

## DISPOSITIONS

### DEFINITION

**Dispositions are personal qualities such as values, beliefs, and attitudes that impact an individual's actions and behaviors.**

### IN COMPUTING

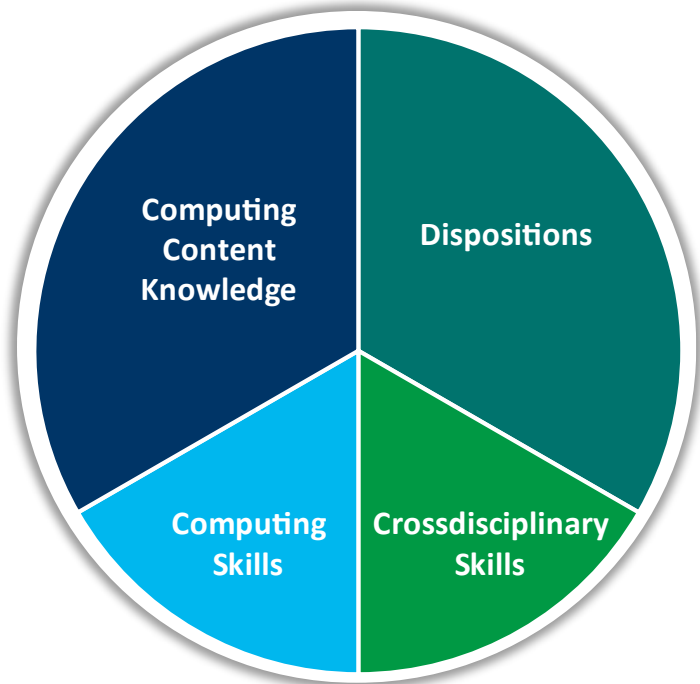
A person may have the appropriate skills and knowledge to perform a task in the computing field and yet may not be able to perform satisfactorily due to the lack of suitable dispositions. Dispositions help a person identify why and when things need to be done and motivate them to follow through in action using their knowledge and skills.

### HOW TO IDENTIFY DISPOSITIONS FOR COMPUTING DISCIPLINES

1. Dispositions can be recognized as feelings, values, appreciation, enthusiasm, motivations, and attitudes.
2. Dispositions enable the application of skills and knowledge in the relevant context.
3. Dispositions are malleable; they can change over time and based on need.
4. Dispositions are not agile; it takes a lot of effort to learn or unlearn a disposition.
5. Dispositions cannot be directly measured. They are indirectly measured through actions and behaviors.

Some examples of dispositions are:

- ✦ Attention to detail
- ✦ Perseverance
- ✦ Self-efficacy
- ✦ Resilience
- ✦ Being open to critical feedback and failure



### PEDAGOGICAL APPROACHES

Pedagogical approaches include incorporating dispositions explicitly in curriculum planning at program and course level through ongoing exposure to:

- ✦ Drawing attention to the disposition
- ✦ Instructor modeling of disposition through communicating their thought process
- ✦ Professionals discussing the importance of the disposition (in-person visit; video; etc.)
- ✦ Using case studies to highlight the presence or absence of the disposition
- ✦ Whole class and small group discussion
- ✦ Student reflection on their own development of the disposition
- ✦ Enculturation - everyone in the program exhibiting the disposition, including faculty, students, senior peers

### ASSESSMENT APPROACHES

Assessment approaches for measuring the development of the disposition occurs indirectly, e.g. through:

- ✦ Self-evaluation of student's own development
- ✦ Evaluation of reflections
- ✦ Oral assessments through interviewing students
- ✦ Student demonstration of completing a task while communicating their thought process

## THEORETICAL PERSPECTIVE

Dispositions are socio-emotional abilities that represent one's sensitivity to know when and why to perform a task using the skills and knowledge relevant to the context. They motivate the person to follow through and perform the task (Frezza & Adams, 2021). A person's motivation to perform a task is impacted by their appraisal of the goal relevance and congruence, the perception of autonomy and control, and self-efficacy (Schutz et al., 2014).

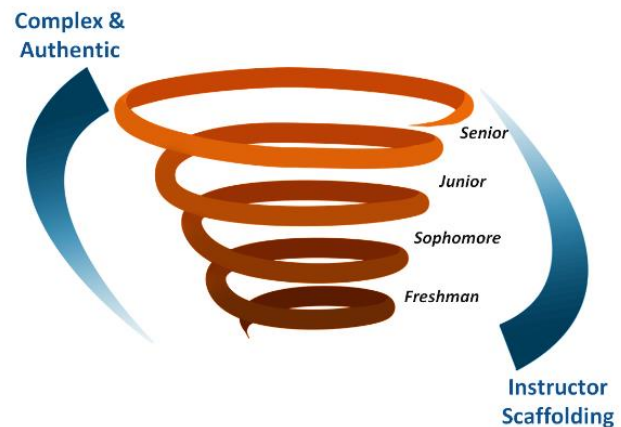
Regulation and development of context relevant dispositions requires metacognition and reflection on these appraisal processes (Ritchhart & Perkins, 2000). A person who has the appropriate disposition for a computing task is sensitive to the context, able to make judgements about appropriate actions or non-actions and follows through to perform or refrain from performing those actions (Dondi et al., 2021).

## EXAMPLES

**Perseverance or Tenacity:** keep going even when one encounters obstacles

This disposition is very important in professional computing contexts. Below are examples of how it can be fostered across multiple courses. A spiral model curricular design will allow students to begin with a large amount of instructor scaffolding and then move on to more authentic contexts without specific prompting by instructors.

Note that multiple competencies are accessed during each of these activities in addition to perseverance.



### Freshman Year: Drawing attention to the disposition, instructor modeling

#### **Instructor modeling and drawing attention to the disposition**

Within a freshman computing course, students have already learned the basics about *for loops*. Now, Professor Boca will pair practice of this computing skill with an emphasis on perseverance required during the programming process. Professor Bocca introduces a problem and the whole class comes up with a plan to solve the problem. She explains that having to persevere in writing and debugging code is necessary to succeed in this field. She shares her screen and begins to demonstrate how she writes a problem that aligns with the class's plan. She explains that she will make some errors typical of what any software developer experience. Once she has the basic for loop in place, she runs the code and sees the errors. As she goes through multiple rounds of correcting errors, she explains what she's doing (identify, debug, test cycle) and emphasizes why perseverance is necessary to the process.

#### **Encouragement and enculturation**

After her demonstration, students use pair programming to solve a similar problem. Professor Bocca circulates in the room providing advice, encourages frustrated students to persist, and acknowledges those who demonstrate perseverance. She also instructs students to remind one another to persist. Professor Bocca's interactions are both instructional and a form of formative assessment.

## Sophomore Year: Enculturation and reflection; Student self-evaluation; Instructor assessment of reflections

### **Enculturation and reflection**

In a sophomore-level database design course, Professor Wang's students are working on a database design project based on a public data set. They must first understand how the data is structured, then talk to at least two "proxy users" (someone who frequently uses this type of data or would like to use it) to understand views they would like to see. Finally, they can begin the normalization process, develop queries, and design a UI. Throughout the process, they are asked to log their actions and findings in Discord – as well as their frustrations and celebrations. Students are directed to help remind each other to persist even when they face hurdles or difficulties. Professor Wang reviews the discord discussions and jumps in to support students when necessary (formative evaluation).

### **Student self-evaluation; Instructor assessment of reflections**

At the end of the project, students can reflect on three challenges they faced and how they worked beyond them. Professor Wang reviews discord posts and reflections for evidence of perseverance and areas for improvement (her feedback acts as both formative and summative assessment).

## Junior Year: Modeling, enculturation, and reflection

### **Modeling, enculturation and reflection**

In a Junior-level course, Dr. Kelly's students work on a large, team-based project, that builds on a project developed by last year's students. They have difficulty reproducing the run-time environment based on the how-to guidelines provided by the previous students and find many bugs as they dig into the project. Within this course, the instructor, senior students, and alumni within a LinkedIn group who are willing to assist on the project, provide guidance on problem-solving techniques, thus providing opportunities for enculturation. At key milestones across the project, students are asked to reflect on the experience. They will be prompted to discuss which dispositions they believe have impacted their project work, why these were helpful, and what they have learned about working in computing.

## Senior Year: Modeling, enculturation, reflection, and oral interviews

### **Modeling, enculturation and reflection; oral interviews**

Each student participates in an internship between junior and senior year. Their mentors (industry supervisor, faculty supervisor, informal mentors) teach them the organizational culture and about what meeting expectations looks like, while modeling persistence as they go about their own jobs. At the beginning of senior year, students are asked to participate in oral interviews about their experiences. An oral assessment is conducted when they return – related to project experience and internship. This allows them to deeply reflect on what they have learned.

## REFERENCES

- Marco Dondi, Julia Klier, Frederic Panier, and Jorg Schubert. 2021. Defining the skills citizens will need in the future world of work. McKinsey Global Institute, McKinsey & Company. Retrieved from <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/defining-the-skills-citizens-will-need-in-the-future-world-of-work>
- Frezza, S., & Adams, S. (2021). Bridging professionalism: Dispositions as means for relating competency across disciplines. IEEE Frontiers in Education Conference Proceedings, pp. 1-5. doi: 10.1109/FIE44824.2020.9274058.
- Ron Ritchhart and David N. Perkins. 2000. Life in the Mindful Classroom: Nurturing the Disposition of Mindfulness. J. Soc. Issues 56, 1 (January 2000), 27–47. <https://doi.org/10.1111/0022-4537.00150>
- Schutz, P. A., Rogers, K. A., & Simcic, J. (2010). Motivation and Emotional Transaction: where do we go from here? In T. C. Urdan, & S. A. Karabenick, Decade Ahead: Applications and Contexts of Motivation and Achievement (pp. 43 – 68). Emerald Publishing Limited.