

# Perspectives on Dispositions in Computing Competencies

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## CCS CONCEPTS

• **Social and professional topics** → **Computing education**;

## KEYWORDS

Computing Curricula 2020, CC2020, competencies, dispositions, cultivated behaviors

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## 1 SUMMARY

Curricular recommendations [6, 7, 11] and accreditation bodies [1, 5, 8] have recently started emphasizing competencies for computing graduates. The three components of *competency* in the context of performing a task are *knowledge*, *skills*, and *professional dispositions*, according to Computing Curricula 2020 [6]. Of these components, professional dispositions is new, and complements knowledge and skills that have constituted computing curricula in the past.

Long fostered in professional disciplines such as medicine [18], law [4], and teacher education [14], professional dispositions such as *adaptability* or *persistence* lead to successful job performance [19]. A disposition is distinct from knowledge or skill as it includes the *intent* and *willingness* to apply the knowledge or skill in a given context [9, 15, 17]. In short, *professional dispositions* are *cultivated behaviors desirable in the workplace*, an operational definition consistent with prior work [2, 9, 12].

For decades, education reports have explicitly emphasized the inclusion of dispositions to avoid limiting expected outcomes of higher education to the cognitive domain (e.g., [10]). In fact, an educational system is considered to have failed its mission if it “fosters the development of cognitive processes at the expense of that of

the whole, integrated person” [13, p. 39]. On the demand side, employers have been expressing their dissatisfaction with computing graduates who lack job skills, in particular, “soft skills” [3]. Yet, as many computing educators do not understand the role of dispositions, little is known about observing, promoting, and evaluating dispositions in a learning environment [16].

This panel will discuss professional dispositions from different perspectives, including the instructor, student, evaluator, employer, and researcher. Although each perspective sheds distinctive light on dispositions, inter-dependencies exist among the perspectives. The goal is to encourage dialog about the role of professional dispositions, and how they can be incorporated into computing education.

## 2 PANEL PRESENTATION STRUCTURE

Table 1 outlines the panel structure. The moderator will introduce the panelists and discuss dispositions in the context of computing education. The panelists, whose position statements appear in the next section, will present their perspectives. Although all panelists plan to be in person in Dublin, they are well-versed in participating in meetings in a hybrid format, and some may participate remotely depending on travel conditions. The panel will thus allow for both panelists and attendees to participate virtually and in person.

Table 1: Panel Structure

	Description	Duration
1	Introductions and Background	3 minutes
2	Panelists' Presentations	30 minutes
3	Audience Q & A	25 minutes
4	Summary	2 minutes

As shown in Table 1, the proposal ensures that ample time will be available for the audience to participate actively in the session. The moderator will also seed the Q & A with early questions from remote participants to ensure that their viewpoints receive equal treatment.

## 3 POSITION STATEMENTS

This section presents the panelists' positions, beginning with that of the moderator.

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### 3.1 John Impagliazzo - Moderator

Impagliazzo is a professor emeritus at Hofstra University and was a steering committee member of the CC2020 project, a principal co-author of its report, and a co-writer of the predecessor CC2005 report. In addition, Impagliazzo chaired the committee that produced the computer engineering curricular report (CE2016) and is an associate editor for Springer Nature. He will moderate the panel, introduce the panelists, outline dispositions, facilitate audience Q & A and discussion, and summarize the session.

### 3.2 Natalie Kiesler - Researcher Perspective

Kiesler, a senior researcher at the DIPF Leibniz Institute, has a background in qualitative analysis of discursive data in computing education, focusing on modeling competencies. She will present a research perspective on dispositions in the context of computing education. Due to the lack of empirical, exploratory research on dispositions in computing, Kiesler will illustrate qualitative research methods to investigate dispositions to improve the understanding of this component of competency. She believes that such future research will affect educators, learners, curricula designers, institutions and eventually help foster student success.

### 3.3 Amruth N. Kumar - Assessment Perspective

Kumar is a professor of computer science who has developed programming tutors, used by hundreds of K-16 instructors since 2004. He views dispositions as learnable, though not always teachable. Educators can formatively assess them, though not always summatively. In this context, what can educators do to assess the dispositions of their students? What are the challenges in assessing students' dispositions, especially in computing education? Can formative assessment instruments be used to foster dispositions? He will address some of these questions.

### 3.4 Bonnie MacKellar - Student Perspective

MacKellar is an associate professor and program director in computer science at St John's University, which serves a highly diverse student population with many students who are first in their family to attend college. She has a research background in various areas of software engineering education. She brings this background to the panel, discussing issues surrounding dispositions from the perspective of diverse student learners. One of the tasks of educators is to recognize the diverse ways in which students demonstrate dispositions and model and foster dispositions in terms of academic and professional tasks.

### 3.5 Rajendra K. Raj - Employer Perspective

Raj is a professor of computer science whose recent research attempts to address the skills gap between employer expectations and career preparation of computing graduates. He previously spent a decade as a software developer, architect, and manager developing worldwide private cloud infrastructures for a multinational company. In this role, Raj interviewed hundreds of students on campus and mentored recent college graduates into successful professionals. Understanding the power of dispositions in professional practice, he will provide employer perspectives on dispositions.

### 3.6 Mihaela Sabin - Instructor Perspective

Sabin is a professor of computer science. She chaired the ACM/IEEE joint task force that produced the Information Technology 2017 Curricular Guidelines and co-led the ITiCSE 2021 working group "Professional Competencies in Computing Education: Pedagogies and Assessment." Her scholarship focuses on competency-based learning for all students. Her perspective is on pedagogical approaches that facilitate students' learning and development of professional dispositions. In particular, she will focus on the task aspect of competency and how learning tasks may make behaviors that characterize dispositions explicit.

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