Supplemental Digital Appendix 1

Guided ***R***eflection ***A***nd ***P***rofessionalization/***Hi***dden **C**urriculum

PRIMING	**CURRICULAR DESCRIPTION**	**SUPPORTING CONCEPTS**	**REFERENCES**
Preparing students in advance of the clinical experiences for their encounter with social pressures to engage in unprofessional or inappropriate behavior, By having them collectively and individually reflect in a safe, guided context: On previous situations in which they were subjected to and/or conformed to peer pressure and Anticipate how this might play out in the clinical context.		Arming students with the knowledge that we are all prone to comply or conform, *"to form accurate perceptions of reality and react accordingly; to develop and preserve meaningful social relationships; and to maintain a favorable self-concept"*	(Cialdini and Goldstein 2004)
		Correcting biasing effects with knowledge; just knowing that we are susceptible to normative influence enables us to correct for it	(Wilson and Brekke 1994)
		Reflection before action; anticipating situations so that future encounters are informed by previous encounters	(Sandars 2009)
		Guided reflection, the "emancipatory educator"; challenging students to explore alternative ways of thinking and acting	(Brookfield 1987, Mezirow 1990, Sandars, Murray et al. 2008)
		Group reflection: Creation of an "institution of reflective practice" that links individual reflection with processes of collegial reflection to enhance and sustain lifelong learning and commitment to medical professionalism.	(Frankford, Patterson et al. 2000, Mann, Gordon et al. 2009)

NOTICING	**CURRICULAR DESCRIPTION**	**SUPPORTING CONCEPTS**	**REFERENCES**
Training students to become self-ethnographers by documenting their own enculturation experiences with attendant experiences in the clinical context of pressures to conform		Situation awareness; recognition that something is happening	(Schön 1987, Sandars and Homer 2009)
		Mindfulness: deliberate and non-judgmental attention to the immediate thoughts and emotions	(Sandars and Homer 2009)
		Noticing our emotional state; the "disorientating dilemma", how our emotions may bias perceptions, interpretations and actions	(Mezirow 1990, McConnell and Eva 2012)
		Slowing down when you should; recognizing cues in the environment that require us to engage our analytic processes	(Moulton, Regehr et al. 2007, Sandars and Homer 2009)
		Student as "participant observer" or "self-ethnographer"	(Feudtner and Christakis 1994, Kawulich 2005)
		Contemporaneous note-taking to avoid contamination by memory	(Loftus 2003, Eva and Regehr 2008)

GRAPHiC derived from Holmes CL, Harris IB, Schwartz AJ, Regehr G. Harnessing the hidden curriculum: A four-step approach to developing and reinforcing reflective competencies in medical clinical clerkship. Advances in Health Sciences Education. 2015;7:379-385.

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PROCESS	CURRICULAR DESCRIPTION	SUPPORTING CONCEPTS	REFERENCES
Processing Guiding students to reflect after their experiences in a safe, group regarding what happened, What they did, What they might have done, What the "right" thing to do might have been, and What strategies they might try next time.		Reflection on action: reviewing prior behavior and performance outside the immediacy of work demands	(Kolb 1984, Schön 1987, Frankford, Patterson et al. 2000, Sandars and Homer 2009)
		Guided reflection: imagining alternatives: "brainstorming, envisioning alternative futures, developing preferred scenarios, and futures invention", culminating in collective action	(Brookfield 1987, Mezirow 1990, Sandars, Murray et al. 2008)
		Group Reflection: Creation of a "safe space" for reflection and discussion to disempower the hidden curriculum, allowing both positive and negative experiences to be used to reinforce values and behaviors conducive to the development of compassionate, emotionally engaged physicians	(Feudtner and Christakis 1994, Frankford, Patterson et al. 2000, Mann, Gordon et al. 2009, Treadway and Chatterjee 2011)
		Developing critical questioning competencies - challenging and exploring alternative ways of thinking and acting	(Brookfield 1987, Mezirow 1990)
		Dealing with ambiguity; how to function in indeterminate zones of practice, the "swampy lowlands"	(Schön 1987, Mylopoulos and Regehr 2007)
		Reinforcing of nonconforming subculture (Deviance Regulation Theory): to create meaningful identities by engaging in actions that deviate from reference group norms in desirable ways	(Blanton and Christie 2003)
		Creating a story to liberate and enhance the reflective process	(Sandars, Murray et al. 2008)

CHOOSING	CURRICULAR DESCRIPTION	SUPPORTING CONCEPTS	REFERENCES
Helping the students develop the skills to make intentional and informed decisions about what to adopt as behaviors and values that move them toward what they want to become; What to eschew as behaviors and values that are part of the current culture; What they wish to adopt as part of their own professional identity;		Reflective identity formation as our students transition into their new community of practice	(Harris 2011)
		Intentional un-biasing; when we are made aware that unwanted agents are influencing our judgment, we can try to correct for it	(Wilson and Brekke 1994)
		Controlling our experiences; reflective imitation, role of transformative learning in "enhancing our sense of agency over ourselves and our lives"	(Mezirow 1990, Benbassat 2014)

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How to act on these decisions in ways that reinforce their own development but do not alienate them from their senior and peers; How to act with humility rather than arrogance when they reject behaviors and values of others.	Reinforcing of nonconforming subculture (Deviance Regulation Theory): To create meaningful identities by engaging in actions that deviate from reference group norms in desirable ways	(Blanton and Christie 2003)
	Developing adaptive expertise; helping students learn to function competently in clinical situations where there are no right answers or standard procedures; preparing students for competence in the indeterminate zones of practice; the "swampy lowlands".	(Schön 1987, Mylopoulos and Regehr 2007, Ginsburg, Lingard et al. 2008)
	Contribute to a culture of respect	(Leape, Shore et al. 2012)

GRAPHiC Course derived from 4-Step Curriculum (Holmes, Harris et al. 2014)

REFERENCES:

Benbassat, J. (2014). "Role Modeling in Medical Education: The Importance of a Reflective Imitation." Acad Med.

> The medical literature almost uniformly addresses the positive aspects of role modeling. Still, some authors have questioned its educational value, a disagreement that is probably due to differing definitions of role modeling. If defined as demonstration of skills, provision of feedback, and emulation of specific professional behaviors, then role modeling is an important component of clinical training. However, if it is defined as a learner's unselective imitation of role models and uncritical adoption of the messages of the learning environment, then the benefits of role modeling should be weighed against its unintended harm.In this Perspective, the author argues that imitation of role models may initially help students adapt to the clinical environment. However, if sustained, imitation may perpetuate undesirable practices, such as doctor-centered patient interviewing, and unintended institutional norms, such as discrimination between private and public patients. The author suggests that the value of role modeling can be advanced not only by targeting role models and improving faculty performance but also by enhancing students' reflective assessment of their preceptors' behaviors, especially so that they can better discern those that are worth imitating. This student-centered approach may be accomplished by first, warning students against uncritically imitating preceptors who are perceived as role models; second, showing students that their preceptors share their doubts and uncertainties; third, gaining an insight into possible undesirable messages of the learning environment; and finally, developing policies for faculty recruitment and promotion that consider whether a clinical preceptor is a role model.

Blanton, H. and C. Christie (2003). "Deviance regulation: A theory of action and identity." Review of General Psychology **7**(2): 115-149.

Brookfield, S. D. (1987). Developing critical thinkers : challenging adults to explore alternative ways of thinking and acting. San Francisco, Jossey-Bass Inc.

Guided Reflection And Professionalization/Hidden Curriculm

Cialdini, R. B. and N. J. Goldstein (2004). "Social influence: Compliance and conformity." Annual Review of Psychology **55**: 591-621.

This review covers recent developments in the social influence literature, focusing primarily on compliance and conformity research published between 1997 and 2002. The principles and processes underlying a target's susceptibility to outside influences are considered in light of three goals fundamental to rewarding human functioning. Specifically, targets are motivated to form accurate perceptions of reality and react accordingly, to develop and preserve meaningful social relationships, and to maintain a favorable self-concept. Consistent with the current movement in compliance and conformity research, this review emphasizes the ways in which these goals interact with external forces to engender social influence processes that are subtle, indirect, and outside of awareness.

Eva, K. W. and G. Regehr (2008). ""I'll never play professional football" and other fallacies of self-assessment." J Contin Educ Health Prof. **28**(1): 14-19.

It is generally well accepted in health professional education that self-assessment is a key step in the continuing professional development cycle. While there has been increasing discussion in the community pertaining to whether or not professionals can indeed self-assess accurately, much of this discussion has been clouded by the fact that the term self-assessment has been used in an unfortunate and confusing variety of ways. In this article we will draw distinctions between self-assessment (an ability), self-directed assessment seeking and reflection (pedagogical strategies), and self-monitoring (immediate contextually relevant responses to environmental stimuli) in an attempt to clarify the rhetoric pertaining to each activity and provide some guidance regarding the implications that can be drawn from making these distinctions. We will further explore a source of persistence in the community's efforts to improve self-assessment despite clear findings from a large body of research that we as humans do not (and, in fact, perhaps cannot) self-assess well by describing what we call a "they not we" phenomenon. Finally, we will use this phenomenon and the distinctions previously described to advocate for a variety of research projects aimed at shedding further light on the complicated relationship between self-assessment and other forms of self-regulating professional development activities.

Feudtner, C. and D. A. Christakis (1994). "Making the rounds. The ethical development of medical students in the context of clinical rotations." Hastings Cent Rep. **24**(1): 6-12.

Frankford, D. M., et al. (2000). "Transforming practice organizations to foster lifelong learning and commitment to medical professionalism." Acad Med. **75**(7): 708-717.

Practice organizations will increasingly engage in activities that are the functional equivalents of continuing medical education. The authors maintain that if these activities are properly structured within practice organizations, they can become powerful engines of socialization to enhance physicians' lifelong learning and commitment to medical professionalism. They propose that this promise can be realized if new or reformed practice organizations combine education and service delivery and institutionalize processes of individual and collective reflection. The resulting "institutions of reflective practice" would be ones of collegial, experiential, reflective lifelong learning concerning the technical and normative aspects of medical work. They would extend recent methods of medical education such as problem-based learning into the practice setting and draw on extant methods used in complex organizations to maximize the advantages and minimize the disadvantages that practice organizations typically present for adult learning. As such, these institutions would balance the potentially conflicting organizational needs for, on the one hand, (1) self-direction, risk taking, and creativity; (2) specialization; and (3) collegiality; and, on the other hand, (4) organizational structure, (5) coordination of division of labor, and (6) hierarchy. Overall, this institutionalization of reflective practice would enrich practice with education and education with practice, and accomplish the ideals of what the authors call "responsive medical professionalism." The medical profession would both contribute and be responsive to social values, and medical work would be valued intrinsically and as central to practitioners' self-identity and as a contribution to the public good.

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Ginsburg, S., et al. (2008). "Know when to rock the boat: how faculty rationalize students' behaviors." J Gen Intern Med **23**(7): 942-947.

BACKGROUND: When faculty evaluate medical students' professionalism, they make judgments based on the observation of behaviors. However, we lack an understanding of why they feel certain behaviors are appropriate (or not). OBJECTIVE: To explore faculty's reasoning around potential student behaviors in professionally challenging situations. DESIGN: Guided interviews with faculty who were asked to respond to 5 videotaped scenarios depicting students in professionally challenging situations. SUBJECTS: Purposive sample of 30 attending Internists and surgeons. APPROACH: Transcripts were analyzed using modified grounded theory to search for emerging themes and to attempt to validate a previous framework based on student responses. RESULTS: Faculty's reasoning around behaviors were similar to students' and were categorized by three general themes: Imperatives (e.g., take care of patients, behave honestly, know your place), Affect (factors relating to a student's "gut instincts" or personality), or Implications (for the student, patients, and others). Several new themes emerged, including "know when to fudge the truth", "do what you're told", and "know when to step up to the plate". These new codes, along with a near ubiquitous reference to Affect, suggests that faculty feel students are responsible for knowing when (and how) to bend the rules. Potential reasons for this are discussed. CONCLUSIONS: Although faculty are aware of the conflicts students face when encountering professional challenges, their reliance on students to "just know" what to do reflects the underlying complexity and ambiguity that surrounds decision making in these situations. To fully understand professional decision-making, we must acknowledge and address these issues from both students' and faculty's points of view.

Harris, I. (2011). Conceptions and Theories of Learning for Workplace Education. Extraordinary Learning in the Workplace. J. P. Hafler. Dordrecht, Springer. **6:** 39-62.

Holmes, C. L., et al. (2014). "Harnessing the hidden curriculum: a four-step approach to developing and reinforcing reflective competencies in medical clinical clerkship." Adv Health Sci Educ Theory Pract.

Changing the culture of medicine through the education of medical students has been proposed as a solution to the intractable problems of our profession. Yet few have explored the issues associated with making students partners in this change. There is a powerful hidden curriculum that perpetuates not only desired attitudes and behaviors but also those that are less than desirable. So, how do we educate medical students to resist adopting unprofessional practices they see modeled by supervisors and mentors in the clinical environment? This paper explores these issues and, informed by the literature, we propose a specific set of reflective competencies for medical students as they transition from classroom curricula to clinical practice in a four-step approach: (1) Priming-students about hidden curriculum in their clinical environment and their motivations to conform or comply with external pressures; (2) Noticing-educating students to be aware of their motivations and actions in situations where they experience pressures to conform to practices that they may view as unprofessional; (3) Processing-guiding students to analyze their experiences in collaborative reflective exercises and finally; (4) Choosing-supporting students in selecting behaviors that validate and reinforce their aspirations to develop their best professional identity.

Kawulich, B. B. (2005) Participant Observation as a Data Collection Method. Mayo 2005 **6**,

Observation, particularly participant observation, has been used in a variety of disciplines as a tool for collecting data about people, processes, and cultures in qualitative research. This paper provides a look at various definitions of participant observation, the history of its use, the purposes for which it is used, the stances of the observer, and when, what, and how to observe. Information on keeping field notes and writing them up is also discussed, along with some exercises for teaching observation techniques to researchers-in-training. URN: urn:nbn:de:0114-fqs0502430

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Kolb, D. A. (1984). Experiential learning : experience as the source of learning and development. Englewood Cliffs, N.J., Prentice-Hall.

Leape, L. L., et al. (2012). "Perspective: A Culture of Respect, Part 2: Creating a Culture of Respect." Acad Med **87**(7): 853-858.

Creating a culture of respect is the essential first step in a health care organization's journey to becoming a safe, high-reliability organization that provides a supportive and nurturing environment and a workplace that enables staff to engage wholeheartedly in their work. A culture of respect requires that the institution develop effective methods for responding to episodes of disrespectful behavior while also initiating the cultural changes needed to prevent such episodes from occurring. Both responding to and preventing disrespect are major challenges for the organization's leader, who must create the preconditions for change, lead in establishing and enforcing policies, enable frontline worker engagement, and facilitate the creation of a safe learning environment.When disrespectful behavior occurs, it must be addressed consistently and transparently. Central to an effective response is a code of conduct that establishes unequivocally the expectation that everyone is entitled to be treated with courtesy, honesty, respect, and dignity. The code must be enforced fairly through a clear and explicit process and applied consistently regardless of rank or station.Creating a culture of respect requires action on many fronts: modeling respectful conduct, educating students, physicians, and nonphysicians on appropriate behavior, conducting performance evaluations to identify those in need of help, providing counseling and training when needed, and supporting frontline changes that increase the sense of fairness, transparency, collaboration, and individual responsibility.

Loftus, E. (2003). "Our changeable memories: legal and practical implications." Nat Rev Neurosci. **4**(3): 231-234.

The malleability of memory is becoming increasingly clear. Many influences can cause memories to change or even be created anew, including our imaginations and the leading questions or different recollections of others. The knowledge that we cannot rely on our memories, however compelling they might be, leads to questions about the validity of criminal convictions that are based largely on the testimony of victims or witnesses. Our scientific understanding of memory should be used to help the legal system to navigate this minefield.

Mann, K., et al. (2009). "Reflection and reflective practice in health professions education: a systematic review." Adv Health Sci Educ Theory Pract. **14**(4): 595-621. Epub 2007 Nov 2023.

The importance of reflection and reflective practice are frequently noted in the literature; indeed, reflective capacity is regarded by many as an essential characteristic for professional competence. Educators assert that the emergence of reflective practice is part of a change that acknowledges the need for students to act and to think professionally as an integral part of learning throughout their courses of study, integrating theory and practice from the outset. Activities to promote reflection are now being incorporated into undergraduate, postgraduate and continuing medical education, and across a variety of health professions. The evidence to support and inform these curricular interventions and innovations remains largely theoretical. Further, the literature is dispersed across several fields, and it is unclear which approaches may have efficacy or impact. We, therefore, designed a literature review to evaluate the existing evidence about reflection and reflective practice and their utility in health professional education. Our aim was to understand the key variables influencing this educational process, identify gaps in the evidence, and to explore any implications for educational practice and research.

McConnell, M. M. and K. W. Eva (2012). "The role of emotion in the learning and transfer of clinical skills and knowledge." Acad Med **87**(10): 1316-1322.

PURPOSE: Medical school and residency are emotional experiences for trainees. Most research examining emotion in medicine has focused on negative moods associated with

physician burnout and poor quality of life. However, positive emotional states also may have important influences on student learning and performance. The authors present a review of the literature on the influence of emotion on cognition, specifically how individuals learn complex skills and knowledge and how they transfer that information to new scenarios. METHOD: From September 2011 to February 2012, the authors searched Medline, PsycInfo, GoogleScholar, ERIC, and Web of Science, as well as the reference lists of relevant articles, for research on the interaction between emotion, learning, and knowledge transfer. They extracted representative themes and noted particularly relevant empirical findings. RESULTS: The authors found articles that show that emotion influences various cognitive processes that are involved in the acquisition and transfer of knowledge and skills. More specifically, emotion influences how individuals identify and perceive information, how they interpret it, and how they act on the information available in learning and practice situations. CONCLUSIONS: There are many ways in which emotions may influence medical education. Researchers must further explore the implications of these findings to ensure that learning is not treated simply as a rational, mechanistic process but that trainees are effectively prepared to perform under a wide range of emotional conditions.

Mezirow, J. (1990). Fostering critical reflection in adulthood: a guide to transformative and emancipatory learning. San Francisco, Jossey-Bass Publishers.

Mezirow, J. (1990). How critical reflection triggers transformative learning. Fostering critical reflection in adulthood : a guide to transformative and emancipatory learning. J. a. a. Mezirow. San Francisco, Jossey-Bass Publishers**:** 20 p.

Moulton, C. A., et al. (2007). "Slowing down when you should: a new model of expert judgment." Acad Med **82**(10 Suppl): S109-116.

The study of expertise in medical education has tended to follow a tradition of trying to describe the analytic processes and/or nonanalytic resources that experts acquire with experience. However, the authors argue that a critical function of expertise is the judgment required to coordinate these resources, using efficient nonanalytic processes for many tasks, but transitioning to more effortful analytic processing when necessary. Attempts to appreciate the nature of this transition, when it happens, and how it happens, can be informed by the evaluation of other literatures that are addressing these and related problems. The authors review the literatures on educational expertise, attention and effort, situational awareness, and human factors to examine the conceptual frameworks of expertise arising from these domains and the research methodologies that inform their practice. The authors propose a new model of expert judgment that we describe as a process of slowing down when you should.

Mylopoulos, M. and G. Regehr (2007). "Cognitive metaphors of expertise and knowledge: prospects and limitations for medical education." Med Educ **41**(12): 1159-1165.

CONTEXT: Many approaches to the study of expertise in medical education have their roots most strongly established in the traditional cognitive psychology literature. As such, they take a common approach to the construction of expertise and frame their questions in a common way. This paper reflects on a few of the paradigmatic assumptions that have 'come along for the ride' with the traditional cognitive approach, and explores what might have been left out as a consequence. METHODS: We examine the operational definition of 'expert' as it has evolved using the traditional cognitive paradigm and we explore some alternative definitions and constructions of expert performance that have arisen in parallel education research paradigms. We address 3 inter-related aspects of expertise as manifested in the traditional cognitive approach: the construction of the expert as a (routine) diagnostician; the construction of the developmental process as the (automatic and un-reflective) accrual of resources through experience, and the construction of accrued knowledge as a relatively static resource that is subsequently used and built upon with further experience. CONCLUSIONS: We hope that, by highlighting these issues, we may

begin to marry the strengths of the traditional cognitive paradigm with the strengths of these other paradigms and expand the scope of cognitive research in medical expertise.

Sandars, J. (2009). "The use of reflection in medical education: AMEE Guide No. 44." Med Teach **31**(8): 685-695.

Reflection is a metacognitive process that creates a greater understanding of both the self and the situation so that future actions can be informed by this understanding. Self-regulated and lifelong learning have reflection as an essential aspect, and it is also required to develop both a therapeutic relationship and professional expertise. There are a variety of educational approaches in undergraduate, postgraduate and continuing medical education that can be used to facilitate reflection, from text based reflective journals and critical incident reports to the creative use of digital media and storytelling. The choice of approach varies with the intended outcomes, but it should also be determined by the user since everyone has a preferred style. Guided reflection, with supportive challenge from a mentor or facilitator, is important so that underlying assumptions can be challenged and new perspectives considered. Feedback also has an important role to enhance reflection. There is little research evidence to suggest that reflection improves quality of care but the process of care can be enhanced.

Sandars, J. and M. Homer (2009). "Impulsive response style in undergraduate medical students: implications for learning and future professional practice." Med Teach **31**(10): 958.

Sandars, J., et al. (2008). "Twelve tips for using digital storytelling to promote reflective learning by medical students." Med Teach **30**(8): 774-777.

Digital storytelling has potential to motivate students to engage in reflective learning since it uses a range of new technologies and multimedia that are more familiar to young people. The use of visual and audio media offers creative opportunities that can motivate students to develop deeper learning. A structured approach to creating a digital story is essential so that its potential is achieved.

Schön, D. A. (1987). Educating the reflective practitioner. San Francisco, Jossey-Bass.

Treadway, K. and N. Chatterjee (2011). "Into the water--the clinical clerkships." N Engl J Med **364**(13): 1190-1193.

Wilson, T. D. and N. Brekke (1994). "Mental contamination and mental correction - unwanted influences on judgments and evaluations." Psychological Bulletin **116**(1): 117-142.

We define mental contamination as the process whereby a person has an unwanted response because of mental processing that is unconscious or uncontrollable. This type of bias is distinguishable from the failure to know or apply normative rules of inference and can be further divided into the unwanted consequences of automatic processing and source confusion, which is the confusion of 2 or more causes of a response. Mental contamination is difficult to avoid because it results from both fundamental properties of human cognition (e.g., a lack of awareness of mental processes) and faulty lay beliefs about the mind (e.g., incorrect theories about mental biases). People's lay beliefs determine the steps they take (or fail to take) to correct their judgments and thus are an important but neglected source of biased responses. Strategies for avoiding contamination, such as controlling one's exposure to biasing information, are discussed.