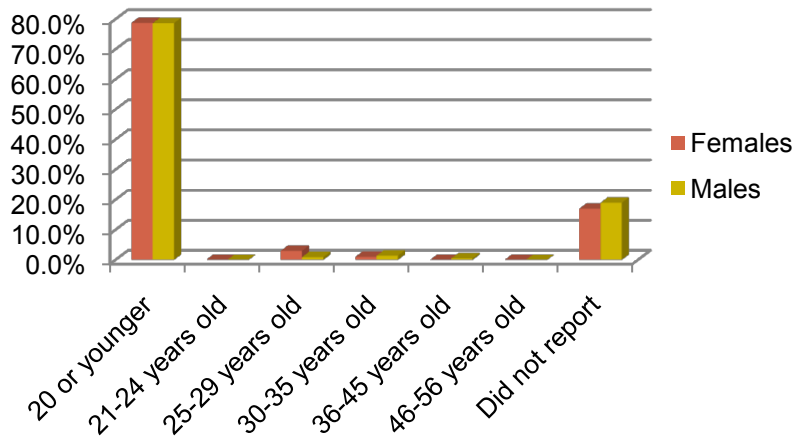
Ethnicity
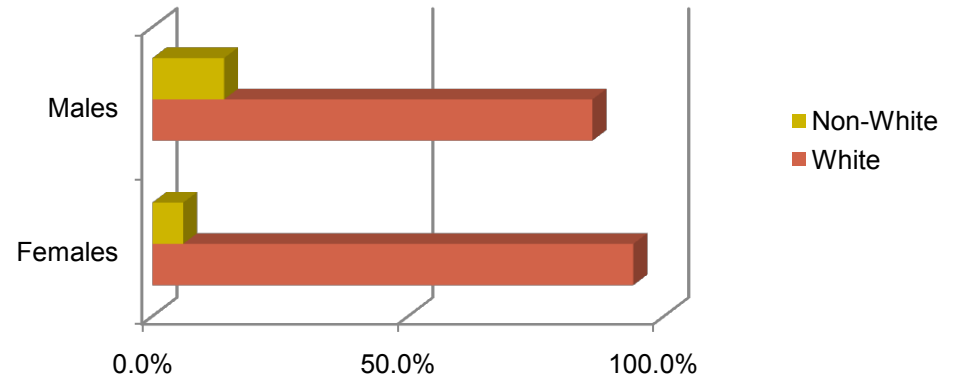
Mother's highest education level

Highest academic degree intended to obtain
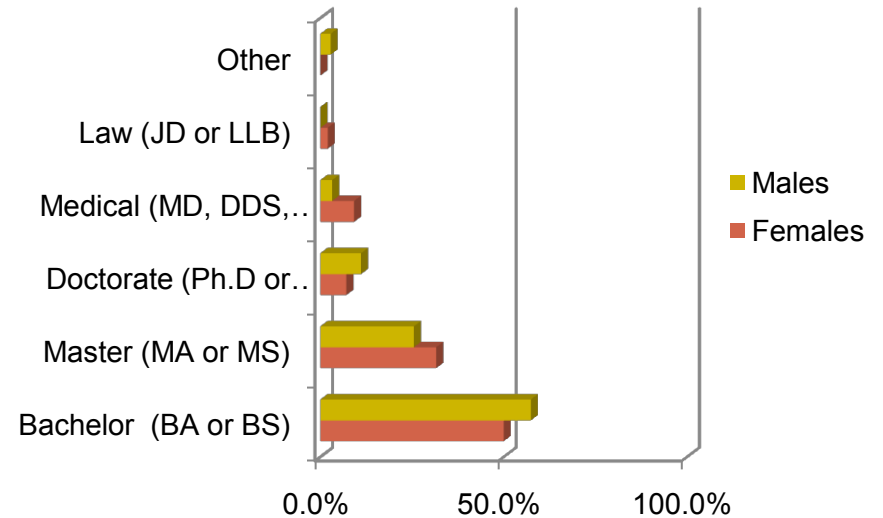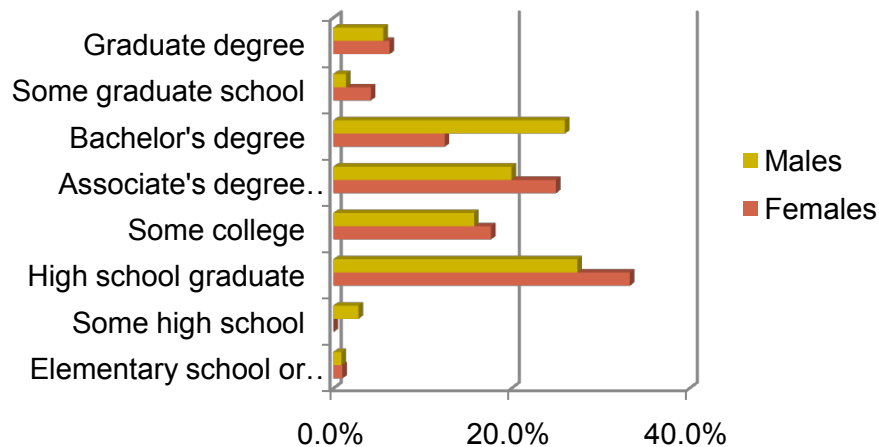
Iowa Community Colleges

Associate's degree obtained
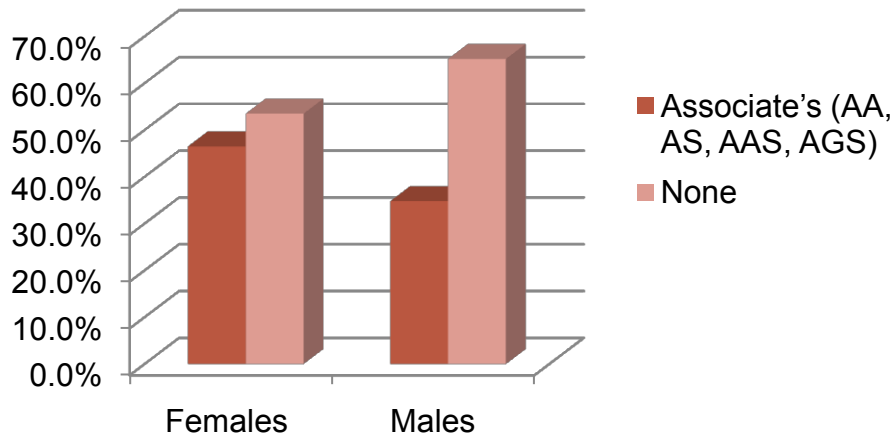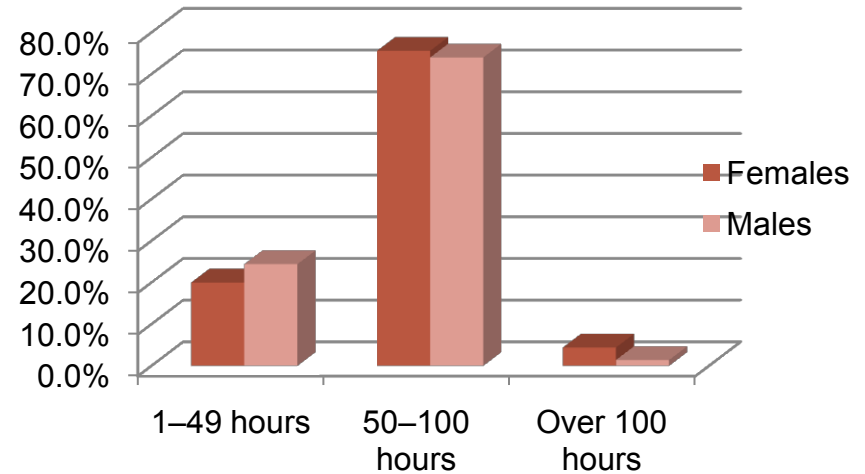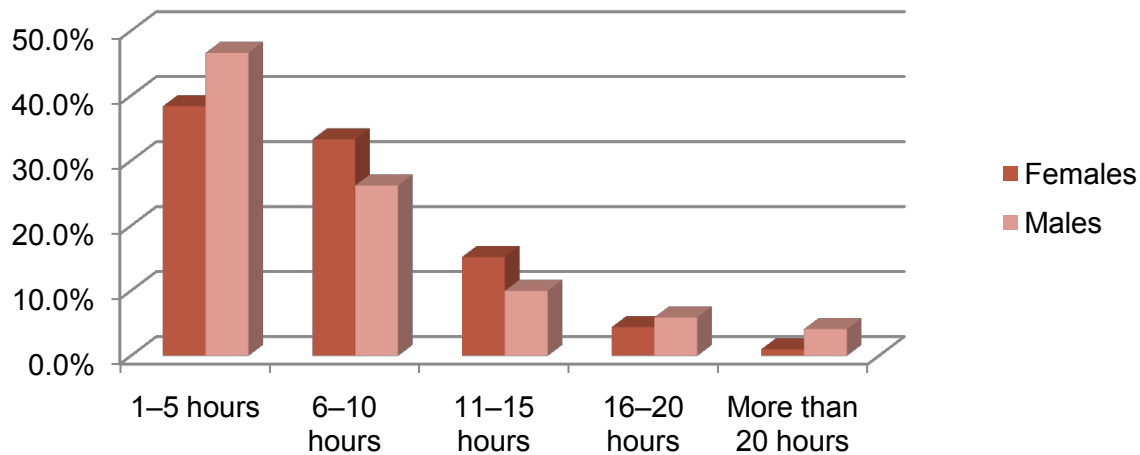
Legend:
- Associate's (AA, AS, AAS, AGS)
- None

Transfer hours

Legend:
- Females
- Males

Hours spent studying and preparing for class

Legend:
- Females
- Males

ISU
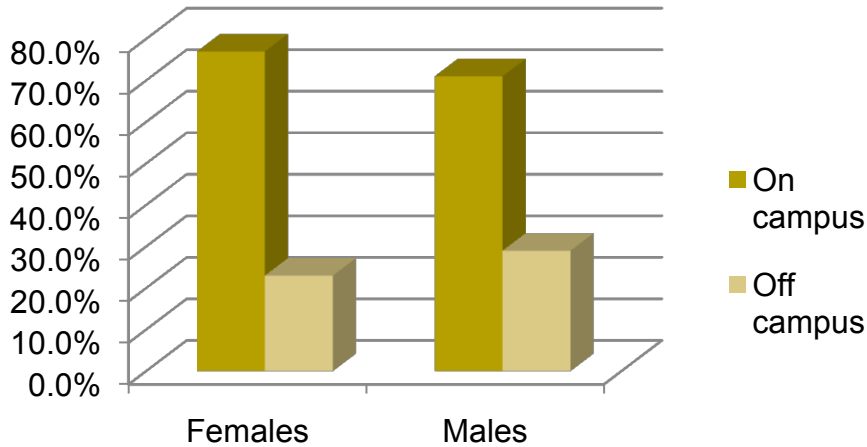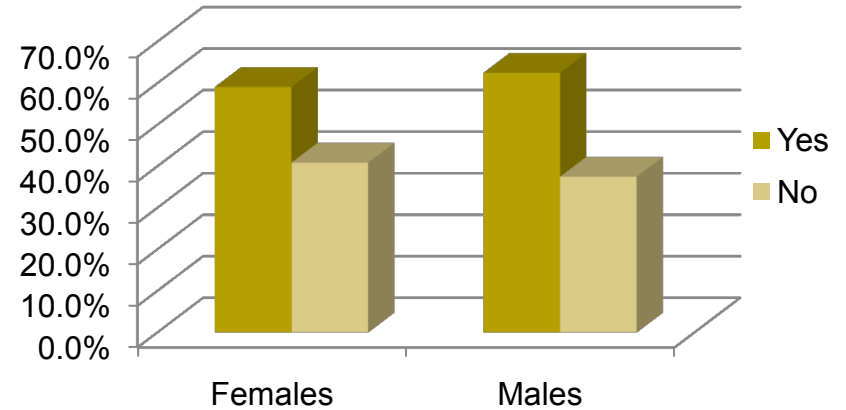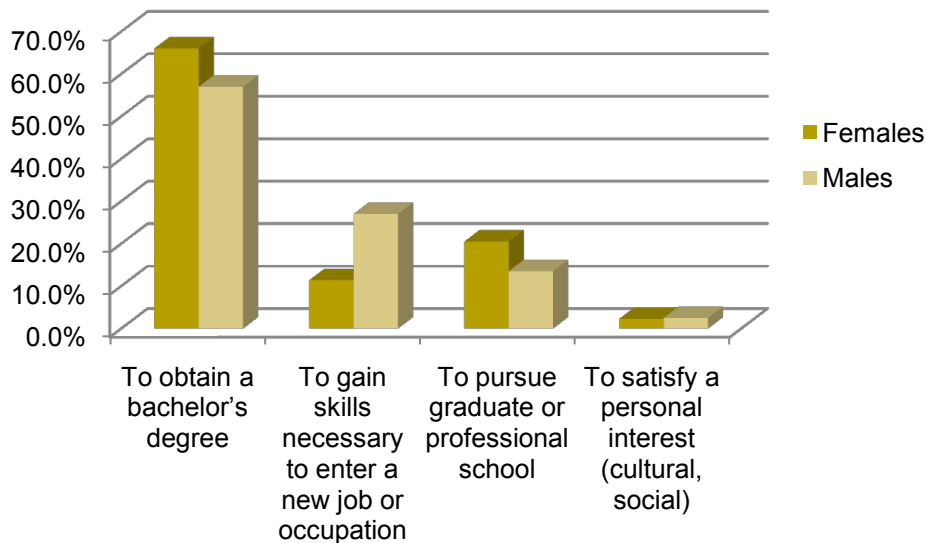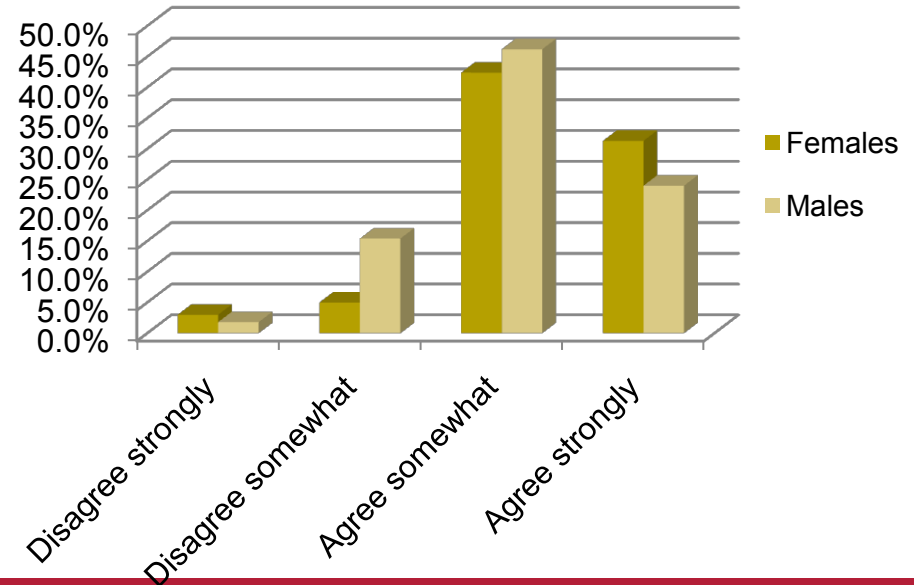
Independent Samples T-Test

Table 14.

Means, Standard Deviations, and T test Results for Iowa Community Colleges Experiences

Community college experiences	Female		Male					Confidence interval	
	M	*SD*	*M*	*SD*	*t*	*df*	*p*	Lower	Upper
Transfer semester credit hours	63.46	27.00	57.99	18.49	2.10	318	.03*	.04	10.58
Transfer GPA	3.31	0.48	3.16	0.51	2.56	318	.01*	.04	.28
Academic advising	3.03	0.93	3.03	0.90	0.07	286	.94	-.22	.24
Experience with faculty	3.08	0.75	2.95	0.80	1.35	284	.18	-.063	.34
Course learning	3.50	0.54	3.30	0.64	2.45	280	.01*	.039	.36
General courses	3.20	0.67	3.15	0.69	0.56	290	.58	-.122	.22
Transfer process	3.23	0.70	3.19	0.68	0.56	293	.58	-.12	-.13
Hours spent studying and preparing for class	1.87	0.92	1.86	1.12	0.04	294	.97	-.26	.27

*p < .05.

Independent Samples T-Test

Table 15

Means, Standard Deviations, and T test Results for ISU Experiences

University experiences	Female		Male		t	df	p	Confidence interval	
	M	SD	M	SD				Lower	Upper
Experience with faculty	2.74	0.81	2.63	0.80	1.00	270	.32	-.10	.32
General perception of course learning	3.45	0.61	3.40	0.66	.61	269	.54	-.12	.22
General perception of transfer student (negative)	2.80	0.72	2.87	0.67	-.75	268	.46	-.25	.11
Influential reasons for attending:									
Reputation	3.01	0.79	3.05	0.81	-.37	284	.71	-.24	.17
Financial	3.21	0.82	2.82	0.95	3.33	279	.00*	.16	.63
Community college advisor, friend, and ISU advisor	2.05	0.83	2.04	0.81	.06	281	.95	-.20	.21
Overall satisfaction	3.52	0.67	3.59	0.56	-.87	130.25	.39	-.24	.09
General perception of faculty	3.25	0.73	3.05	0.73	1.96	272	.05*	-.00	.38

*p < .05.

Dependent Variables

Table 4.

Factor Loadings and Reliability Coefficients of Adjustment Factors (Dependent Variables)

Factor name	α	Adjustment questions	Factor loadings
Academic Adjustment	.613		
		1) The large classes intimidate me	.727
		2) I experienced a dip in grades (GPA) during my first semester	.767
		3) I often feel (felt) with the overwhelmed with the size of the student body	.839
		4) My level of stress increased when I started at ISU	.630
Social Adjustment	.845		
		5) Adjusting to ISU social environment easy	.826
		6) I am very involved with social activities at ISU	.721
		7) I am meeting people and making friends	.805
		8) It is easy to make new friends at ISU	.807

Predictors of Community College Transfer Student Academic Adjustment to ISU

Variable blocks	Standardized regression coefficients		
	Model 1	Model 2	Model 3
Background variables (block 1)			
Father's highest level of education	.018	.048	.046
Gender	-.125*	-.108	-.131*
Highest degree intended to obtain	-.113	-.087	-.076
Community college experiences (block 2)			
Community college GPA		.116	.063
Transfer semester hours		-.119	-.139*
Associate's degree obtained		.047	.091
Hours spent studying/preparing for class		.038	.042
Academic advising		.017	.050
Experience with faculty		.291**	.178*
Course learning		-.092	-.050
General courses		-.102	-.065
University experiences (block 3)			
Influential reasons for attending–financial			-.107
General perception of faculty			-.146*
Negative general perception of transfer students			.314**
R	.163[a]	.333[b]	.519[c]
R^2	.027	.111	.270
ΔR^2	.014	.068	.224

Hierarchical Multiple Regression: Social Adjustment

Predictors of Community College Transfer Student Social Adjustment to ISU

	Standardized regression coefficients		
Variable blocks	Model 1	Model 2	Model 3
Background variables (block 1)			
Father's highest educational level	.012	.023	.028
Parents' household income level	-.147*	-.145*	-.135*
Gender	.016	.018	.070
Highest academic degree intended to obtain at any college	.037	.058	.042
Community college experiences (block 2)			
Hours spent studying and preparing for classes		.049	.018
Academic advising		.184*	.201**
Course learning		-.143	-.183*
University experiences (block 3)			
Influential reasons for attending–reputation			-.002
Influential reasons for attending–financial			.259**
General perception of course learning			.145
Current place of residence			.018
General perception of faculty			-.013
Experience with faculty			.088
Overall satisfaction with ISU			-.068
General negative perception of transfer students			-.153*
R	.151[a]	.232[b]	.438[c]
R^2	.023	.054	.191
ΔR^2	.002	.024	.125

Qualitative Findings

Background of Interview Participants

Pseudonym	Community college credentials[a]	Classification	Major
Jessica	None	Senior	Dietetics
Karen	AS	Senior	Biochemistry
Tasha	AS	Senior	Animal Science
Becky	None	Graduate	Food Science
Tina	AS	Senior	Kinesiology

[a]AS = Associates of Science.

Three themes emerged from the interviews:

(a) Support systems,

(b) Academic preparation, and

(c) Involvement

Activity

- ***Support systems***
  - Discuss different levels of support systems for students. Also discuss varying support systems available for students at your institutions and ways that support systems are established based on student needs.

- ***Academic Preparation***
  - Discuss ways that you would assist students in ensuring they are academically prepared to transfer to the four-year.

- ***Involvement***
  - Discuss ways that students can get involved on campus. Include different categories of organizations and how you would advise students on selected organizations.

Support Systems

- **Family**

"I always liked science, and I liked being outdoors, and I raised livestock and showed animals at the fair, and I did 4-H and FFA. I did cooking and nutrition and things like that for 4-H. Once my parents figured out what I liked, then they helped me kind of tailor to that. They let me figure out kind of the area and then they helped push me along I think."

- **Faculty**

"Here's this women who was very head strong . . . but she cared enough and she knew. I mean she has experienced the same things. She dropped out at some point and then went back to school. She had experienced that and was like, 'Yeah, I did do the same thing.'"

- **Advisor**

"The most helpful? I would say my advisor. Yeah. Hands down. It's really good to have a good advisor. She knew everything. She just sat down and told me to bring in my transcripts and she just knew everything that would pretty much transfer. If it had not been for my advisor, I would not have continued with school."

Qualitative Findings

Academic Preparation

- *"I would say take as many science and math classes as you can in high school, the upper level classes. Take AP level classes if you can. If you have a community college or high school level class that will let you get college credit, I would definitely do that."*

- *"I took like 6 or 9 credits coming in or something like that. I start at [an Iowa community college] from high school. I got some credits before enrolling at the community college."*

Involvement

- *"I was active in the biology club . . . very active. I organized most of the events and the fundraisers. I held the positions of VP, president, treasurer. I also started a new club . . . the Free Thinkers Club."*

Conclusions

- Although female students are entering post-secondary education environments with previous science and mathematical knowledge and experiences and are academically prepared in these areas, ***the role of faculty and academic advisors are extremely important in the adjustment process***.

- Additionally, the continued ***encouragement of female students to participate in classroom environments and become involved in campus organizations*** is essential to their overall positive adjustment and socialization process.

- Encouraging students to ***interact with faculty at the university and transfer as many credit hours as possible*** is also important during the adjustment process.

- In addition, ***assisting students in researching prospective institutions during the transfer process and understanding their value to the university*** is vital in the academic and social adjustment process.

Implications for Policy and Practice

- **State Level Standards**
  - Courses and transfer credits
  - Institutional types, cultures, environments
    - Bridge building among institutional types
    - Common practices
    - Competencies beyond academics
    - Form collaborations
  - Faculty expectations/background experiences

Implications for Policy and Practice

- **Overall**
  - Help faculty at the university to understand the importance of their role.
  - Encourage students to become involved in social activities and in classroom activities.

- **Community Colleges**
  - Hold students accountable for their own learning at the community college.
  - Assess the rigor of the math and science courses at the community college to ensure that students are academically prepared.
  - Encourage involvement at the community college and beyond.
  - Encourage students to take as many math and science courses as possible.

- **Universities**
  - Help transfer students feel welcomed and as though they are an essential part of the university environment.

- **Female**
  - Early exposure to math and science related areas are essential.
  - Support systems that include family, faculty and advisors are necessary.
  - Academic math and science preparation important.

Limitations

- **A secondary dataset was used for this study.**
  - This study does not seek to account for all variables that impact the academic and social adjustment of community college transfer students. For example, information regarding pre-collegiate activities and hobbies related to STEM fields were not accounted for in the quantitative data.
  - This study was also limited to transfer students who chose to participate in this study. As a result, there is a chance that important information is lost due to non participation. Consequently, the sample size limited the analysis that could be conducted.

- **The quantitative and qualitative data in this study were self-reported.**
  - Students often choose not to report and/or choose only to respond to certain survey items. The decision of the student to not respond limited the "true" findings of the study to only those students who chose to respond to all of the survey questions.

- **Context (Iowa)**
  - The findings of this study are limited to those of traditional aged, white Iowa students. The findings of this study can only be generalized to students of the of the same demographics and background characteristics. Therefore, the experiences of students of color may be different.

Recommendations for Future Research

- Conduct longitudinal studies
  - follow students from early grade school throughout their postsecondary education/pre-collegiate hobbies.

- Seek qualitative information that is needed at every stage of the student's socialization
  - to understand how students are interpreting their socialization. Understanding this interpretation early in the socialization process will highlight success factors as well as adjustments that may need to be made.

- Conduct studies on past community college transfer students who are currently in a STEM career to assess their early socialization processes.

- Explore and examine experiences of non-survey and non-interview respondents

- Conduct qualitative research on STEM and Non-STEM students
  - to understand the socialization similarities and differences among these two groups.

- Explore university faculty perceptions of transfer students.

- Explore the socialization experiences of females of color in STEM majors.

For additional information contact:

Dimitra Jackson, Ph.D.
Educational Leadership and Policy Studies
Iowa State University
djackso@iastate.edu

Frankie Santos Laanan, Ph.D.
Educational Leadership and Policy Studies
Iowa State University
laanan@iastate.edu