

## **Turning two ships in tandem: applying the UDL framework in clinical settings**

Cathy Roy cdroy@dawsoncollege.qc.ca; 514-713-6812

Faculty & UDL@Dawson co-facilitator

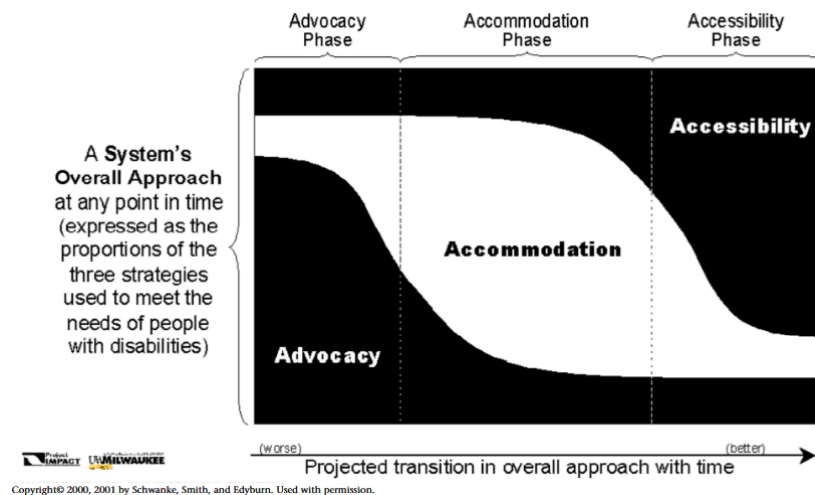
PHYSIOTHERAPY TECHNOLOGY DEPARTMENT: DAWSON COLLEGE

Accommodations in fieldwork settings have been historically complex because of the intermingling of large and complex institutions, each with its own priorities, constraints, and established ways of operating. Communication between various stakeholders while navigating confidentiality policies for both students and clients proves difficult, especially when many students choose not to disclose their disability or are in various stages of understanding it themselves. Accommodating under unclear circumstances, policies and legislation creates confusion and discomfort. The Adaptech Research Network (Fichten et al., 2024) sought to shed light on barriers to accommodation through exploring the experiences of students, faculty, internship supervisors, and accessibility counselors, as well as develop strategies to support all parties and help them collaborate on solutions. This article considers their findings through the lens of Universal Design for Learning.

### **Transitioning from accommodation to inclusion**

Accommodations commonly used in academic settings may need to be adapted for workplace settings (Pace et al., 2019, Heelan et al., 2015). Through the UDL lens, the question evolves from changing the environment to accommodate for a specific student to adapting the environment to meet the needs of diverse students and learning challenges. Using the common accommodation of extended time for exams as an example, we might consider how to afford “extended time” in a clinical setting. Could students who are progressing toward proficiency more gradually be offered extended time to meet the learning outcomes? If a need for adapted or reduced hours spread over a longer period could be matched to supervisors with similar availability, this “accommodation” could increase the number of clinical placements available by allowing part time supervisors into the mix.

The A3 model (Fig. 1) describes the natural evolution of systemic approaches to inclusion, proposing a natural transition from advocacy towards accommodation and accessibility (Schwanke et al, 2001). The approaches are naturally complementary, given the common goal of equitable education, but the expectation is that with time, inclusion becomes less costly in many senses of the word. When universally accessible systems are used, less accommodations are required, and students have less need to bear the responsibility for advocacy or “legitimization” of their own inclusion (Easterbrook et al., 2015).



**Fig 1: A3 Model and Transition of Approach (Schwanke et al, 2001)**

According to Edyburn (2010), the three approaches naturally co-exist; evolution toward accessibility will not preclude the need for advocacy and accommodation. The simplest rationale for such evolution is efficiency – once a protocol is established for the use of a tool or method to accommodate the learning needs of one student in achieving a task, provided the ability to meet the learning objective is maintained or improved, and the modification does not impose undue hardship, by definition the case for “reasonable accommodations”, why not open the option to all? Instead of trying to imagine myriad ways to work around a barrier, we simply remove it by allowing alternate “paths” to achievement to all students.

### **Universal Design for Learning: “Necessary for some, beneficial for all”**

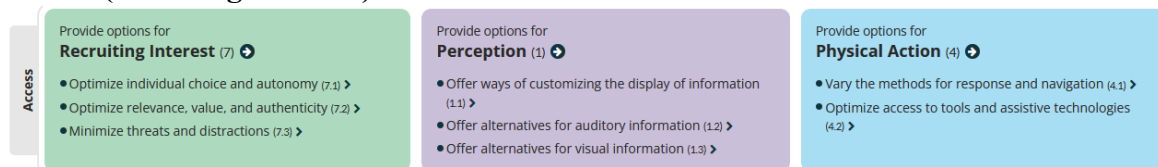
Based on the concept of Universal Design from built environments that promotes design to facilitate use by the greatest variety of user, UDL extends the notion to the learning environment, setting out to remove barriers to learning as part of an iterative design process. Tools, scaffolds, and resource options that allow the student to improve efficiency and focus their cognitive effort on the learning task are often helpful in the absence of disability, even for the most advantaged, well-resourced student. Students who do not need the alternative, or for whom it interferes with learning, simply will not use it, or will choose a method better suited to their needs (Edyburn, 2010). In this way, students who choose not to disclose a disability for various reasons or have not undergone the sometimes-onerous process of assessment and diagnosis as well as those with contextual or intersectional barriers due to psychosocial or environmental circumstances can still benefit from having the option (Stanley et al., 2011). The teacher does not need to be directly involved in each student’s decision about how to accomplish a task; the student simply adjusts the learning environment to their own needs the same way a driver adjusts the seat and mirrors when taking up the wheel in a new vehicle.

The UDL model sees each learning challenge as a design opportunity, where the teacher learns from each new student, progressively integrating more robust course design at each iteration with more viable options for learners to complete tasks in diverse ways. The purpose of this article is to crowd-source our understanding to help teachers, internship supervisors and students meet the

unique challenges in internship across different institutional contexts. It comes down to flexibility – allowing various means to get to the same ends.

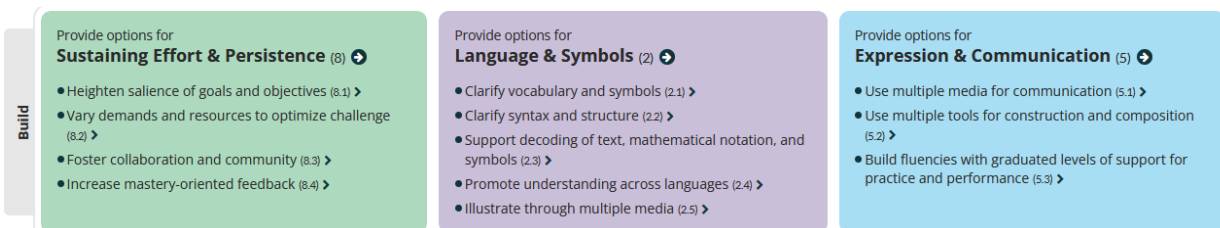
The UDL framework provides guidelines for teachers to scaffold student learning along two intersecting horizontal and vertical axes, outlining nine aspects of inclusive design for classroom settings. For the remainder of the article, I will explore the framework along both axes with a discussion of potential design elements in each area from both the Adaptech project and related literature on reasonable accommodations for clinical settings and applying UDL in clinical education. Examples are provided in-text, and a more exhaustive list for each area of the framework can be found in Appendices A-C. Moving down along the vertical axis we encounter progressively higher order aspects of inclusive design; I will explore each in clinical education settings.

### Access (removing barriers):



Access is the most basic level of inclusion where most regulatory laws come into play, ensuring that information is perceptible to all users. Findings demonstrate that providing accommodations in fieldwork settings is possible with the right institutional supports. Once an accommodation is granted and protocols established to ensure the confidentiality of data and safety and effectiveness of patient care, it is easier for institutions to extend access to all students. We are simply broadening the panoply of educational and work tools to facilitate tasks in the overlapping environments to the benefit of all users. Most of the potential technological or logistical adaptations that Adaptech (Fichten et al., 2024) cites in their findings are at this level and could easily be offered to all students.

### Build (scaffolding learning)



The next field of the UDL paradigm is where the active interventions of the teacher or clinical supervisor as learning designer become more evident. Recommendations at this level are often based on literature on effective teaching and learning practices such as structuring and breaking down learning tasks into requisite parts, and making explicit what might be implicit for experts. Scaffolding helps students navigate the transition from classroom to clinic, since strategies adopted in classroom settings may not always work in clinical environments. Bottlenecks are a normal part of learning, and while the onus of learning is on the student, the onus of design is on the teacher to effectively support the learning process. New learning challenges will engender

new strategies to overcome them, which can then be applied not only for the current difficulty, but for future students (LaRocco & Fanelli, 2021).

### Internalize (developing autonomy)

The infographic is titled 'Internalize' and is divided into three colored boxes: green, purple, and blue. Each box contains a strategy name and a list of sub-points.

- Self Regulation (9)**
  - Promote expectations and beliefs that optimize motivation (9.1)
  - Facilitate personal coping skills and strategies (9.2)
  - Develop self-assessment and reflection (9.3)
- Comprehension (3)**
  - Activate or supply background knowledge (3.1)
  - Highlight patterns, critical features, big ideas, and relationships (3.2)
  - Guide information processing and visualization (3.3)
  - Maximize transfer and generalization (3.4)
- Executive Functions (6)**
  - Guide appropriate goal-setting (6.1)
  - Support planning and strategy development (6.2)
  - Facilitate managing information and resources (6.3)
  - Enhance capacity for monitoring progress (6.4)

Opponents might say that implementation of the above strategies provides too much handholding for our students. Shouldn't they be able to "figure it out on their own," arriving in the clinical setting with all necessary knowledge and skills and need only practice application? The problem with this assumption is that real contexts look different than classroom examples, and each new client or environment requires the student to transfer their knowledge. Our role as mentors is to show our students the tools and methods we have found useful, encourage them to evaluate what works, help them find their own strategies, and provide feedback about what is effective and acceptable in a clinical setting so they can progress towards autonomy. Some scaffolds will be used only temporarily, such as think-aloud modeling (LaRocco & Fanelli, 2021), or scaffolded planning documents, and others will become an integral part of the work task, such as the use of a daily scheduler or facility forms. If the accommodations do not change the outcome and the student can use the tool independently, the learning objective has been achieved. In many cases adapting the work task may serve to improve the product (e.g. electronic notes instead of handwritten). The goal is for students to carry forward whatever tools and supports they need as they continue to grow as learners and professionals functioning in diverse clinical settings as part of interdisciplinary teams with myriad resources at their disposal. The key to building autonomy is reflection, both in-action and after clinical interactions, wherein students learn to evaluate their own learning, with the goal of becoming autonomous, strategic learners (CAST, 2018).

Next, I will explore the horizontal axis, the three neural networks of learning, with examples at each "tier", from left to right: the "why", "what", and "how" of learning.

### Engagement

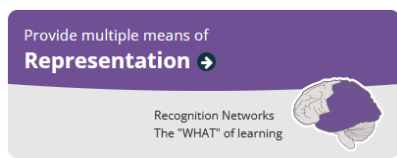
The infographic features a green header with the text 'Provide multiple means of Engagement' and a brain icon with a green arrow. Below the header, it says 'Affective Networks' and 'The "WHY" of learning'.

This column refers to the motivational or "why" aspect of learning. Most students who have progressed far enough in the health program of choice to enter the realm of clinical education do not lack interest or motivation. Clinical learning

environments are naturally engaging, authentic, and situated, all facilitators to learning. However, barriers may become more apparent in a particular milieu. For example, an in-patient clinical setting might be overwhelming in terms of sensory input compared to a community health setting. Matching and/or sequencing sites to align with student abilities and preferences is one way to overcome such challenges. Distractions and threats can influence motivation, desire to participate or ability to succeed in a particular clinical environment. Anxiety runs high where

performance assessment is based on observation by a clinical expert with real clients receiving treatments. Low-stakes modeling and practice with constructive feedback is key to maintaining student engagement (LaRocco & Fanelli, 2021). Providing choice and allowing student autonomy where possible are central to the creation of an engaging learning environment (CAST, 2018).

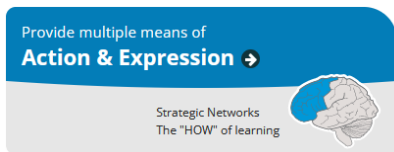
### **Providing multiple means of representation:**



The “what” of learning is provided mostly in classrooms prior to students entering clinical settings, where students first encounter authentic contexts and real clients. The procedures they have practiced on the healthy bodies of their colleagues in the lab, or the artificial tissues of a simulator may look foreign

to them in a real client. Diverse representation of clinical contexts and authentic scenarios in classroom settings prior to arrival support readiness to transition. Early entry into the clinical setting can also not only ease the transition but provide context for concurrent classroom courses. Since this part of the framework often involves the conversion of information to different formats, accessibility officers can be useful partners for faculty designing clinical courses, with their knowledge of technological accessibility tools. They can also be useful resources in helping automate the creation of inclusive online environments, and in teaching faculty and students how to access and use tools. Students with disabilities are not the only beneficiaries to such adaptations. One student might listen to audio versions on the bus during a long daily commute. Another might use closed captioning on videos to help with comprehension in their second language. Fortunately, many such basic adaptations are becoming default features of hardware and software, removing the adaptation onus from the teacher or supervisor. Higher order skills in this area will involve profession or site-specific lexicons (“build”), and scaffolding understanding of complex concepts or cases (“internalize”). For example, a teacher might employ “think-aloud” strategies for a student struggling with applying the clinical reasoning process, wherein the teacher models their own thinking, and then asks the student to do the same, with feedback (LaRocco & Fanelli, 2021).

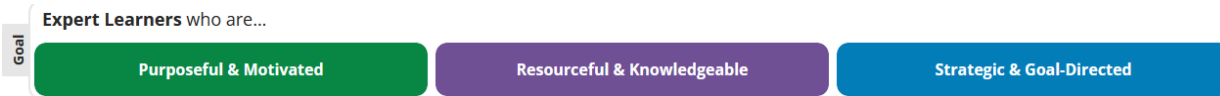
### **Multiple means of action and expression:**



The “how” of learning in clinical settings implicates all interactions the student will have with the site environment, tools, staff, and resources, as well as the clients and site supervisor. The job tasks students are learning to complete must reflect professional standards, but how this is achieved can be

flexible. Some examples from the literature would be accepting reflective work in various formats (e.g. video/audio) or allowing a presentation to be done in small groups or via an online module rather than presenting live to the whole department.

### **The UDL mission: forging expert learners**



The goal of UDL is to form resourceful, knowledgeable, motivated, reflective, and autonomous life-long learners. No clinician functions in a vacuum, and performance assessment in clinical settings need to consider the student’s resourcefulness as well as their knowledge. Professionals are informed and supported by the tools and resources they use. The better they know how to use them, the better they will function and the better their trade will be.

**UDL + accommodation + equity = meeting the needs of all**

Note that many of the technical solutions proposed in the literature are becoming integral to software and hardware systems that many students and institutions are already using. For example, speech-to-text is now an integral part of word processing software. Other equipment might be discipline-specific (e.g. electronic goniometer for joint mobility) and/or impairment specific (e.g. stethoscope with magnification for hearing impairments). These examples demonstrate a need for the accommodations model to persist alongside UDL implementation. Provision of such devices should be proactive and exploring options in the laboratory setting prior to entry into the clinical site will ensure that students learn how to use them and are not disadvantaged in the learning process.

**Discussion: Barriers to implementation vs ways to overcome them**

*Perceived lack of control vs empathy & design thinking*

Most clinical educators do not think of themselves as “learning designers.” We tend to assume that in clinical settings, the learning environment is dictated by the clinical context, over which we have little control. While it is true that we cannot choose our clients or dramatically change already functioning clinical environments, an exploration of the literature, the Adaptech research, and the writer’s own experience demonstrate that we *can in fact control many aspects of the learning situation, and how we interact within the institutional setting*. The clinical setting provides a physical environment, context (e.g. clients, resources, physical spaces), and dictates certain rules of engagement, but many decisions about how to operate on a “micro” level are negotiable between the clinical instructor and student. We are in fact designing learning environments whether or not we are aware of it; intentionality in course design decisions & assessment structures help ensure our designs respond to the widest variety of student strengths and challenges.

Design thinking implies an iterative approach that is informed by empathy at the outset. Empathizing with the student forces us to ask what is “hard” about the learning task and find cognitive strategies to facilitate it (LaRocco & Fanelli, 2021). Universal design implies that we consider the widest variety of needs possible at the outset, and then continue to adjust based on effectiveness, tweaking the nature and variety paths to learning with each iteration. This perspective offers more than just economy of effort and resources; it removes the burden of disclosure and advocacy from the shoulders of students who do not wish to bear it (Easterbrook et al., 2015), those who are still in the process of understanding their own disability (Nolan et al.,

2014), and those who face challenges not related to a disability, such as students for whom the language of instruction might be their second or third (Hills et al., 2022). When we add intersectional variables to the mix such as long commutes, heavy course load burden, part-time jobs, older students with dependants, there is not much of the student body who do not face some sort of challenge to their learning. Diversity is the rule, not the exception, underscoring the reality that there is no such thing as “the average student” - each student enters the learning environment with a unique blend of strengths, resources, and challenges.

#### *Lack of resources (human and financial) vs sustainability and long-term payoff*

UDL implementation represents a larger up-front investment than accommodation for each student, especially if the changes imply systemic interventions in both environments. However, once a more accessible learning environment is set up and teachers/clinical supervisors are knowledgeable in navigating it, the cost of accommodation could be significantly reduced. Sheer numbers of requests and students enrolling in professional programs with specific disabilities should provide adequate motivation to make the up-front investment necessary to benefit from the long-term payback of more inclusive environments and less restrictive gatekeeping in a time when health care workers are desperately needed. The traditional model of specific accommodations alone may not be sustainable given the continually increasing demand and limited resources. Fortunately, compliance with inclusion standards is working in favour of improving access for all, in both education and work settings, so what might have been onerous changes to imagine even 5 years ago are becoming commonplace.

#### *Lack of awareness & understanding vs education and awareness building*

The biggest impediment to implementation of UDL in clinical settings is lack of understanding and the equation of learning disabilities with cognitive deficits or fundamental inability of the student to perform. One main tenet of the UDL framework is the maintenance of high standards. It is the structuring of the learning environment that allows students to meet those standards with increasing autonomy. Any scaffolds necessary to the task can continue to be used by the student as needed, provided they do not interfere with meeting professional standards. In many cases (e.g. e-charting) the accessible product may meet professional requirements with better efficiency, effectiveness, and safety (Neal-Boylan & Smith, 2016). Awareness campaigns and workshops that specifically target healthcare partners involved in clinical education are necessary to dismantle myths and erode stigmas, but also to enable clinical educators to walk the line between flexible learning environments and ensuring continued rigour in provision of safe patient care. (Heelan et al., 2015)

#### **Summary: accessible learning environments, healthy populations**

The overlap between learning establishments and healthcare settings brings us back to the universal design origins of the UDL model as it applies to both physical/built and online environments. Education and work settings continue to evolve in tandem in how they manage to embrace diversity and adapt to a wide variety of needs for both service providers and clients; however, the speed and direction of their evolution may not be perfectly aligned. At the natural intersection of two worlds, clinical education and internships have a unique opportunity to

advance thinking and practices in both. There is a bilateral hesitation that comes from not knowing: clinical supervisors might be hesitant to allow methods that they imagine might not be accepted in the workplace environment, when in fact those same methods may already be in use. Reasonable accommodations are mandated by law – any accommodation that does not interfere with patient safety or the performance of essential work tasks can be considered “reasonable.” On the other hand, workplaces can only provide accommodations that they know exist and that are within their means; education institutions have the interdisciplinary knowhow and space to experiment and bring forth new tools, ideas, and methods, both from a sociological and technological perspective.

The pooling of knowledge through institutional collaboration is essential in moving towards more inclusive environments in healthcare settings across the continuum of education to employment. Implicated stakeholders go beyond faculty, students, and accessibility advisors. Current students are our future caregivers; it is in our common interest to purposefully support practices that will lead to diverse representation in the health professions (Nolan et al., 2015). Ensuring that barriers are removed has the potential to benefit not only individual students in a particular clinical setting, but also the students that come after them, as well as current and future professionals.



## References

- Brown, K., James, C., & MacKenzie, L. (2006). The Practice Placement Education Experience: An Australian Pilot Study Exploring the Perspectives of Health Professional Students with a Disability. *British Journal of Occupational Therapy*, *69*(1), 31–37. <https://doi.org/10.1177/030802260606900106>
- CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from <http://udlguidelines.cast.org>
- Easterbrook, A., Bulk, L. Y., Ghanouni, P., Lee, M., Opini, B., Roberts, E., Parhar, G., & Jarus, T. (2015). The legitimization process of students with disabilities in Health and Human Service educational programs in Canada. *Disability & Society*, *30*(10), 1505–1520. <https://doi.org/10.1080/09687599.2015.1108183>
- Fichten, C., Havel, A., Wileman, S., & Jorgensen, M. (2024) Students with Disabilities in Clinical Internships: Perspectives of College Faculty, Accessibility Advisors, and Students. *Adaptech Research Network, Dawson College, Montreal, Canada*.
- Harris, C. (2018). Reasonable adjustments for everyone: Exploring a paradigm change for nurse educators. *Nurse Education in Practice*, *33*, 178–180. <https://doi.org/10.1016/j.nepr.2018.08.009>
- Heelan, A., Halligan, P., & Quirke, M. (2015). Universal Design for Learning and Its Application to Clinical Placements in Health Science Courses (Practice Brief). *Journal of Postsecondary Education and Disability*, *28*(4), 469–479.
- Hills, M., Overend, A., & Hildebrandt, S. (2022). Faculty Perspectives on UDL: Exploring Bridges and Barriers for Broader Adoption in Higher Education. *The Canadian Journal for the Scholarship of Teaching and Learning*, *13*(1). <https://doi.org/10.5206/cjsotlracea.2022.1.13588>
- LaRocco, D. J., & Fanelli, L. L. (2021). *Universal Design for Learning for Clinical Educators: Design Thinking in Clinical Settings*. 389–411. <https://doi.org/10.4018/978-1-7998-7106-4.ch020>
- Murphy, L., Panczykowski, H., Fleury, L., & Sudano, B. (2020). Implementation of Universal Design for Learning in Occupational Therapy Education. *Occupational Therapy in Health Care*, *34*(4), 291–306. <https://doi.org/10.1080/07380577.2020.1780663>
- Neal-Boylan, L., & Smith, D. (2016). Nursing Students with Physical Disabilities: Dispelling Myths and Correcting Misconceptions. *Nurse Educator*, *41*(1), 13–18. <https://doi.org/10.1097/nne.0000000000000191>
- Nolan, C., Gleeson, C., Declan Treanor, Treanor, D., & Madigan, S. (2015). Higher education students registered with disability services and practice educators: Issues and concerns for professional placements. *International Journal of Inclusive Education*, *19*(5), 487–502. <https://doi.org/10.1080/13603116.2014.943306>
- Nolan, C., Gleeson, C., & Madigan, S. (2014). *An investigation into the supports for students with disabilities whilst on practice placement*. <https://doi.org/10.13140/RG.2.1.5101.3368>

- Pace, K., Pace, A., Martyn, K., Halligan, P., & Gee, N. (2019). *Universal Design for Learning to support nursing students: Experiences in the Field*. 1–14.
- Peddle, M., Bearman, M., McKenna, L., & Nestel, D. (2020). “Getting it wrong to get it right”: Faculty perspectives of learning non-technical skills via virtual patient interactions. *Nurse Education Today*, 88, 104381. <https://doi.org/10.1016/j.nedt.2020.104381>
- Stanley, N., Ridley, J., Harris, J., & Manthorpe, J. (2011). Disclosing disability in the context of professional regulation: A qualitative UK study. *Disability & Society*, 26(1), 19–32. <https://doi.org/10.1080/09687599.2011.529663>
- Tee, S., & Cowen, M. (2012). Supporting students with disabilities – Promoting understanding amongst mentors in practice. *Nurse Education in Practice*, 12(1), 6–10. <https://doi.org/10.1016/j.nepr.2011.03.020>

## Appendix A

### Options for engagement in a clinical setting:

#### *Recruiting interest:*

- Displaying enthusiasm for the site/context (Murphy et al., 2020)
- Providing adaptable hours/shift patterns (Tee & Cowen, 2012)
- Matching clinical site to student preferences and geographic location. (Fichten et al.)
- Organizing site visits and providing information on the nature of work tasks prior to start date (Brown et al., 2006; Heelan et al., 2015; Pace et al., 2019)
- Providing a quiet location to read and write
- Providing unrestricted access to a resource room for all students (Pace et al., 2019)
- Closing the curtain when working with patients to minimize distractions (Fichten et al.)

Provide options for  
**Recruiting Interest (7)** ↕

- Optimize individual choice and autonomy (7.1) >
- Optimize relevance, value, and authenticity (7.2) >
- Minimize threats and distractions (7.3) >

#### *Sustaining effort and persistence:*

- Welcoming environment with explicit value placed on diversity
- Engaging orientation activities including icebreakers or gamifying information (Heelan et al., 2015)
- Frequent, specific & actionable feedback (Brown et al., 2006; Murphy et al., 2020)
- Transparent learning objectives, reviewed early using visual supports (e.g. concept map) (Heelan et al., 2015; Murphy et al., 2020)
- Student mentorship (Brown et al., 2006; Heelan et al., 2015; Tee & Cowen, 2012)
- Environment (face to face or online) that encourages peer interaction (across or within sites/intra or inter-disciplinary) to create spirit of community & support (Fichten et al., Brown et al., 2006)

Provide options for  
**Sustaining Effort & Persistence (8)** ↕

- Heighten salience of goals and objectives (8.1) >
- Vary demands and resources to optimize challenge (8.2) >
- Foster collaboration and community (8.3) >
- Increase mastery-oriented feedback (8.4) >

#### *Self-regulation*

- Scheduling breaks, both physical and mental (Fichten et al.)
- Flexibility to schedule support or mentorship appointments as needed (Pace et al., 2019)
- Scaffolding self-reflection/self-assessment (Murphy et al., 2020)
- Modeling a positive outlook & supporting development of personal coping mechanisms, (Brown et al., 2006)
- Supporting disclosure as needed and guiding student to appropriate help (Tee & Cowen, 2012)

Provide options for  
**Self Regulation (9)** ↕

- Promote expectations and beliefs that optimize motivation (9.1) >
- Facilitate personal coping skills and strategies (9.2) >
- Develop self-assessment and reflection (9.3) >

## Appendix B

### Options for representation in a clinical setting:

#### *Perception*

- Screen reading, C-pen/scribe pen & apps that allow zoom/magnification of text (Fichten et al., 2024)
- Access to documentation off-site digitally (Fichten et al.)
- Video/audio resources (e.g. policies/procedures) with captions & transcript (Harris, 2018)
- Site maps & organizational chart of personnel with pictures (Pace et al., 2019)
- Hard copy and digital versions of reading materials (Pace et al., 2019)
- Clocks on the walls in each room (Pace et al., 2019)

Provide options for  
**Perception (1)** ↻

- Offer ways of customizing the display of information (1.1) >
- Offer alternatives for auditory information (1.2) >
- Offer alternatives for visual information (1.3) >

#### *Language & symbols*

- Allow recording of interactions, discussions, or seminars (need signed consent) (Fichten et al., 2024)
- Provide paper and electronic supports/lexicons for institutional/disciplinary language specifics (Pace et al., 2019)
- Mnemonics for memorizing different procedures and skills e.g. ISBAR (Pace et al., 2019)
- Digital dictionaries & translation tools for language barriers (Fichten et al., 2024)
- Carry notepad or index cards (Fichten et al., 2024)

Provide options for  
**Language & Symbols (2)** ↻

- Clarify vocabulary and symbols (2.1) >
- Clarify syntax and structure (2.2) >
- Support decoding of text, mathematical notation, and symbols (2.3) >
- Promote understanding across languages (2.4) >
- Illustrate through multiple media (2.5) >

#### *Comprehension*

- Use graphic organizers to structure information e.g. cue cards, mind map software, step by step flow charts for procedures, visual flow charts (Tee and Cowen, 2012; Pace et al., 2019)
- Provide examples and application of information, such as cases for prioritization (Pace et al, 2019, Murphy et al., 2020)
- Peer learning: students create lists of goals for clients and compare (Fichten et al., 2024)
- Highlight critical features of a procedure, surgery, policy (Pace et al., 2019)
- Teach in a systematic way, e.g. from head to toe, or inside to outside (Pace et al., 2019)
- Use similar assessment formats from classroom to clinic (Hua et al., 2014).
- Use verbal comprehension tool “RAP” to support reading comprehension: Read a document, Ask meaning (2 key details), and then Paraphrase (Hua et al., 2014).
- Suggest students create “crib notes” to prompt quick decision-making (Fichten et al, 2024)
- Allow students to record difficult procedures, encourage students to find/watch videos of medical interventions in their field to activate background knowledge (Fichten et al, 2024)

Provide options for  
**Comprehension (3)** ↻

- Activate or supply background knowledge (3.1) >
- Highlight patterns, critical features, big ideas, and relationships (3.2) >
- Guide information processing and visualization (3.3) >
- Maximize transfer and generalization (3.4) >

## Appendix C

### Options for action & expression in a clinical setting:

#### *Physical action* (Fichten et al., 2024)

- Use of digital pens
- Read and write, Kurzweil, or Word Q software
- Noise cancelling headphones for concentration.
- Mobile technology for dictation and recording (while ensuring patient confidentiality).

Provide options for

#### **Physical Action** (4) ↻

- Vary the methods for response and navigation (4.1) >
- Optimize access to tools and assistive technologies (4.2)

#### *Expression & communication*

- Medical spell check and dictionary software or devices (Pace et al., 2019)
- Dragon medical dictation software (Pace et al., 2019)
- Antidote software for grammar & translation (Fichten et al., 2024)
- Word prediction feature (Fichten et al., 2024)
- Use of virtual patients for extra non-technical skills practice (Peddle et al., 2020)
- Practice of critical skills in off-site simulations (Heelan et al., 2015)

Provide options for

#### **Expression & Communication** (5) ↻

- Use multiple media for communication (5.1) >
- Use multiple tools for construction and composition (5.2) >
- Build fluencies with graduated levels of support for practice and performance (5.3) >

#### *Executive function*

- Guided goal setting (Brown et al., 2006)
- Encourage use of note-taking and to-do apps (Fichten et al., 2024; Harris, 2018)
- Multiple media for clinical reflections (e.g. audio/video)
- Support autonomous scheduling & time management using apps/physical calendars completed by the student/automated reminders (Harris, 2018; Heelan et al., 2015)
- Negotiable deadlines (e.g. collaboratively decided) and “negotiated time-outs” (Tee & Cowen, 2012)
- Use of checklists/flowcharts for repeated or procedural tasks (Fichten et al., 2024; Pace et al., 2019)

Provide options for

#### **Executive Functions** (6) ↻

- Guide appropriate goal-setting (6.1) >
- Support planning and strategy development (6.2) >
- Facilitate managing information and resources (6.3) >
- Enhance capacity for monitoring progress (6.4) >