Self-Regulated Learning

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Introduction

Several assumptions undergird my research program. First, one way people learn relies on innate features of our cognitive architecture. Like Pavlov's dogs, who learned a novel stimulus (a bell) could forecast food or Skinner's pigeons who learned to behave in particular ways (pecking button on a wall) under particular conditions (when a red light but not a green light was illuminated) to obtain food, we assemble information in the world to create knowledge in our minds. Second, people also learn using cognitive tools. These tactics and strategies are kinds of information of a procedural sort. One example is using mnemonics, like ROY G BIV for colors in the visible spectrum of light in order of wavelength. Another is using schemas that describe a task, like checking whether an explanation of an effect is complete by identifying its cause, describing boundaries within which the cause produces the effect, and providing a rationale for the causal relation that conforms to a larger conceptual structure, a theory. Third, students have goals for their learning. Goals can be primal, like dogs' and pigeons' hunger. Also, goals can have human sophistication, such as figuring out how to study with minimal effort and time. Fourth – here is where my research has focused for the past quarter century – students are learning scientists. Like "professional" learning scientists, students construct organized accounts about knowledge and about various learning mechanisms – working memory, forgetting. They use these to design theories about why learning works as it does. Students also engineer interventions they theorize can help them reach their goals for learning:

"Background music helps me learn," or *"I can skip what seems familiar."*

Then, they carry out experiments on the effects of their cognitive tools. They gather data from those experiments, analyze the data, interpret findings and plan how to make learning better – whatever "better" means for each of them. In the terminology of learning science, students are self-regulating learners.

I investigate learners' theories about learning and, especially, how they self-regulate learning. Whether they study the Peloponnesian Wars, stereochemistry or Shakespeare's comedies, I want to discover what innate operations are in play, which goals learners set, which cognitive tools they use and, especially, how they design and carry out a personal program of research about tools for learning they predict will optimize their ability to reach their goals. Across the broad range of my and many colleagues' research on these topics, thought-provoking yet disheartening findings have emerged. For example, on average, learners learn less well than they might. In part, this is because they have misconceptions about innate mechanisms of learning that mislead them to study ineffectively. Many learners are disadvantaged because they have an impoverished toolkit of learning tactics and strategies. Most learner's recollections about how they study are incomplete and biased, a poor reflection of what they actually did. Few learners are skilled in the scientific method needed to carry out a revealing program of research. While all learners are self-regulating learners, these findings explain why productive self-regulated learning is not common.

Can learning science help? I believe so. Facets of my research program identify and track the particular effects of such difficulties that beset learners. I have developed and tested models of innate processes learners have. Mine is a small set of operations on information that help learners to become SMART: searching, monitoring, assembling, rehearsing and translating (Winne, 2005). Second, I have cataloged cognitive tools learners use as well as tools learning science has discovered that are backed by empirical evidence they work (Winne, 2013). Third, I have traced goals learners have (Zhou & Winne, 2012). Fourth, I have designed and built support systems – software called nStudy – to help learners become better learning scientists (Roll & Winne, 2015; Winne, 2010; Winne & Baker, 2013).

Alongside my theoretical and empirical work, nStudy is one of my most significant endeavors – see http://www.sfu.ca/edpsychlab.html. As well as being software that supports learning per se, it is a scientific instrument that records *every* observable action a learner carries out while studying online content. For example, when a learner highlights text on a web page, that event is comprehensively logged: What text was highlighted? In what web page was the text? When (to approximately 1/100th second) was that content highlighted? Data at this fine grain fuses information the learner cognitively operated, documents motivation to apply a cognitive or metacognitive operation at that time, and represents which cognitive or metacognitive tool was used. nStudy's data allow me to better research how learning unfolds. Along with learning analytics (analyses of many learning events that yield results learners can use to productively shape a line of personal research) developed using nStudy's data, I research how to help learners forge a personal, progressive program of research about making self-regulating learning more productive.

Colleagues and I have just received a new SSHRC grant to explore how to support productive self-regulated learning when learners encounter problems in finding, mining, and using information in complex projects like researching a term paper or constructing a business plan. The challenge of this topic is large. If you're interested to learn more or to join us, please contact me: winne@sfu.ca.

References

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