# Florida's Students from School to IT Career:

### Early Results from a Pipeline to Pathway Analysis

Marcia A. Mardis Florida State University

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## The Leaky STEM Pipeline



## What Employers Want



Are they really ready to work? Employers' perspectives on the basic knowledge and applied skills of new entrants to the 21st century U.S. workforce (2006)

#### **Rating Percentages for High School Graduates**

Very few rate skills of new entrants with a high school diploma as "excellent."

#### Deficient

#### Rank Skill

#### Basic knowledge/skills

1	Writing in English 72.0%	ŝ
2	Foreign Languages 61.7	
3	Mathematics 53.5	
4	History/Geography 45.7	
5	Government/Economics 45.6	
6	Science 44.5	
7	Reading Comprehension 38.4	
8	Humanities/Arts 30.7	
9	English Language 21.0	
App	lied skills	
1	Written Communications 80.9	
2	Leadership	
3	Professionalism/Work Ethic 70.3	
4	Critical Thinking/	
	Problem Solving 69.6	
5	Lifelong Learning/ Self Direction	
6	Creativity/Innovation 54.2	
7	Oral Communications 52.7	
8	Ethics/Social Responsibility 44.1	
9	Teamwork/Collaboration 34.6	
10	Diversity 27.9	
11	Information Technology	
	Application 21.5	
Num	her of respondents varied for each question	

Number of respondents varied for each question, ranging from 258 to 357 for basic skills and 342 to 353 for applied skills.

#### Adequate

#### Rank Skill

knowledge/skills	
English Language	73.1%
Humanities/Arts	67.8
Reading Comprehension	58.2
Science	54.8
Government/Economics	54.1
History/Geography	53.5
Mathematics	45.1
Foreign Languages	38.0
Writing in English	27.1
ied skills	
Information Technology	
Application	62.8%
Diversity	61.8
Teamwork/Collaboration	60.9
Ethics/Social Responsibility	53.0
Oral Communications	45.9
Creativity/Innovation	43.8
Lifelong Learning/	
Self Direction	40.1
Critical Thinking/	
Problem Solving	30.1
Professionalism/Work Ethic	28.3
Leadership	26.3
Written Communications	18.9
	knowledge/skills English Language Humanities/Arts Reading Comprehension Science Government/Economics History/Geography Mathematics Foreign Languages Writing in English Foreign Languages Writing in English ied skills Information Technology Application Diversity Teamwork/Collaboration Ethics/Social Responsibility Oral Communications Creativity/Innovation Lifelong Learning/ Self Direction Critical Thinking/ Problem Solving Professionalism/Work Ethic Leadership Written Communications

Number of respondents varied for each question, ranging from 258 to 357 for basic skills and 342 to 353 for applied skills.

#### Excellent

ank	Skill
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#### Basic knowledge/skills

-		
1	English Language	5.9%
2	Reading Comprehension	3.4
3	Humanities/Arts	1.5
4	Mathematics	1.5
5	Writing in English	0.8
6	History/Geography	0.8
7	Science	0.7
8	Foreign Languages	0.4
9	Government/Economics	0.4
Ap	plied skills	
1	Information Technology	
	Application	15.8
2	Diversity	10.3
3	Teamwork/Collaboration	4.5
4	Ethics/Social Responsibility	2.9
5	Creativity/Innovation	2.0
6	Lifelong Learning/	
	Self Direction	1.8
7	Professionalism/Work Ethic	1.4
8	Oral Communications	1.4
9	Leadership	1.2
10	Written Communications	0.3
11	Critical Thinking/	
	Problem Solving	0.3
Aluma	has af an an damba	

Number of respondents varied for each question, ranging from 258 to 357 for basic skills and 342 to 353 for applied skills.

Table	3	Table	4	Table	5
For new entrants with a high school diploma, applied skills are four of the top five "very important" skills in combined ranking with basic knowledge and skills.		For new entrants with a two-year college/technical school diploma, applied skills are four of the top five "very important" skills in combined ranking with basic knowledge and skills.		For new entrants with a four-year college diploma, applied skills are the top five "very important" skills in combined ranking with basic knowledge and skills.	
		110			
1	Professionalism/Work Ethic* . 80.3%	1	Professionalism/Work Ethic* . 83.4%	1	Oral Communications* 95.4
2	Teamwork/Collaboration* /4./	Z	Teamwork/Collaboration* 82.7	2	Teamwork/Collaboration* 94.4
3	Oral Communications* 70.3	3	Oral Communications* 82.0	3	Professionalism/Work Ethic* . 93.8
4	Ethics/Social Responsibility* . 63.4	4	Critical Thinking/	4	Written Communications* 93.1
5	Reading Comprehension 62.5	-	Problem Solving*	5	Critical Thinking/
6	English Language 61.8	5	Reading Comprehension 71.6		Problem Solving* 92.1
7	Critical Thinking/	0	written Communications* 71.5	0	writing in English
12-1	Problem Solving* 57.5	7	English Language 70.6	7	English Language
8	Information Technology	8	Ethics/Social Responsibility* . 70.6	8	Reading Comprehension 87.0
•	Application* 53.0	9	Information lechnology	9	Ethics/Social Responsibility* . 85.6
4	Written Communications* 52.7	180	Application* 68.6	10	Leadership* 81.8
10	Diversity * 52.1	10	Writing in English 64.9	11	Information Technology
11	Writing in English 49.4	11	Lifelong Learning/	10	Application*
12	Lifelong Learning/	10	Self Direction* 58.3	12	Creativity/Innovation* 81.0
10	Sell Direction* 42.5	12	Diversity	13	Lifelong Learning/
13	Creativity/innovation* 36.3	13	Creativity/Innovation* 54.2	222	Self Direction*
14	Mathematics 30.4	14	Leadersnip* 45.4	14	Diversity*
15	Leadersnip* 29.2	15	Mathematics 44.0	15	Mathematics 64.2
10	Foreign Languages 11.0	10	Science	10	Science
10	Science	10	Foreign Languages 14.1	10	Foreign Languages
18	Government/ Economics 3.5	18	Government/ Economics 6./	18	Government/ Economics 19.8
19	History/Geography 2.1	19	Humanities/Arts 4.4	19	History/Geography 14.1
20	Humanities/Arts 1.8	20	History/Geography 3.6	20	Humanities/ Arts 13.2
Basic rating	and applied skills rank ordered by percent g as "very important."	Basic rating	and applied skills rank ordered by percent g as "very important."	Basic	c and applied skills rank ordered by percent g as "very important."
Number of respondents varied for each question,		Number of respondents varied for each question,		Number of respondents varied for each question,	
ranging from 336 to 361.		ranging from 334 to 360.		ranging from 382 to 409.	
* Indi	icates an applied skill	* Ind	icates an applied skill	* Ind	licates an applied skill

### **High School Graduates**

The Workforce Readiness Report Card for new entrants with a high school diploma has no items on the Excellence List. All 10 skills that a majority of employer respondents rate as "very important" to workforce success for high school graduates are on the Deficiency List of the Report Card. These are: *Professionalism/Work Ethic, Teamwork/Collaboration, Oral Communications, Ethics/ Social Responsibility, Reading Comprehension, English Language (spoken), Critical Thinking/ Problem Solving, Information Technology Application, Written Communications, and Diversity.* The only applied skill close to being on the Excellence List for new entrants with a high school diploma is *Information Technology Application*, with fewer than 1 in 6 respondents (15.8 percent) rating skill levels as "excellent."

On the Deficiency List of the Workforce Readiness Report Card for new workforce entrants with a high school diploma, the skills include two from the basic knowledge category and ten from among the applied skills. At the top of the Deficiency List is *Written Communications*, with over 80 percent (80.9 percent) of employer respondents reporting that these new entrants' readiness is "deficient" in this "very important" skill. In fact, five of the ten "very important" skills on the Deficiency List are related to communication ability (*Written Communications, Oral Communications, Reading Comprehension, English Language (spoken)*, and *Teamwork/Collaboration*).

#### Table 12

## Applied skills dominate rankings of knowledge and skills expected to increase in importance over next five years.

#### Rank Basic knowledge and applied skills

1	Critical Thinking/Problem Solving* 77.8%
2	Information Technology Application* 77.4
3	Teamwork/Collaboration* 74.2
4	Creativity/Innovation* 73.6
5	Diversity* 67.1
6	Leadership* 66.9
7	Oral Communications* 65.9
8	Professionalism/Work Ethic* 64.4
9	Ethics/Social Responsibility* 64.3
10	Written Communications* 64.0

Kank	Basic knowledge and applied skills				
11	Lifelong Learning/Self Direction* 64.0%				
12	Foreign Languages 63.3				
13	Mathematics 48.8				
14	Writing in English 45.4				
15	Reading Comprehension 41.0				
16	Science				
17	English Language 32.8				
18	Government/Economics 24.8				
19	History/Geography 17.9				
20	Humanities/Arts 9.5				

Number of respondents varied for each question, ranging from 398 to 424. Percents calculated out of total number of respondents electing "increase" in importance over the next five years.

\* Indicates an applied skill

## Whose Responsibility?

Chart 3

K– 12 schools, two-year and four-year colleges, and new entrants themselves considered to have primary responsibility for workforce readiness



## Selected Hot Jobs 2012-2022



Sources: National Association of State Directors of Career Technical Education Consortium (Career Cluster); Bureau of Labor Statistics, Employment Projections program (projected job openings).<sup>2014</sup>

## **IT** Certifications

HR Perceptions of How the Use of IT Certifications will Change



#### How IT Certifications Factor into the Hiring Process [*HR perspective*]



CompTIA

Source: CompTIA



How are these competencies developed and furthered?

U.S. Department of Labor Information Technology Competency Model

## **Research Questions**

RQ 1: To what extent do technology curricula internships, IT industry certifications, and employer perceptions reflect job requirements?

RQ2: What are the different pathways students available to students as they move from school to career?

## Corpus

I. Employer Needs and Perceptions

- a. 72 (FSCJ) job postings for technology-related positions;
- b. 21 regional technology employers' interviews

II. Emerging Pathways: Match Between Hot Jobs, Knowledge Areas, and Degree Programs

- a. 26 IT & 31 CS syllabi of **FSU**;
- b. 39 IT & 15 CS syllabi from **FAMU**;
- c. 27 IT Certifications from **FSU** and **FAMU**
- d. 116 syllabi of Florida State College at Jacksonville (FSCJ);

III. High School: Content of technology syllabi and IT certifications from selected 6 **high schools** 



## Pathway Mapping Process

- 1. Take "hot job"
- 2. Identify relevant Knowledge and Skills Statements for NASDCTEc Pathway
- 3. Identify relevant Plan of Study for NASDCTEc Pathway
- 4. Match 2 & 3 to syllabi, internship, and certification content



## **Employers' Perceptions and Needs**

## **Employers: Job Postings**

### **Business (Soft) Skills**

*Concepts*: verbal skills, work, define, analyze, development, team, experience, management, solutions, learn, able, plus, independently, word, improve, problems, ability, derive, solving, selfstarter

### Software and Application

*Concepts*: software , configuring, design, systems, support, system, programming, customers, maintenance,

web

### **Core Technical Knowledge**

*Concepts*: HTML, SQL, available , technology

### Applications

*Concepts*: applications , hardware, computer, analysis



N=72 FSCJ Job Postings

## **Employers: Interviews**



### Work

*Concepts:* internship, opportunity, projects, experience, skills, program, knowledge, interns, professional, needed, responsibilities, support **Development** *Concepts:* business,

management, technical, technology, design(s), project

### N=21 interviews

Skill	Number of Mentions
Networking	43
Self-Management	33
System Administration and Maintenance	24
Web Systems & Technologies	22
Programming Fundamentals	21
Customer Service	19
Problem Solving	19
Platform Technologies	19
Business Fundamentals	18
Interpersonal Skills	18
System Integration and Architecture	18
Professional Communications (R,W,OC)	17
Information Assurance and Security	15
Information Management	13
IT Fundamentals.	11
Integrative Programming and Technologies	8
Mathematics and Statistics for IT	7
Teamwork Concepts and Issues	5
Accountability	3
Flexibility	3

Hot of the Press: 14 Local Interviews

Engineering (n=1)	Healthcare (n=2)	Financial (n=2)	Government (n=4)	Technology (n=7)
Internships	Work Experience	Internships	Work Experience	Work Experience
OJT	OJT	OJT	Internships	Internships
	Internships	Work Experience	OJT	OJT
		Service	Service	

### Interviews

### Soft Skills

*Concepts:* internship, opportunity, projects, experience, skills, program, knowledge, interns, professional, needed, responsibilities, support

### Technical/Application

*Concepts:* business, management, technical, technology, design(s), project

## Postings

### **Soft Skills**

*Concepts*: verbal skills, work, define, analyze, development, team, experience, Postings, learn, able, plus, independently, word, improve, problems, ability, derive, solving, self-starter

#### Software

*Concepts*: software , configuring, design, systems, support, system, programming, customers, maintenance, web

### **Core Technical Knowledge**

*Concepts*: HTML, SQL, available , technology

### Applications

*Concepts*: applications , hardware, computer, analysis

## Sample Emerging Pathways

### Master Pathway Diagram





N=153 Internships posted in 1/2014-12/2014

#### **Major Internship Topics**

### **Business**

*Concepts:* skills, team, management, training, program, processes, solutions, project, innovative, people, clients

### Development

*Concepts*: software, design, intern, data, web, include, product, field, improve, research, use, analysis **Work** 

*Concepts:* projects, experience, opportunity, professional, knowledge, real, using **Technology** 

*Concepts:* support, products, customers, provide, assist **Information** 

*Concepts:* information, social, media, website, site

IT Career Clusters and Certifications Recommended by FAMU BS in IT



N=27 Certifications

### 4 Year Pathways to Network Systems Cluster Computer systems analysts Internship Certs Networking Platform ...... = Technologies Required \_\_\_\_ Optional FAMU BS in CS Fŝų B\$ in IT

### 4 Year Pathways to Programming and Software Development Cluster\*



certifications





## **High School**

## High School Course Content



- Pathways to Engineering
- Aerospace Technologies
- Applied Cybersecurity
- Web Development
- Java Development & Programming
- Game Simulation, Animation, Visual Design
- Digital Media and Technology
- Business and Technical Ed Core

## **High School Certifications**



Adobe Creative Suite
Web Foundations
Microsoft Office
Web Professional
Site Development
Internet Business Associate
A+
Network+
Photoshop
Dreamweaver

## Conclusions

## **Preliminary Conclusions**

- Employers value competency over degree
- Employers highly value internships
- Internships and certifications require study

   Degrees function culturally: maturity, soft skills
   Certifications document interest, disposition
- Pathways emerge in each career cluster
- CS and IT don't always prepare students for different jobs

## **Preliminary Conclusions**

- 2 year programs=pipeline to workforce
- 2+2=pathway to workforce
  - What does the 4 year experience impart?
  - How are soft skills measured?
  - How can internships be designed to complement and extend curriculum?
- What's the role of K-12? Who are the key stakeholders?

## Most Essential Action for Building Relevant Career Pathways



Action 1 — Build bridges <u>from high school</u> to postsecondary education and the workplace by creating rigorous, relevant career pathways driven by labor market demand.

- Combine a college-ready academic core with challenging technical studies and require students to complete realworld assignments.
- Align three stages of learning secondary, postsecondary and the workplace — through strategies like dual enrollment and work-based learning.
- Create guidance systems that include career information, exploration and advisement and engage students in ongoing career and college counseling beginning in the middle grades.
- Allow students to choose accelerated learning options in settings that provide the extended time needed to earn advanced industry credentials.
  - Lead to further education and training and high-skill, high-wage jobs in high-demand industries.



## **Research Team**

### Jinxuan Ma

Post-Doctoral Researcher

Chandra R. Ambavarapu Graduate Research Assistant

### Heather Kelleher

Graduate Research Assistant

### Marcia A. Mardis

Co-Principal Investigator

### Susan C. Thomas

Program Coordinator

### Laura I. Spears

Research Coordinator

### Charles R. McClure

Principal Investigator