A Quantitative Study of Dispositions in Terms of Behaviors

Amruth N. Kumar, Bonnie K. MacKellar,

Renée McCauley, Mihaela Sabin
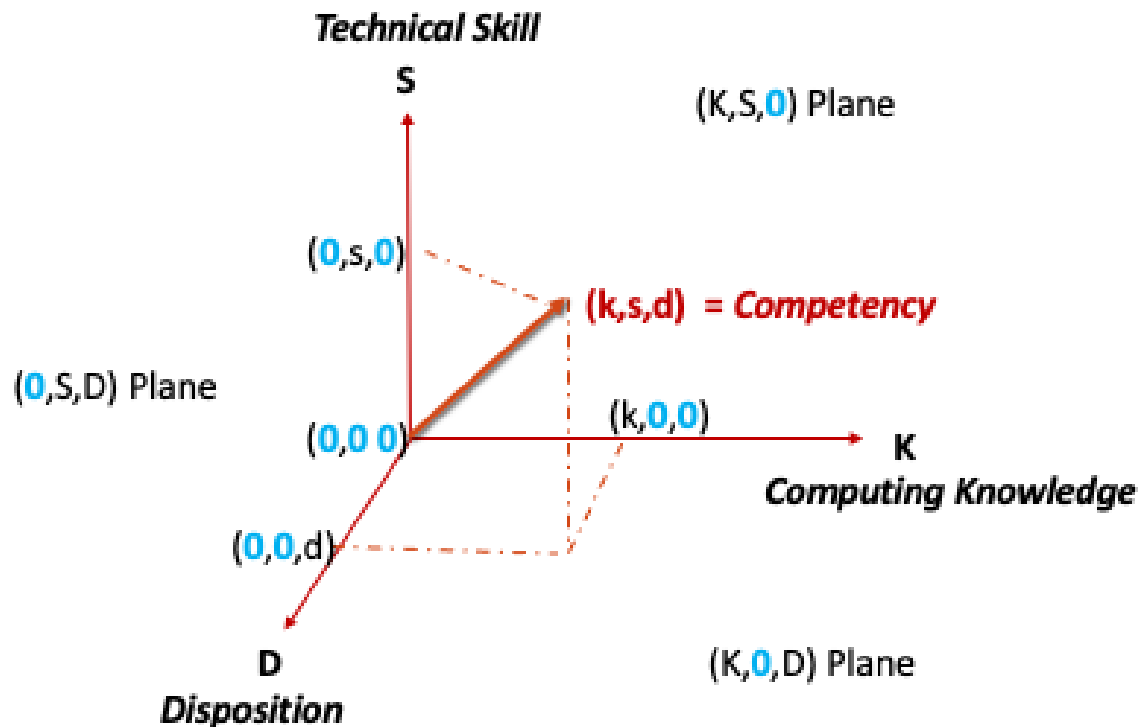
Professional Dispositions

➢Values, beliefs, attitudes that enable behaviors desirable in the workplace

➢Mediate the application of knowledge and skills to solve problems

➢Learnable

Competency =
Knowledge, Skills, and Dispositions
[Raj et al, SIGCSE 22]

Research Questions

➢RQ1: Do students associate behaviors [Kiesler et al - ITiCSE 2023, ITiCSE 2024] with dispositions?

➢RQ2: Does reflection change self-assessment in terms of behaviors?

➢RQ3: Do assessments vary by academic level – introductory versus advanced?

Targeted Dispositions

➢ Meticulous

➢ Persistent

➢ Responsive

➢ Self-directed

➢ (Adaptable as distractor)

Descriptions of Dispositions

➢**Meticulous:** Pay attention to details, even incidental, even when not rewarded

➢**Persistent:** Stick with a task until completion, even when difficult and with self-doubt

➢**Responsive:** To respond promptly, even when not expected or rewarded

➢**Self-directed:** Learn on your own, even when minimally used and no credit awarded

Protocol
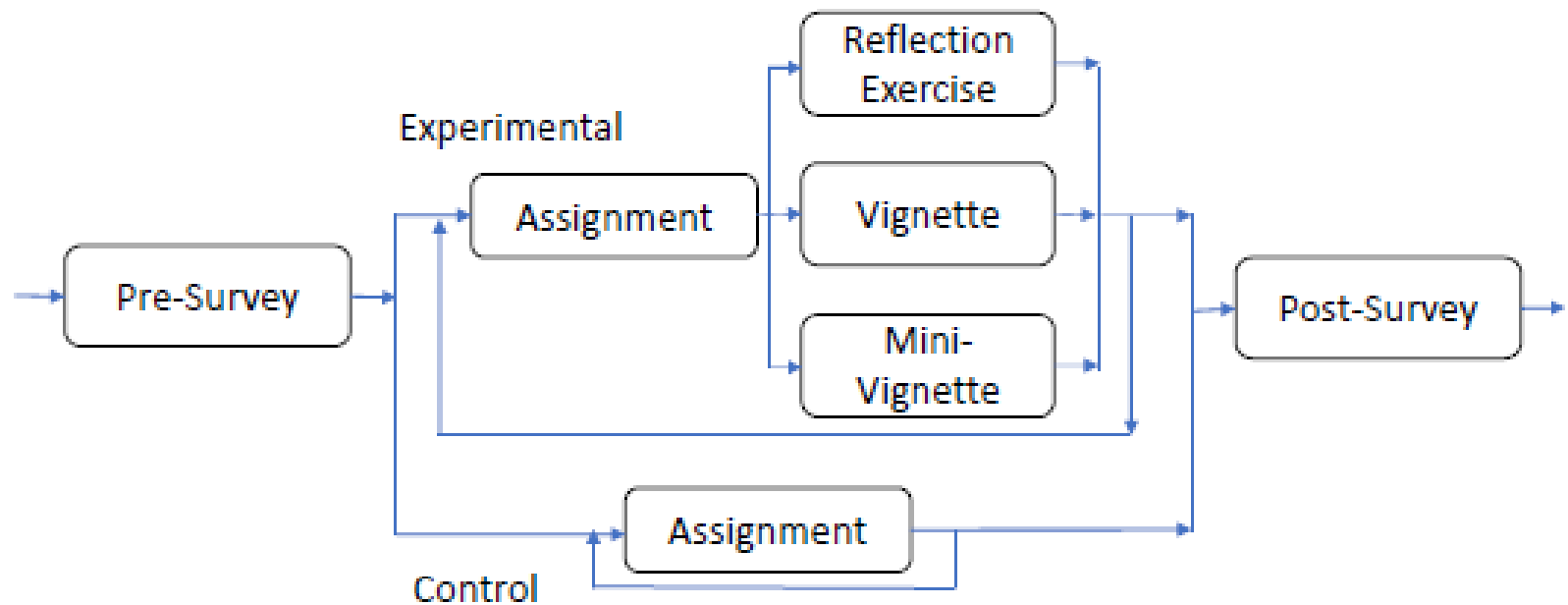
Pre- and Post-Survey Behavior Statements (3 per disposition):

➢ S1 When I encounter frustrating problems and obstacles on my assignment, I work hard at figuring out a solution. (*persistent*)

➢ S2 I teach myself more than what is taught in class. (*self-directed*)

➢ S3 When I get feedback, I apply it to the very next assignment if relevant. (*responsive*)

➢ S4 I set aside time to double-check my assignment submissions. (*meticulous*)

➢ S5 When I have difficulties with understanding a concept, I work at it until I understand it. (*persistent*)

➢ S6 I read all the messages sent to me and promptly reply to the ones that require a follow-up. (*responsive*)

Behavior Statements

➢ S7 If I get stuck when working on assignments, I look for additional information not provided by the instructor (e.g., tutorials, forums, etc.). (*self-directed*)

➢ S8 I test my solutions exhaustively. (*meticulous*)

➢ S9 For the tasks assigned to me, I figure out things on my own. (*self-directed*)

➢ S10 I promptly fill out course surveys even when they are optional. (*responsive*)

➢ S11 I re-read assignment instructions to ensure that I do not miss any detail of the assignment. (*meticulous*)

➢ S12 Even if I find that a course is more challenging than expected, I will still complete the course. (*persistent*)

Pre- and Post-Survey

S1-S12	Pre-Survey	Post-Survey
Identify the disposition best reflected by the statement S: • Adaptable / Meticulous / Persistent / Responsive / Self-directed / Not sure	√ RQ1	
How often the statement S described their behavior in their classes: • Never (1) / Seldom (2) / Sometimes (3) / Often (4) / Always (5)	√ RQ2, RQ3	√ RQ2, RQ3

Data Collection

➢Three semesters: spring 23, fall 23, spring 24

➢Four US institutions

➢Multiple courses:

o   *Introductory: CS1, CS2, DS*

o   *Advanced: DB, SD, PL*

➢Controlled Study:

o   *Control: 2 CS1 sections (N=71)*

o   *Experimental: 16 sections (N=221)*

RQ1: Behavior Recognition

➢ ≥ 80% for 7 out of 12 statements

➢ **Meticulous:** ≥74%
o   Alternate: Persistent

➢ **Persistent:** ≥ 76%
o   Alternate: Adaptable (all 3)

➢ **Responsive:** ≥ 68%
o   Alternate: Adaptable

➢ **Self-Directed:** ≥ 61%
o   Alternate: Adaptable (all 3)

RQ2: Pre vs. Post

Disposition	Control	Experimental
S3 Responsive	4.60 → 4.31 ↓	
S4 Meticulous		3.76 → 3.64 ↓*
S6 Responsive	4.20 → 4.54 ↑	
S7 Self-directed	3.89 → 4.37 ↑	
S9 Self-directed		4.04 → 3.82 ↓
S10 Responsive	3.49 → 3.94 ↑	
S11 Meticulous		4.36 → 4.18 ↓

RQ2: Pre-Post differences

➢On only some statements: Discriminate

➢Not the same in all the courses: Context-sensitive

➢Not on all the statements of a disposition: Course practices

→ Must replicate in various contexts before generalizing

RQ2: Experimental Group Pre vs. Post by Course

| Disposition	CS1 (N=44)	PL (N=45)	DB (N=49)
S1 (Persistent)		4.33 → 4.08 ↓	
S2 (Self-directed)	3.30 → 3.10 ↓		
S9 (Self-directed)		4.09 → 3.78 ↓	
S11 (Meticulous)		4.31 → 4.05 ↓	4.49 → 4.20 ↓

RQ2: Pre vs. Post Discussion

➢ *Decreased* for experimental group:

o *More realistic self-assessment after reflection*

➢ *Increased* for control group:

o Continued socially desirable responses without reflection

➢ Dunning-Kruger effect:

o Limited competence ➔ Over-estimation of abilities

RQ3: Introductory vs. Advanced

Disposition	CS1 (N=44) vs. PL (N=45)	
	CS1 Pre vs. PL Pre	CS1 Post vs. PL Post
S2 Self-directed		↑*
S4 Meticulous		↑
S6 Responsive		↑*
S7 Self-directed	↑	↑*
S9 Self-directed	↑	

RQ3: Potential model of development
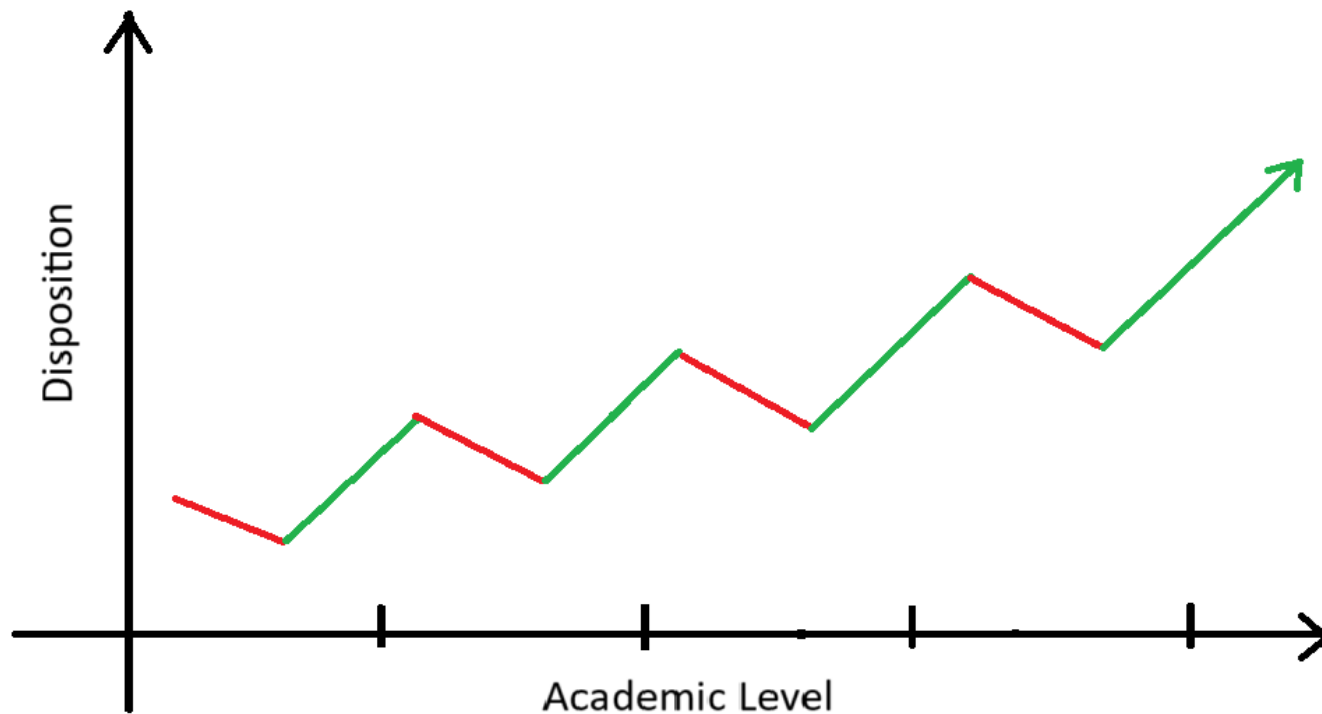
Threats to Validity

➢All four are US institutions

➢Three different treatments involving reflection

➢Smaller class sizes

➢Three semesters of data combined

Future Work

➢Stratify and analyze data by:

o Course grade

o Demographics

➢Replicate to generalize!

Acknowledgments

Come, join us:

dispositions-project.org