Proposing a Model of Co-Regulated Learning for Graduate Medical Education

Jessica V. Rich, MEd

Abstract

Primarily grounded in Zimmerman’s social cognitive model of self-regulation, graduate medical education is guided by principles that self-regulated learning takes place within social context and influence, and that the social context and physical environment reciprocally influence persons and their cognition, behavior, and development. However, contemporary perspectives on self-regulation are moving beyond Zimmerman’s triadic reciprocal orientation to models that consider social transactions as the central core of regulated learning. Such co-regulated learning models emphasize shared control of learning and the role more advanced others play in scaffolding novices’ metacognitive engagement.

Models of co-regulated learning describe social transactions as periods of distributed regulation among individuals, which instrumentally promote or inhibit the capacity for individuals to independently self-regulate. Social transactions with other regulators, including attending physicians, more experienced residents, and allied health care professionals, are known to mediate residents’ learning and to support or hamper the development of their self-regulated learning competence. Given that social transactions are at the heart of learning-oriented assessment and entrustment decisions, an appreciation for co-regulated learning is likely important for advancing medical education research and practice—especially given the momentum of new innovations such as entrustable professional activities.

In this article, the author explains why graduate medical educators should consider adopting a model of co-regulated learning to complement and extend Zimmerman’s models of self-regulated learning. In doing so, the author suggests a model of co-regulated learning and provides practical examples of how the model is relevant to graduate medical education research and practice.

Patient encounters present opportunities for residents (as well as more experienced physicians) to practice self-regulated learning skills. These skills include monitoring performance in action and retrospectively reflecting on past practices, self-assessing performance, and identifying medical knowledge and technical skills that are below professional (or personal) standards of practice. Residency training cannot prepare residents to face every challenging task their qualification brings. Self-regulation skills can, however, enable residents to be effective lifelong learners in the clinical workplace. Even the most experienced physicians must learn from their clinical activities to maintain the competencies needed to practice safely. Consequently, self-regulation has become a central tenet of postgraduate residency training.

The learning context of residency training includes not only the physical location of practice (i.e., clinic, hospital ward, operating room, etc.) but also the content of the clinical problem(s) at hand, and the team of people involved in providing patient care. Learning in the clinical workplace poses many challenges for residents, who must balance the tensions of learning and patient care. Patient flow is unpredictable, creating gaps and duplication in learning opportunities. When hospitals and clinics are busy, patient care comes first—thus limiting the time available for purposeful teaching, observation, and quality feedback dialogues between residents and attending physicians.

Social transactions with patients and their families, attending physicians, and allied health care professionals are known to afford and constrain residents’ self-regulated learning activity and capacity. Given the centrality of social transactions to medical practice (e.g., emphasis on patient-centered care) and workplace learning, it is important for graduate medical education to also consider models of co-regulated learning that position social transactions at the heart of residents’ learning and development. This way, residents and more experienced physicians can be viewed as sharing the regulation of each other’s learning during collaborative tasks and mediating residents’ development of self-regulated learning competence.

Medical education research and practice are currently guided by Zimmerman’s social cognitive theory, wherein self-regulated learning takes place within social context and influence, and the social context and physical environment reciprocally influence persons and their...
behavior. However, contemporary perspectives on regulated learning are moving beyond Zimmerman’s triadic reciprocal orientation and emphasis on “self” to models describing interdependent transactional regulation or “co-regulated learning” between individuals. Co-regulation has been defined as “a transitional process in a learner’s acquisition of regulated learning, within which learners and others share a common problem-solving plane.” Individuals are thought to bring different kinds of self-regulatory challenges and expertise to the emergent moments of co-regulation, thereby influencing the quality of the shared regulation and the capacity of each person to independently self-regulate. Because of the interdependency of both parties, co-regulated learning is viewed as being transactional.

In this article, I offer a rationale as to why medical educators should consider adopting a model of co-regulated learning that brings social transactions (exchange) to the foreground of residents’ regulated learning. In doing so, I suggest a model of co-regulated learning and practical examples of how such models can be applied to medical education research and practice. I conclude by explaining the relationship between models of self- and co-regulated learning—justifying why both models are needed to fully capture the regulation of residents’ learning.

Regulated Learning From a Cognitive and Social Cognitive Perspective

As an applied field of research, medical education has been influenced by cognitive as well as sociocultural theories of learning. While cognitive learning theories tend to focus on the individual and personal changes in mental representations and cognitive structures, sociocultural learning theories emphasize interpersonal participation in communities of shared discourse, practice, and thinking. Historically, cognitive and sociocultural approaches to learning have been positioned as disparate and conflicting camps. However, to understand the intricacy and complexity of residents’ learning in the clinical workplace, medical educators are increasingly exploring research questions that span the cognitive–sociocultural divide.

Models of self-regulated learning

Along the cognitive–sociocultural divide, models of self-regulated learning can be arranged on the continuum, but tend to align more closely with the cognitive camp. This is because prominent models, including those developed by Boekaerts and Niemivirta, Borkowski and colleagues, Pintrich, Winne and Perry, and Zimmerman, emphasize internal cognitive processing and metacognitive strategies. Although each of these models acknowledges the role that social others play in developing individuals’ capacity to self-regulate learning (e.g., modeling, guided practice), none of them describes regulated learning as being a distributed, shared, or mediated process between individuals.

Generally speaking, self-regulated learning is described as an internal metacognitive ability involving muliphasic processes to direct one’s own cognitions and behavior according to internal standards and/or goals and environmental influences (including social). Learners are thought to influence themselves, others, and their physical environment by regulating their cognition, motivation, and behavior. Reciprocally, social others and environmental conditions are thought to influence learners’ ability to adopt, develop, and refine strategies to set goals, perform learning tasks, monitor performance, and evaluate performance.

Models describe self-regulated learning as a process occurring in phases, including a preparatory/preliminary phase, followed by a performance/task completion phase, and an appraisal/adaptation phase. During the preparatory phase, motivational beliefs, metacognitive knowledge of the self, and cognitive knowledge help prepare individuals for forthcoming learning opportunities. In the performance phase, individuals monitor their own performance and apply metacognitive strategies to make progress toward a goal. Lastly, in the appraisal phase, individuals self-evaluate their own performance and use the resulting feedback to guide subsequent preparatory processes. Although the phases of self-regulated learning do not necessarily occur in a strict linear sequence from preparatory planning to self-reflection on action, it is suggested that learning is more effective when forethought comes first.

Models of co-regulated learning

In contrast to models of self-regulated learning, which tend to emphasize individual agency and internal metacognitive processes, models of co-regulation stress shared control of learning and the role that more advanced others play in scaffolding novices’ metacognitive engagement. Along the cognitive–sociocultural divide, models of co-regulated learning would fall closer to, but not in, the sociocultural camp. The sociocultural camp is akin to socially shared regulation, where goals and standards are co-constructed and the desired product is socially shared cognition. Co-regulation is social, but novices are still working toward increasingly independent regulation of learning through dialogue with more capable others.

Conceptions of co-regulation in the education literature include those by Sameroff, Diaz and colleagues, Gallimore and colleagues, McCaslin, and Hadwin and colleagues. The underlying theory grounding the multiple conceptions of co-regulated learning in the education literature is Vygotsky’s zone of proximal development and internalization. For this reason, there appears to be tight conceptual agreement about co-regulation as a construct. When collaborating in a shared activity that learners cannot do on their own, but can accomplish with guidance from more capable others, novices can be supported in developing knowledge and skills, including their ability to self-regulate learning. Therefore, co-regulated learning differs from self-regulated learning in that it focuses on temporary mediation of regulated learning to promote the development of self-regulated learning ability; shared regulation of learning in the context of collaborative work (individuals mediating each other’s metacognitive and cognitive actions); and the ways in which social contexts and cultures afford and constrain individuals’ self-regulated learning activity and capacity.

Notions of Regulated Learning in Medical Education

In the medical education literature, Zimmerman’s notion of self-regulation (derived in part from Bandura's social-
cognitive theory) is a commonly used model to explain residents’ learning.\textsuperscript{2,6,12} Zimmerman\textsuperscript{11} maintains that the self is triadically and reciprocally regulated by personal, behavioral, and environmental influences. According to Zimmerman,\textsuperscript{11} self-regulatory processes (e.g., goal setting, self-direction, self-evaluation) and accompanying self-motivation beliefs fall into three phases of a self-regulation cycle: forethought; performance or volitional control; and self-reflection. In this model, self-regulation would appear to be a self-initiated metacognitive process of preparing for, interpreting, and reflecting on learning experiences, in which external social influences are internalized.

Like other theorists of self-regulated learning, Zimmerman\textsuperscript{12} acknowledges the social origins of self-regulatory competence development and the progression from more externally guided learning to more independent self-regulated learning activity over time. That said, Zimmerman does not describe learning as ever being shared, distributed, or co-regulated between individuals. Further, even though Zimmerman talks about reciprocal influence, he tends to focus on the learner’s development of metacognitive processes without delving into the interdependent influence learners have on the regulation of more competent others’ regulated learning.\textsuperscript{13}

Building from Zimmerman’s\textsuperscript{11} phases of self-regulated learning, Brydges and Butler\textsuperscript{2} proposed an integrative model of self-regulation specifically for the field of medical education. While this model situates cycles of self-regulation within nested layers of the social learning environment, it does not depict shared regulation whereby individuals mediate each other’s metacognitive and cognitive actions and capacity to self-regulate learning. As a field of research, medical education has been criticized for ignoring the complexities of social learning, favoring linear models that examine individual system components in isolation.\textsuperscript{4} This penchant for linearity likely reflects a positivistic culture and a deep-rooted belief that simple structure yields greater understanding. However, in distilling out the facet of shared regulation, one risks losing the essence of residents’ learning. A framework of co-regulated learning—emphasizing the interdependency between learners and other regulators—has potential to further medical education research and practice. One framework to consider is Sameroff’s\textsuperscript{15} unified theory of development, integrating models of personal change and co-regulation within nested and overlapping social ecologies.

**Sameroff’s Unified Theory of Development and Practical Extensions to Graduate Medical Education**

Sameroff’s\textsuperscript{15} unified theory of development presents a macro model integrating co-regulation, social context, and person change models of development (Figure 1). There are several details of Sameroff’s framework that are pertinent to recent trends and advances in competency-based medical education specifically related to the entrustment of responsibility. In the discussion that follows I will discuss each of these models as they pertain to the development of residents’ ability to self-regulate learning and provide practical extension for consideration by medical educators.

**Co-regulation, social ecologies, and personal development**

Co-regulation is the linchpin of Sameroff’s unified theory of development. It describes transactions whereby the self-system (composed of interacting biological and psychological processes) interacts interdependently with other regulators who are nested in overlapping social contexts. Similar to Bronfenbrenner,\textsuperscript{19} Sameroff describes social contexts as ecologies—for instance, as progressively more peripheral social systems within which individuals transact.\textsuperscript{13} The social groups that most immediately and directly impact the development of residents’ self-regulated learning competence include patients, other resident peers, attending physicians, physicians with leadership roles within their residency program (i.e., chief residents, program directors, academic advisors), and allied health care practitioners within the hospital community. More peripheral influences on the regulation of residents’ learning would include the university community, accreditation and regulatory bodies.

Overlapping social ecologies represent the social context of collaborative learning between self and other regulators.\textsuperscript{15} During collaborative work, residents and more experienced physicians mediate one another’s metacognitive and cognitive actions and thus their ability to independently engage in self-regulated learning. When engaging in a collaborative task (e.g., reviewing a patient’s chart or a resident’s portfolio), either individual may initiate co-regulated learning by requesting information, requesting judgments of learning, summarizing or paraphrasing, modeling thinking, and/or providing prompts for thinking and reflecting.\textsuperscript{17}

Increasingly, workplace assessments, electronic portfolios, required reflections, and progress meetings are being used as external mechanisms to regulate

---

**Figure 1** Sameroff's unified theory of development, depicting co-regulation (distributed regulation of learning between the biopsychological self-system and that of more-capable others); overlapping social ecologies (the social context of collaborative learning between self and other regulators); and personal change over time (short periods of rapid change in the relative proportion of regulation by one's self and others over time, followed by longer periods of modest growth).

Source: This figure has been reproduced with permission from John Wiley and Sons publishing from Sameroff A. A unified theory of development: A dialectical integration of nature and nurture. Child Dev. 2010;81:6–22.
residents’ learning.36,38 Such educational interventions can also provide residents with structured opportunities to reflect, self-assess, and plan their learning. They also serve as mechanisms to spur dialogue between residents and more senior physicians in academic teaching and supervisor roles. Through reviewing portfolios with residents, co-regulating workplace assessment results and feedback, and engaging in deliberate mentoring, these more senior physicians are co-regulating residents’ learning. In essence, educational interventions are being used to catalyze the co-regulated learning process and scaffold residents’ development of self-regulation competence.

Residency programs shifting toward competency-based medical education frameworks (e.g., the Accreditation Council for Graduate Medical Education Milestones 2015, CanMEDS 2015) are beginning to describe the performance outcomes expected of residents at significant transition points in training along the developmental continuum (e.g., transition to discipline, foundations of discipline, core of discipline, transition to practice).37,38 The transitions that lead from one developmental stage to another are marked by rapid periods of growth (i.e., steep learning curves) as more responsibility for patient care is released or entrusted to residents. When growth plateaus and there are long periods of stasis, this may be an indication of mastery, at which point more responsibility should be entrusted to scaffold continued growth. This punctuated equilibrium is a key feature of Sameroff’s model of development (Figure 1). As residents succeed at taking on increasingly more responsibility for their own learning and for patient care, they eventually reach a point in which they can become part of the other-regulation of a more novice resident for particular entrustable professional activities (EPAs).39

With more advanced stages of training come more complex EPAs, creating pressures for a new equilibrium between regulation of learning by self and others. In essence, co-regulation by more experienced physicians allows for residents to practice self-regulation during increasingly complex experiences and provides a safety net for when self-regulation fails. Increasingly, global entrustment scores are being used to summarize and communicate the level of supervision a resident requires for a specified unit of professional practice.39 Before revising their workplace assessment tools, medical educators may consider asking themselves two questions: Does a rating scale capture and convey the nuances of the delicate balance between regulation of learning and performance by resident and supervisor? And to what extent do characteristics of the trainee, the supervisor making the entrustment decision, the current context or circumstances, the task or activity, and/or the relationship between trainee and supervisor also need to be commented on and described? These are just two examples of important questions that come to mind when looking at the regulation of residents’ learning from a socio–interpersonal lens.

Should Medical Education Shift Away From Focusing on Self-Regulation?

All of this is not to say that medical educators should abandon Zimmerman’s conception of self-regulated learning. Rather, I am suggesting that models of self- and co-regulated learning are needed to fully explore and understand the regulation of residents’ learning. Not only do these models shine light on different aspects of regulated learning but they also present different ways of approaching the same challenge: helping learners to learn more efficiently. Whereas Zimmerman’s focus is on the individual, and the metacognitive subprocesses involved in self-regulation, Sameroff’s focus is on social transactions between self- and other co-regulators and mediation of the proportion of regulation by self and others over time. Zimmerman’s micro and Sameroff’s macro models can therefore be viewed as complementary lenses, representing the integration of more cognitive–intrapersonal and socio–interpersonal components of regulated learning.

Moving forward, it is important to keep in mind that like Zimmerman’s models, Sameroff’s model was not developed with graduate medical education in mind. Therefore, it will be important to conduct research on the transferability of this particular model of co-regulated learning to adult physician trainees and their development of self-regulated learning competence in the clinical workplace. For instance, future research could investigate the extent to which changes in the relative proportion of regulation by residents and more experienced physicians map onto the developmental stages of residency training involving more complex EPAs.

Weaving Together Self- and Co-Regulated Learning

As noted by Hadwin and Oshige,13 perspectives on self-regulated learning have evolved to consider co-regulatory models, where, in many instances, the social context becomes more central, rather than taking the peripheral position in Zimmerman’s and other’s (e.g., Winne’s) earlier work. Similarly, over time the social context has become increasingly important to medical education research and practice.6,40,42 However, medical education has been slow to adopt a model of regulation that positions social transactions at the central core of learning. An appreciation for co-regulated learning is important for moving medical education research and practice forward—especially given the momentum of new innovations regarding entrustment (e.g., EPAs and entrustment scales). At the heart of entrustment decisions are transactions between residents and more experienced physicians. The people with whom residents transact, the quality of those transactions, and the feedback obtained are critical for moderating the performance of both learners and educators and for developing residents’ ability to self-regulate learning in context.3,43 A model of co-regulated learning can be applied to research exploring the factors that contribute to and impede a dialectic relationship between residents and their co-regulators. Such findings may assist residents and medical educators to monitor and adjust the interplay of regulation by self and others over time, as well as their approach, so that residents are entrusted with appropriate levels of responsibility and work safely within their zones of proximal development.44

In Summary

In medical education, most of the rhetoric is about “self”-regulation.2,11,12 In recognition of the social transactions that occur between residents and more capable others, the aim of this article has been to advance conceptual understanding of regulated learning by introducing a model of co-regulated learning to graduate medical education discourse. Sameroff’s model extends contemporary thinking about self-regulation by acknowledging the interdependency between learners and
other regulators during learning moments and the changes in the relative proportion of regulation by one’s self and others over time. A model of and appreciation for co-regulated learning will serve medical educators well the new era of competency-based medical education and entrustment.

Acknowledgments: The author wishes to thank Dr. Rena Upitis and Dr. Sue Fostaty-Young for their guidance and feedback in preparing this manuscript.

Funding/Support: The Social Sciences and Humanities Research Council of Canada (SSHRC) supported the author’s doctoral studies.

Other disclosures: None reported.

Ethical approval: Reported as not applicable.

Previous presentations: Roundtable discussion at the Rosa Bruno-Jofré Symposium in Education, Faculty of Education, Queen’s University, February 26, 2016.

References