

Bridging Professionalism: Dispositions as Means for Relating Competency across Disciplines

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Abstract— Work In Progress: this work-in-progress submission, we unpack the learning goals related to competency development in two disparate professional disciplines: Software Engineering and Occupational Therapy. Using competency modeling as a springboard, this research analyzes dispositions as a means of comparing and contrasting the competency goals for different majors. Leveraging recent research in competency modeling, professional competency, is structurally composed of Knowledge, Skills, and Dispositions performed in a particular context. While knowledge, skills and context can vary significantly across disciplines, this paper explores how dispositions vary between two significantly different professional settings: Software Engineering (SE) and Occupational Therapy (OT).

Keywords—Professional Skills; Disposition; Competency Modeling

I. MOTIVATION

At first glance, Software Engineering and Occupational Therapy would not appear to be very related disciplines or consequently have much commonality in facilitating student learning. However, in conversations about issues with student learning in upper-division courses, a common theme emerged around self-directed learning and higher-order cognitive thinking. As these issues with project-based learning were explored, the similarities of students not choosing to go beyond demonstrating basic knowledge, not choosing to put any extensive investment than what was required of the rubric, or expectations of the project was clearly an identified.

The common point between the two disciplines is that both share a need for students to develop professional competencies. The insight was that competency modelling [1], [2] provided a useful lens for separating the knowledge and skills required of the student, allowing the differences in knowledge and skill between OT and SE to be accounted for. What appeared to be common between the two disciplines was the disposition(s) expected to be displayed in the process of developing or demonstrating a particular professional competency.

A. Student Performance Issues

This work was motivated by an observation that our students shared common issues in moving forward from the student to professional role; how in classroom work, or more specifically the hands-on clinical/fieldwork and client-oriented practical settings, our students would routinely have difficulty operating without guidance. This would show itself in multiple ways: failing to probe, inquire, question, and challenge their assumptions, their teammates or themselves. What was most

interesting was not that students struggled with these higher-order, more synthetic expectations when working on open-ended problems. Rather the surprise was that our experience of the students in very different fields of study were so similar: Students struggling with appropriate attention to detail, not having alternative plans or given thoughts to risks and alternatives; demonstrating appropriate curiosity, failing to act in purposeful, self-directed manner especially in settings where the students had already demonstrated foundational knowledge and the ability to integrate their learning.

While some of this experience of failing to transfer knowledge from one class/setting to another is expected [3], our experience was rather that students would not take the steps to act on their exploration of metacognition. These similar experiences sparked an interest a research question:

How well do OT and SE students develop similar professional dispositions?

Given that the knowledge and skills needed in SE and OT were very different, the common experience in student learning was apparent. Here, the common theme centered on the dispositional aspect of our students' competency development.

B. Professional Competency as a Common Goal

Occupational Therapy professionals begin by learning various types of foundational content in the classroom before transitioning to clinical experiences. While learning to understand the general variables of a diagnosis, it is also important to understand the complexity of client factors. Each client has different underlying genetic make-up, in which there is no one standardized protocol to facilitate a therapy session or to help a client. A step-by-step recipe does not exist, making it critical for a student to gain clinical reasoning abilities in school to develop foundational skills when working toward becoming a licensed occupational therapist. The Occupational Therapy Practice Framework (OTPF) [4] defines the language for the knowledge and processes that OT professionals must use.

For Software Engineering professionals, the 2014 Software Engineering Competency Model (SWECOM) describes a set of competencies for software engineers who develop and modify software-intensive systems [5]. In SWECOM, behavioral attributes and skill are exhibited through action which makes the ability to productively apply knowledge, cognitive skills, and technical (computing) skills visible. The approach includes components of disposition, citing behavioral attributes like initiative, enthusiasm and trustworthiness.

II. DISPOSITION AND COMPETENCY

Numerous models for competency have been developed and applied in different educational frameworks. Any competency statement is an assertion that integrates knowledge, skills, and dispositions that are observable in a particular context. These integral components of competency are manifest in observable and tangible form within a work context [1].

A. Competency Modeling: CoLeaF

Our approach views competency as a practical educational goal [1], [2], [6], [7] [8]. Consistently-modeled competency includes all three K+S+D components observed in a particular work context (C); in practice, competencies are developed through the development of knowledge and skills, and more slowly through the development of appropriate dispositions that moderate the quality of how that knowledge and skill are applied. This Competency Learning Framework (CoLeaF) model [1] is displayed in Figure 1.

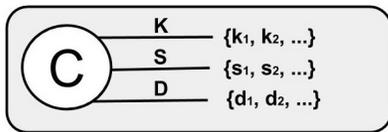


Figure 1. Competency Learning Framework (CoLeaF) [1]

Knowledge (K) designates an awareness and understanding of core concepts and content. This dimension receives initial attention from teachers when they design their syllabi, from departments when they develop program curriculum, and from accreditation organizations when they articulate accreditation criteria. This is the “know-what” dimension that can typically be assessed directly.

Skills (S) refer to capabilities and strategies that develop over time through deliberate practice. Skill development often requires engagement in higher-order cognitive activities. This is the “know-how” dimension often assessed indirectly, through observation of the process or quality of work produced.

Dispositions (D) encompass socio-emotional skills, behaviors, and attitudes that characterize the inclination to carry out tasks and the sensitivity to know when and how to engage in those tasks [9], [10]. Hence, disposition denotes the values and motivation that guide applying knowledge while designating the quality of knowing commensurate with a standard of professional performance. This “know-why” reflects enacted values and is often more difficult to assess [11][12][13]. Because of the difficulty of assessing values and intention, disposition is typically assessed indirectly, through the observance of patterns of behavior or reflection making it challenging to assess.

Context: The shift to include a defined observable context as a part of educational goals emphasizes the importance of workplace-bound experiences, the need for active involvement of employers to support internship and co-op programs, provide expert mentorship, authentic problems, and the motivation for professional action. Context serves as a descriptor of what the student does to obtain competency. This is well-established

with OT, as fieldwork/clinical experiences is central to becoming a practitioner [14]–[16].

The inclusion of disposition as a part of educational goals encourages the engagement of diverse teams, collaborative and project-based activities, and deliberate and critical reflection on practice to participate effectively in decision-making and remain engaged in a process of continuous learning.

B. Dispositions as a Component of Competency

‘Disposition’ can be a misleading concept. Fundamentally in English it has two definitions: the first is administrative while the second is temperamental. The administrative definition asserts disposition to be the “act or power of disposing or the state of being disposed. “where the definition of ‘disposed’ is that of “to place in readiness” or “arrange in an orderly way” [17]. Consequently, disposition that is not separate from, but rather intertwined with knowledge and skill, observable when there is a ‘right’ or ‘better’ application of knowledge and skill in a particular context. From a learning perspective, disposition is that affective component which puts skill and knowledge into correct action in a specific context. The understanding is not fundamentally temperamental, nor is it an inherent tendency of a person, but rather that willful effect of a person to act in a certain manner in particular circumstances. [13]

Dispositions are fundamentally learned and learnable. To the extent that a person translates one’s disposition into habits, and those habits become ingrained into their behavior, only then is one’s disposition, one’s competency becomes a more fixed part of one’s personality. *E.g.*, where they can affect one’s temperament per the 2nd definition. Dispositions can be unlearned and replaced by others. This is normatively part of the moral growth of a person, as they translate through willful translation of their values through the selective application of their skills and knowledge. Hence, disposition is not permanently fixed; rather, it is something managed by the individual, it is learned, it is informed by one’s character, community and can shift with circumstance. [13]

To this extent, disposition is connected to the upper levels of Bloom’s Affective Domain, addressing the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes[18]. One may easily value something, and consistently choose to act or not, apply skill or knowledge or not, without the affective ‘enjoyment’ of that application.

III. EXPLORING OT AND SE PROFESSIONAL EXPECTATIONS

The focus of this descriptive work is to explore dispositions that enable professional competency in OT and SE, and to compare these dispositions for entry-level positions as they appear in definitional literature as well as our experience in student preparation. These explorations begin with understanding the definitional literature and related vocabulary for each profession.

A. OT Community Standards and Expectations

Students in healthcare programs must learn how to make decisions when working with a client, as the evaluation process begins with a thorough understanding of the underlying medical

condition, any preexisting conditions, contraindications, and health risks in the present. An OT must determine what/how to implement an assessment, analyze the results, and interpret the findings to create a therapy plan for the individual client.

The OTPF [4] is an official document created by the American Occupational Therapy Association (AOTA) which is utilized when educating occupational therapy students of the professional language required when documenting the therapeutic process for client services. Not only is it important to establish a therapeutic relationship with a client, it is imperative to design a treatment plan that is holistic that includes having the knowledge about a client's environment, values, goals, and desires which creates an opportunity for positive health outcomes. The complexity of the therapeutic process requires practitioners to utilize clinical reasoning, analyzing activities and occupations, collaborating with clients, families, and other healthcare professionals.

Analyzing occupational performance requires an understanding of the individual client characteristics, the environment, and the activity requirements of the occupation they are engaging in. This is a complex process of evaluating all components to create an effective therapeutic plan since all of these factors influence each other and impact the performance outcomes. Three key areas of cognitive processing are normatively included in OT education:

Clinical Reasoning (CR) [19][20] enables practitioners to identify multiple demands, the required skills of a task, and the potential meaning of the occupations as it relates to the client. This allows for a deeper understanding of the interconnectedness of all aspects of the domain that will affect the client-centered outcomes addressed in the therapeutic process.

Therapeutic Use of Self (TUS) [21], [22] allows practitioners to manage their relationship with clients using empathy during services. This is an emotional exchange that allows a professional open communication to assist them during their life situation. This relationship allows the client to have more power and control during the decision-making process. The knowledge and expertise from the therapist is intertwined with the client's life experiences and expectations to create a measurable outcome

Activity Analysis (AA) [23] is a vital part of the therapeutic process, in which all practitioners engage in to understand the demands of an activity. The analysis of the activity allows for specific understanding of how the body works during activities, the specific skills needed to complete the activity, and the environmental demands for successful engagement in the activity.

Disposition as a factor in these areas of cognitive processing has been explored. The area of Clinical Reasoning has received the most study (e.g., [15], [19]).

B. SE Computing Dispositions

Unlike Occupational Therapy, the competency expectations of software engineering graduates is much less well defined. While the SWECOM and international curriculum documents provide guidance, they are not as authoritative or universally recognized as the OTPF. The only equivalent in the United

States is the ABET Criteria for Software Engineering [24], [25], but these are content-focused not competency-focused.

Alternatively, recent explorations in computing competency have developed preliminary sets of computing dispositions applicable to software engineering [2][13]. Leveraging these explorations is one of the points of our study.

IV. A COMPARATIVE STUDY

Our descriptive study is focused on examining the learning activities that instructors use in the classroom to help the SE/OT students develop and demonstrate higher cognitive thinking skills that support competency development. The purpose is to examine and separate the knowledge/skill aspects from the dispositional expression. The hope is to address the research question, "How well do OT and SE students develop similar professional dispositions?"

The subjects of this descriptive exploration are faculty leading pediatric intervention and similar OT courses and Software Engineering project-based courses at two [Podunk] University campuses. The primary focus is on two upper-division courses in both programs that include substantive requirements for students to engage in field work/project work and other client/stakeholder interaction. The courses we have piloted this work in are *OT Intervention: Pediatrics and Developmental Disabilities I & II* and *Mobile App Development I & II*. Both courses were selected because they expect students to demonstrate appropriate competency at a 'Synthesize' level. (Bloom's Level 5).

A. Course: Pediatric Intervention

This course sequence is required in a Doctor of Occupational Therapy (OTD) program. Along the continuum of the OT program, these courses build upon the OT fundamentals, such as developmental psychology, anatomy, movement analysis, and neuroscience. Specifically in higher-level courses, students are asked to engage in activities such as a case study for the purpose of developing the competency to apply outcomes for future practices in real settings [20]. This work challenges students to independently consider multiple possibilities and make/recommend and implement decisions on how to proceed. The quality of this determination appears dispositional: How well the analysis and implementation are planned reflect enacted values.

B. Course: Mobile App Development

This course sequence is required of a BS in Software Engineering program. This is a series of two Project-Based Learning courses where students synthesize knowledge from their other programming and software development courses to develop skills in software testing, team coding, and stakeholder interaction and leverage coursework in coding, software design, agile process and the user experience. The first course involves scaffolded project work, while the second uses an open-ended project pedagogy and just-in-time learning for more detailed technology topics. These approaches are targeted to support students developing, through their classroom work, the competency of stakeholder-driven, team software development.

The project work, particularly in the second course, challenges students to independently consider multiple possibilities and make decisions on how to proceed, and to correct when team directions do not appear to be working out sufficiently. The quality of this determination appears dispositional: How well the analysis and implementation are planned reflect enacted values. Extracting these dispositional expectations from these and other similar OT/SE courses is part of the anticipated analysis work.

C. Method.

For each subject (instructor/course) the project will undertake a systematic exploration for identifying the disposition expectations of the students/courses and how those dispositional elements are integrated into the student learning experience. This will begin with the development of a structured set of questions for use in an interview setting. Using the two examples identified, the initial questions would focus on expanding the performance expectations (such as CR, TUS, AA for OT's) for each subject. These performance expectations would then be examined for their dispositional components. The subject pool is ~4 faculty and ~6 courses. The interview structure is still under development.

The interview process will include open and closed-ended questions to gather information relating to 1) how the faculty perceive the dispositional expectations of their course(s), followed by 2) how their students perceive learning of dispositions. The intent to collect and describe the activity the students engage in and the goals of the students' project work, including the faculty's perception of how their students were exposed to dispositions.

V. COMPARISON: DISPOSITIONAL EXPECTATIONS

In these courses, the dispositional expectations are mostly unspoken. However, they motivate the active learning pedagogy used in the classes and motivate their inclusion in the two programs.

A. OT Example: Forward-Thinking.

During a therapy session, a client may have a goal of meal preparation in which it requires the engagement of cooking using a stove. If a client has challenges with compliance with safety precautions, a task of heating up soup in a pot on a stove may require support and visual/verbal cues from the therapist. The therapist needs to have an intentional awareness of the client's cognitive, visual, and tactile systems to understand their base line of functional abilities. If a client is making an impulsive decision and moves their arm over the preheated burner to place the pot on it, the therapist must provide a fast-reactive response to intercept the dangerous situation so the client doesn't get burned.

One of the most important therapist qualities is to demonstrate forward-thinking and sense of predictability [20], which is beneficial when the therapist knows the client's weaknesses to intercept a problem that may arise before it actually occurs. Forward-thinking is a component of the competency needed in managing a therapy session. This aspect of session management is fundamentally dispositional – it is

actionable and reflects values embodied by the student in what they do, what they do not do; in what they plan or do not plan for.

B. SE Summary

In open-ended projects, software engineers are expected to manage their life-cycle processes and their teams to deliver value to their stakeholders/clients. Students are expected to act professionally: To take responsibility for both their individual and teamwork. This includes not just their ability to produce a design, but also their ability to work with a client, or even train the client how to participate in the development process. Their responsibilities (both individual and as a team) extend to the iterative requirements elicitation, design, coding, testing, quality assurance, and make development decisions about what to build first/next so that they progressively deliver a team product of use to their stakeholder.

Individually, a key disposition is that of taking appropriate responsibility: Reflecting on the particular conditions and concerns of the development project, then acting according to what is appropriate to the situation. Making responsible assessments and taking actions as well as influencing their team to do the same is a key component to software process management, particularly as a contributor. Similar to the observation about Forward Thinking for OT students, this is fundamentally dispositional, being actionable and reflecting values embodied by the student in how they perform their work; in what they do, what they plan to do or not plan to do.

These two examples briefly illustrate the types of dispositional exploration that this work-in-progress proposes. The plan is to attempt to be thorough: to examine all of the key learning activities in each course for their dispositional aspects. This should produce a list of the dispositional rationale for the activities for comparison, analysis and the improvement of the active-learning pedagogy of both courses.

VI. CONCLUSIONS AND NEXT STEPS

To date, the literature studies support the notions that competency as professionals warrants comparison [19], [26], [27]. Furthermore, the language for framing competency provided by CoLeaf and its extensions [1], [2] appears to be useful in facilitating this comparison. Further investigation into this literature will continue.

The descriptive research work comparing the expectations and experiences of the two courses should produce a list of dispositional elements expected in the courses and connect these expectations to the broader program-outcome goals as well as the learning experiences of each course. These in turn should provide a means of examining how these dispositional elements influence student assessment and provide guidance how to improve both course delivery and assessment. The hope is to develop a sufficient understanding of the commonality and differences among OT/SE dispositional expectations to design a study that can be used in both settings, to assess student development of disposition.

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