Perspectives on Dispositions in Computing Competencies

Panel Presentation

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John – Panel Organization

Presenters

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Structure (Time - Activity)

00 Introductions (John)

02 Dispositions Meaning and Competency (John)

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John – **Disposition Meaning**

Disposition relates to the human attributes and characteristics expected from (computing) professionals in (computing) environments

Disposition Elements from the CC2020 Report

Element	Elaboration	Element	Elaboration
Adaptable:	Flexible; agile, adjust in response to change	Professional:	Professionalism, discretion, ethical, astute
Collaborative:	Team player, willing to work with others	Purpose-driven:	Goal driven, achieve goals, business acumen
Inventive:	Exploratory. Look beyond simple solutions	Responsible:	Use judgment, discretion, act appropriately
Meticulous:	Attentive to detail; thoroughness, accurate	Responsive:	Respectful; react quickly and positively
Passionate:	Conviction, strong commitment, compelling	Self-directed:	Self-motivated, determination, independent
Proactive:	With initiative, self-starter, independent		

John – **Competency Meaning** [Industry]

Competency = Dispositions

+ Skills

+ Knowledge

in Context

Competency = <u>Human Attributes</u> + <u>Technical Skills</u> + Knowledge

Competency = <u>Behavior</u> + <u>Technical Skills</u> + Knowledge

Competency = <u>Ability</u> + <u>Technical Skills</u> + Knowledge
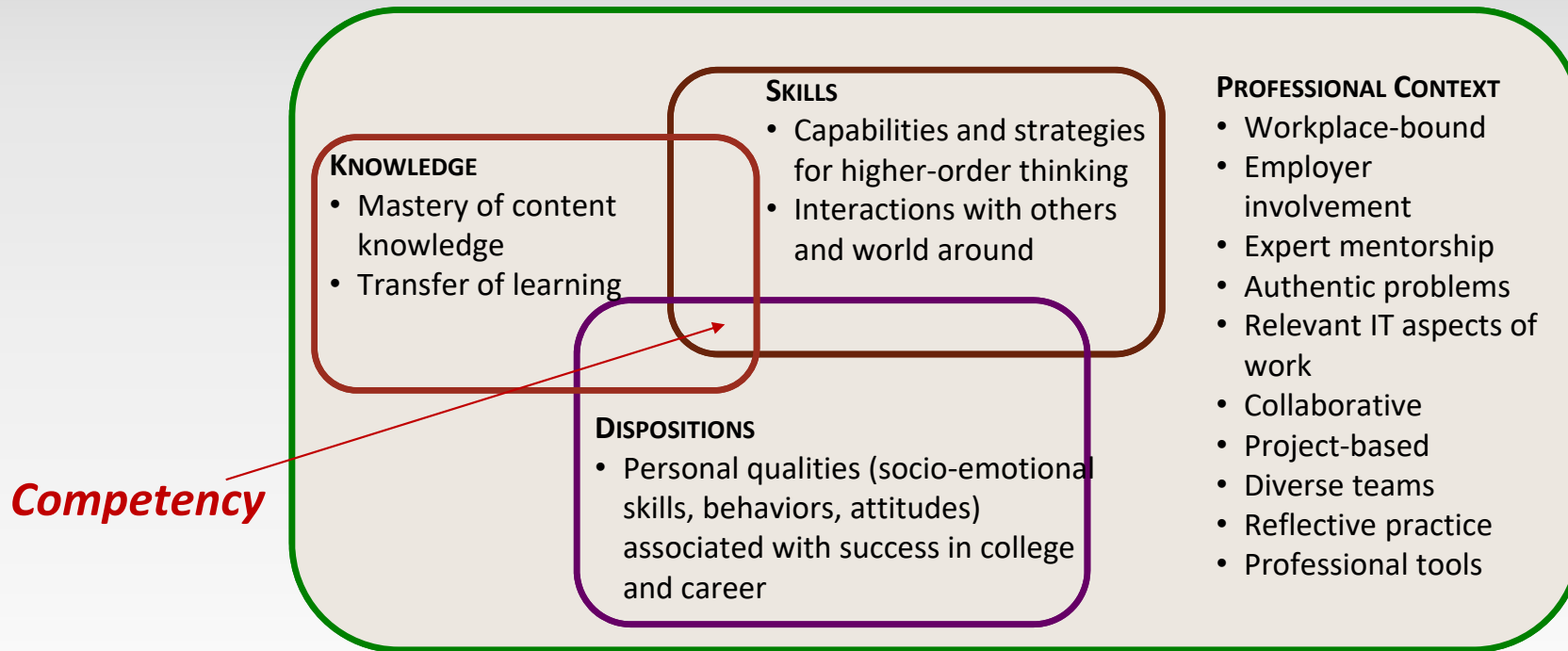
John – **Competency Meaning** [Academic]

Competency = Knowledge

+ Skills

+ Dispositions

in Context

Competency = Knowledge + Technical Skill + Ability

Competency = Knowledge + Technical Skill + Behavior

Competency = Knowledge + Technical Skill + Human Attributes

John – **Competencies in IT Context**

KNOWLEDGE
- Mastery of content knowledge
- Transfer of learning

SKILLS
- Capabilities and strategies for higher-order thinking
- Interactions with others and world around

DISPOSITIONS
- Personal qualities (socio-emotional skills, behaviors, attitudes) associated with success in college and career

PROFESSIONAL CONTEXT
- Workplace-bound
- Employer involvement
- Expert mentorship
- Authentic problems
- Relevant IT aspects of work
- Collaborative
- Project-based
- Diverse teams
- Reflective practice
- Professional tools

Competency

Natalie – **Research Perspective**

Despite the working definition of dispositions (CC2020), we need to improve our _understanding_ of dispositions before we can foster and assess them.

Prior research:
- Focused on working professionals and students to predict their performance in pair programming, form optimal teams, find good fits to work roles,
- Used personality trait models based on self-reporting as assessment,
- Analyzed project artifacts, or
- Tried to identify and associate dispositions with performance metrics.

Natalie – **Research Perspective**

Initial research questions to explore dispositions might be:

⇒ How can we investigate dispositions?
⇒ What is a suitable research method or design?

Suggestions:

⇒ Qualitative research methods to gather educators', students' and professionals' perspectives on the meaning of dispositions.
⇒ Use open question formats in surveys, guided interviews, etc.
⇒ Provide neutral stimuli, e.g., vignettes, to avoid bias
⇒ Triangulate different methods

Natalie – **Research Perspective**

More open research questions for future work in CS education:
- ⇒ How do dispositions manifest in the computing context?
- ⇒ How can we translate dispositions in observable, measurable behaviors or patterns?
- ⇒ How can educators foster dispositions?
- ⇒ How can educators assess dispositions?

Such future research will affect educators, learners, curricula designers, institutions and, eventually, help foster students succeed.

Amruth – **Assessment Perspective**

Additive → *Projective*
⇒ Making it *Salient*

Integrated → *Disaggregated*

Teachable → *Learnable*
⇒ Active → Passive
⇒ Sage on the stage → *Guide on the side*

Summative → *Formative*

Amruth – Assessment Perspective

Measurable → *Observable*

⇒ By the instructor

⇒ *By the student*

Context-Specific:

⇒ Discipline

⇒ Task: Assignment

⇒ Institution

Instrument

⇒ Likert-scale exercises

⇒ Reflection journal

⇒ Vignettes with engagement questions

Amruth – **Assessment Perspective**

Assessment changes

⇒ By assignment

⇒ Over the course of a term

⇒ From course to course

Gradual introduction

⇒ Not all at the same time

Amruth – Assessment - Anecdotes

⇒ I actually learned a new meaning of the word persistent: not knowing if you can finish something but still doing it regardless. That's pretty inspirational stuff.

⇒ It made me self reflect on what things are important traits to work on to ensure success in academics and career.

⇒ I learned to structure my weaknesses and reflect on what I did wrong. I've worked on a big project for my own sake in the past, and a survey like that would have put me on the right path instead of tossing the project to the side.

⇒ They are all very important attributes that I must continue to work on to become as successful as possible

Bonnie – **Student Perspective**

⇒ Students may not know the term "disposition" but they know that personal traits such as persistence and responsibility are important.

⇒ K12 education has recently been focusing on personal traits that lead to learner success - "grit", "SEL"

⇒ Students may not know, however, what it means to be responsible or self-directed or persistent, particularly in the context of computing. What behaviors are self-directed, for example?

Bonnie – **Student Perspective & Advantages**

⇒ Furthering academic success - Students are very aware that dispositions such as responsibility and persistence are tied to academic performance.

⇒ Furthering career success - Students are usually aware that employers want more than just technical skills, and that dispositions are tied to career success

⇒ Promoting equity - Students may come from family backgrounds where they don't have a lot of professional role models. Dispositions are malleable and can be shaped by the learning environment.

Bonnie – Student Perspective

Students may dislike focusing on dispositions for a number of reasons

⇒ They may feel it is a waste of time
⇒ They may think it is too squishy
⇒ They may feel they are being assessed on personality traits they cannot control
⇒ They may fear bias in assessment, particularly if the instructor's background is different from their own.

Mihaela – **Teaching Perspective**

Framing Questions

⇒ Who the students are
  - Lived experiences
  - Goals, values, beliefs

⇒ How students demonstrate competencies
  - Performing realistic and authentic tasks in realistic and authentic settings
    - Real-life scenarios/problems, labs, case studies, projects, internships
  - Interacting with "stakeholders" other than the teacher and class peers
    - Peers in other majors, guest speakers, online forum, professional organization
  - In multiple contexts
    - Educational, social, professional, and life contexts
  - Through reflective practice

⇒ What guides students' development of competencies
  - Regular and constructive feedback from multiple sources
  - Explicitly and clearly stated expectations and requirements

Mihaela – **Teaching Perspective**

Pedagogical Approaches

⇒ Apprenticeship or learning by doing (guided/facilitated by an expert in the field)

⇒ Experiential learning or authentic learning

⇒ Just-in-time and self-directed learning opportunities

⇒ Fading scaffolding

⇒ Modeling and role modeling

⇒ Reflective learning (learning logs/diaries, learning portfolio)

⇒ Self and peer feedback

⇒ Lightweight practices to support student well-being

⇒ Targeted disposition cultivation

Mihaela – **Teaching Perspective**

Make Dispositions *Explicit* in the Curriculum

⇒ Include targeted dispositions in curriculum planning

⇒ Specify and define *dispositional competencies* in the course syllabus

⇒ Adopt pedagogical approaches amenable to fostering dispositions
  - Modeling
  - Discussion
  - Observation
  - Reflection

⇒ Have students create learning artifacts that allow them to self-report on their dispositions
  - Self-evaluation
  - Reflection

Rajendra – **Employer Perspective**

⇒ **SIGSCE 2022 Affiliated Event:** How Should CS Programs Balance First-Job Readiness

and Foundations for Long-Term Career Success?

⇒ **Key Employability Skills:** "… Essential to being an effective employee"

1. Communication skills
2. Leadership skills
3. Teamwork skills
4. Interpersonal skills
5. Learning/adaptability skills
6. Self-management skills
7. Organizational skills
8. Problem-solving skills
9. Open-mindedness
10. Strong work ethic

It's not just computing skills, but also Dispositions!

Rajendra – SFIA Responsibility Characteristics

CC 2020 Dispositions	Autonomy	Influence	Complexity	Knowledge	Business Skills
Adaptable	X	X	X	X	X
Collaborative	X	X	X	X	X
Inventive			X		
Meticulous	X		X		X
Passionate	X			X	X
Proactive	X	X	X	X	X
Professional	X	X	X	X	X
Purpose-driven	X	X	X	X	X
Responsible	X	X			X
Responsive	X	X			X
Self-directed	X	X	X	X	X

Audience Participation

Summary

Thank You!

Acknowledgments: