Chapter 30
Assessment of Task Persistence

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ABSTRACT

Task persistence is defined as the continuation of activity in the face of difficulty, obstacles, and/or failure. It has been linked to educational achievement, educational attainment, and occupation outcomes. A number of different psychological approaches attempt to explain individual and situational differences in persistence and there is mounting evidence that interventions can be implemented to increase persistence. New technological capabilities offer the opportunity to seamlessly gather evidence about persistence from individuals' interactions in digital environments. Two examples of assessment of persistence in digital games are presented. Both demonstrate the ability to gather information without interruption of activity and the use of in-game actions as evidence. They also both require consideration of the student/player model, task model, and evidence models. A design pattern outlining each of these elements is presented for use by those considering assessment of persistence in digital environments.

INTRODUCTION

Task persistence is most simply defined as continuing with a task despite obstacles, difficulty, and/or failure. In the cognitive literature, persistence is generally classified as an element of executive function and thought to be related to self-regulated attention and response inhibition (Schmeichel, 2007). In the temperament literature, persistence is viewed as a biologically-based tendency to persevere in conditions of partially reinforced behavior, resisting extinction (Cloninger, Svrakic, & Przybeck, 1993). In personality literature, it is described as an aspect of conscientiousness (Shute & Ventura, 2013), related to but not identical to grit (Duckworth, Peterson, Matthews, & Kelly, 2007). In the motivation literature, persistence is related to mastery goals and a growth mindset in which failure is viewed as an opportunity to learn, rather than evidence of personal shortcomings (Dweck, 2006).

It could be argued that persistence in not a "new" skill in the 21st century workplace, given that there was a historical review of the literature on measurement of persistence written in 1939 (Ryans, 1939). However, it is often enumerated in lists and discussions of 21st century skills and attributes (Fadel, 2011; Pellegrino & Hilton, 2012),

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because jobs in the 21st century are increasingly complex, requiring sustained application of effort to complete multifaceted tasks (Andersson & Bergman, 2011).

Task persistence is of particular interest and importance because it has been shown to be predictive of many academic and employment outcomes, including adult educational attainment, income, and occupational level (Andersson & Bergman, 2011). The relationship between persistence and academic achievement has been repeatedly documented (Boe, May, & Boruch, 2002; Deater-Deckard, Petrill, Thompson, & DeThorne, 2005; McClelland, Acock, Piccinin, Rhea, & Stallings, 2013). It is hypothesized that willingness and ability to persist or persevere increases an individual's opportunities to learn from the environment (Sigman, Cohen, Beckwith, & Topinka, 1987).

This chapter will begin with a review of definitions of task persistence from multiple theoretical perspectives. The second section will explore the relationship between task persistence and educational and occupational outcomes. A third section will examine evidence for interventions that impact an individual's persistence.

The fourth section will review methods of assessment of persistence, focusing on how new technological capabilities allow us to gather evidence about persistence seamlessly from individuals' interactions in digital environments. It will specifically explore two projects that used log file data from game play to assess persistence, leading to a discussion of issues related to game-based assessment. Games potentially provide a means to assess 21st century skills that are difficult to assess via traditional means. A final section will propose a design pattern for the assessment of persistence in digital environments that can help those interested in creating performance-based measures of persistence consider the important elements of definition, tasks, and evidence.

DEFINITION OF PERSISTENCE

Given a fairly simple definition of persistence as the continuation of an activity in the face of difficulty or failure, it is interesting to note the number of different conceptualizations and explanations for its presence or absence. This section will review explanations of persistence from cognitive, temperament, personality, and motivational perspectives.

Cognitive Perspective

From a cognitive perspective, persistence is related to executive control and self-regulation. Persisting at a task requires executive control processes including focusing attention, inhibiting the impulse to give up, and updating working memory to meet the requirements of a task (Schmeichel, 2007). Executive control processes are theorized to control the selection, initiation, execution, and termination of tasks (Logan, 1985; Meyer & Kieras, 1997; Shiffrin & Schneider, 1977). In the cognitive perspective, persistence is closely linked with sustained attention, or the ability to engage attention on a task for an extended period of time despite distracting external or internal stimuli. Research suggests that ability to sustain attention is related to broad executive control measures rather than individual working memory or response inhibition measures by themselves (Unsworth, Redick, Lakey, & Young, 2010).

Interestingly, research suggests that the capacity for executive control is not constant and that prior efforts requiring significant levels of executive control can reduce the ability to exercise those resources in the immediate future (Schmeichel, 2007). For example, people who forced themselves to eat radishes rather than chocolate chip cookies subsequently quit faster on unsolvable puzzles than those who did not have to resist eating the cookies (Baumeister, Bratslavsky, Muraven, &