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Harnessing the Power of Technology to Enhance Financial Literacy Education and Personal Financial Well-Being: A Review of the Literature, Proposed Model, and Action Agenda

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Abstract

The development and use of technology-based tools for financial literacy education has grown rapidly in recent years, often based on the presumption that digital media will enhance past practice. However, little attention has been given to understanding why such technologies may be expected to enhance outcomes for either general or vulnerable populations. This literature review fills this gap by examining behavioral and educational theories that provide insight into how digital pedagogies may support personal-finance-related teaching and learning. The authors present an ecological model for technology-based financial literacy education intervention and propose an action agenda for practice and further research.

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The number of technology-based tools for providing and accessing personal finance education has grown exponentially in recent years (see, for example, the Jump$tart Coalition for Personal Financial Literacy searchable clearinghouse at http://jumpstart.org/jump$tart-clearinghouse.html). This is due to a growing public awareness of personal financial vulnerability that has accompanied the recent national and international economic downturn (MSNBC 2008) as well as educational policy responses, such as the expansion of state standards for K-12 personal finance education (Council for Economic Education 2009). Nonprofit organizations and educational entrepreneurs have sought to meet the growing demand for instructional resources as have for-profit concerns interested in marketing financial services (see for example, Visa Financial Football and Financial Soccer at www.practicalmoneyskills.com/games/trainingcamp and tips and tools offered by online bank ING Direct at http://home.ingdirect.com/privacy/privacy.asp). The rush to embrace technology-based educational resources is frequently also based on a presumption that digital media, such as computer games, simulations, interactive tutorials, and virtual learning environments, will improve past practices, which have thus far not yielded consistent evidence of effectiveness for either youth or adults (McCormick 2009).

The problem is that little attention has been given to understanding *why* technology-based tools and strategies may be expected to improve financial literacy or personal financial outcomes. The literatures that may help advance such understanding are diverse and have not yet been well examined and integrated in terms of applicability to financial education and personal financial well-being. This report is designed to fill this gap by examining behavior theories and

their applicability to financial literacy education, as well as theoretical perspectives about learning and educational motivation that can inform the selection and design of digital pedagogies to support personal-finance-related teaching and learning. Such insights should be helpful in designing financial literacy interventions generally, but they arguably may be particularly important for financially vulnerable populations.

Theories of Behavior and Personal Finance Education

Braunstein and Welch (2002) pointed out nearly a decade ago that while acquiring additional information can lead to improved financial behavior, it cannot be counted on to do so automatically. Research has shown that individuals and households do not always act in ways consistent with their best financial interests even when they have accurate financial information. Although there are a few notable examples of programs with a behavioral component (e.g., Lusardi et al. 2009; Sherraden et al. 2009), financial education has most frequently been focused on enhancing knowledge (or knowledge, attitudes, and skills) related to specific personal finance topic areas, such as money management, banking, credit, saving, investment, insurance, and taxes rather than behavior per se (Coussens 2006; McCormick 2009; Vitt et al. 2005).

When the importance of behavior is acknowledged, financial behavior is often presumed to follow from improved understanding of financial concepts. Definitions for the field reflect the importance of action, but also commonly reflect an implied link between knowledge and action. The President's Advisory Council on Financial Literacy (2009), for example, recently defined financial literacy as 'the ability to *use* [emphasis added] knowledge and skills to manage financial resources effectively for a lifetime of financial well-being,' but financial education is defined as 'the process by which people improve their understanding [*knowledge*] of financial

products, services and concepts, so they are empowered [*somehow*] to make informed choices, avoid pitfalls, know where to go for help and take other actions to improve their present and long-term financial well-being' (p. 4). While the interest is clearly in enabling individuals to take action (engage in behavior) that will lead to financial well-being, little guidance has been available about how to enhance the likelihood that knowledge and skills acquired within financial education programs will lead to desired (or desirable) financial behavior.

In terms of what people know about financial literacy on their own, an extensive body of research on consumer and economic socialization, or on how people gain consumer and economic competence, does exist (see, for example, John 1999; Lunt and Furnham 1996). However, as Beutler and Dickson (2008) point out, much of this research has focused on illuminating the development of children's consumer and economic understandings (for example, of concepts such as money, process, profit, supply and demand, property ownership, and choice) using theories of cognitive development rather than examining the factors (including conceptual understandings) that influence behavior.

Some inroads have been made in clarifying the external influences of agents, such as the family and school on economic behavior. Webley and Nyhus (2006), for example, found a positive correlation between children's savings behavior and two family characteristics: parents discussing financial matters and parents having a future orientation. Bernheim and colleagues (2001) demonstrated a link between state-mandated financial education in high school and later increased household savings. And Hibbert and colleagues (2004) discovered a relationship between college students' debt-avoidance behavior and financially prudent behaviors in their families of origin. The gap that remains, though, is that few of these studies have attempted to

systematically examine how or why these and other factors exert such effects on financial behavior.

One body of literature that may help fill this void is human behavior theory, which offers a variety of explanations for how behaviors are actually formed and why. The relevance of behavior theory to consumer financial behavior has long been recognized (see, for example, Xiao 2008). And behavior theories have been applied extensively in a number of other fields, such as health behavior and education specialties (Glanz et al. 2008) and nutrition education (Contento 2010). However, researchers are only beginning to explore how behavior theory could be used to advance personal finance education research and development (Way and Holden 2009b; Xiao 2008). Examining the utility of behavior theories for designing financial education programs and activities and assessing their impact was, in fact, identified as a priority at the National Research Symposium on Financial Literacy and Education convened in 2008 by the U.S. Department of the Treasury and U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service (Schuchardt et al. 2009). The following section outlines a sample of key behavior theories and discusses their potential applicability to personal finance education.

Behavior Theories and Points of Intervention for Financial Education. One way of thinking about how behavior theories could enhance financial education research and development is to start by examining the units of practice within which they could be applied. There are a number of models that seek to explain the development of behavior in terms of the attributes of individuals, others that emphasize the etiology of behavior in terms of interpersonal interactions, and still more that shine the spotlight on the role of group and community dynamics. There are also models that focus on broader patterns of public thought reflecting norms and values and how to change them to affect behavior.

Although these behavior theories are typically presented as distinct, some contain overlapping constructs. And while different behavior theories may be best suited to different units of practice, researchers and practitioners may also find them complementary to the point where they may choose to employ more than one at a time for a given research or development initiative or as a comprehensive strategy to effect specific behavior change. An approach to financial education that attended to the role of individual, interpersonal, and societal contributions to the development of financial behavior would, in fact, be consistent with the trend toward the application of ecological models to research and practice aimed at improving other domains of well-being, such as health and nutrition. The combination of personal, interpersonal, organizational, community, and policy intervention strategies has, for example, been credited with producing the reductions seen in tobacco use in the United States over the past few decades (Institute of Medicine 2001). A visual depiction of these potential points of intervention, and their relationships is shown in Figure 1.

Figure 1 here

One of the best-known articulations of ecological systems theory is that advanced by Urie Bronfenbrenner (1977). Bronfenbrenner's framework, which draws heavily on the theoretical work of Kurt Lewin (1936, 1951) posits that individual development occurs as a result of 'the progressive, mutual accommodation, throughout the life span, between a growing human organism and the changing immediate environments in which it lives, as this process is affected by relations obtaining within and between these immediate settings, as well as the larger social contexts, both formal and informal, in which the settings are embedded' (Bronfenbrenner, 1977,

p. 514). Bronfenbrenner posits that the environments within which an individual develops exist topologically as a nested arrangement. They include the microsystem, the immediate setting containing the individual, such as the family or classroom; the mesosystem, the interactions between microsystems such as relationships between the family system and the work or school system; the exosystem, an extension of the mesosystem encompassing other social structures that do not themselves contain the developing individual, for example, the world of work more broadly and the educational system; and the macrosystem, the broadest environment which does not actually contain the individual but includes the overarching ideological systems of the culture that give meaning to particular agencies, social networks, roles, and their interrelations.

An ecological perspective may be useful as a heuristic for thinking about the ways in which technology may be employed to support learning aimed at enhancing financial literacy and well-being. As will be discussed in a subsequent section, it has long been recognized that learning takes place within a variety of contexts, including those that can be characterized as formal, informal, and nonformal. Taking account of the variety of contexts for learning and development and the potential ways in which they may interact to support personal-finance-related learning seems particularly relevant given that newer technologies are increasing the speed and ease with which individuals may access and transition between and among learning contexts, both sequentially and simultaneously.

Before moving to how newer technologies might be applied specifically to support learning in financial education initiatives however, we first turn to the models that may help understand and predict financial behavior and the potential role that education can play in it. Examples of some of these models that are both well articulated and particularly promising for

future research and development in this area are described below, beginning with models focused on the behavior of individuals.

Sample Models of Individual Behavior

Theory of Reasoned Action, Theory of Planned Behavior, and Integrated Behavioral Models. The theory of reasoned action (TRA) and the theory of planned behavior (TPB) give attention to how motivational factors contribute to the likelihood that someone will engage in a specific behavior. The TRA, originally articulated by Fishbein and Azjen (1975), was motivated by a recognition that attitude theories of the day were not good predictors of behavior (Ajzen and Fishbein 1980). Both the TRA and the TPB assert that it is actually one's intention to behave in a certain way that most directly predicts behavior and that those intentions are determined by one's attitude toward the behavior and subjective norm associated with the behavior. This has frequently been referred to as the expectancy-value concept and applied widely in psychology in such areas as learning and decision making (e.g., Rotter 1954; Edwards 1954).

Within the TRA, attitude is comprised of a person's beliefs about the outcomes likely to be associated with engaging in the behavior (*behavioral beliefs)* weighted by his or her evaluation of the desirability of the outcomes. Subjective norms are composed of one's beliefs about how close associates would feel about performing the behavior (*normative beliefs)*, weighted by one's motivation to act according to those norms. Thus, someone who strongly believes that investing part of one's income regularly over a long time, regardless of what the stock market is doing now, will result in asset accumulation (behavioral beliefs) and who believes that accumulating a 'nest egg' will result in a happy retirement (evaluation of behavioral outcome) will have a more positive attitude toward 403b program participation than someone who believes either that stock market investments in general are too risky or that retirement

resources aren't that critical to a happy retirement. On the other hand, an individual who believes close family members would disapprove of reducing current available income in favor of saving for retirement (normative beliefs) and who cares a great deal about what family members think would have a negative subjective norm relative to intention to perform the behavior—save for retirement.

After the initial formulation of the TRA, the model was extended to include perceived control as another determinant of intention and behavior in the model (Ajzen 1991, 2002) and renamed the TPB. The addition was meant to account for factors outside one's individual control that may affect intentions and behaviors and the idea that behavior is a function of both motivation and ability (Ajzen 1991). Perceived control is comprised of beliefs about the factors that may serve to impede or facilitate the behavior *(control beliefs)* weighted by the perceived potential impact of each of these factors. In the area of personal finance, control-related factors may include such things as the spending habits of other family members (spouse, children) or access to financial services providers, such as banks, investment advisers, or payroll offices.

The role that identifying beliefs can play in personal finance education is illustrated in a study recently conducted by Lusardi and colleagues (2009). These researchers devised a program to increase retirement saving among female and low-income employees at Dartmouth College. Part of the strategy was to identify beliefs that may serve as barriers to opening a supplemental retirement account (SRA) and then provide solutions to participants using a flyer that printed obstacles on one side and accompanying solutions on the other. Understanding the different kinds of beliefs and value formulations that may contribute to behavioral intentions may permit development of an even more comprehensive intervention strategy, particularly if it were provided via interactive digital media that could permit further individualization. For example,

the Lusardi et al. study elicited nine beliefs from potential program participants about barriers to opening an SRA. A number of control beliefs were identified as obstacles to SRA participation, such as 'I do not have a computer,' 'I don't know where to put the money,' and 'I have no time now.' Only one normative belief was included, 'few people like me do it,' and no beliefs that could be explicitly characterized as behavioral beliefs. However, for any given individual, there may be additional behavioral or normative beliefs that are relevant, and it may actually be one of these that are most salient relative to the other belief categories—for example, a normative belief that 'my spouse or children would object to me reducing my paycheck now.' This is not to criticize past research, of course, but rather to point out how the TRA and TPB may contribute to future interventions and research aimed at enhancing financial behavior.

Recently, Montano and Kasprzyk (2008) proposed a further extension of the TRA and TPB frameworks and termed it the integrated behavioral model (IBM). The IBM includes many of the core concepts of TRA and TPB, but adds four additional constructs that have been posited to directly affect behavior (Jaccard et al. 2002). The four added concepts, which together with intention are depicted as directly affecting behavior, are the knowledge and skills needed to perform the behavior, the salience of the behavior to the individual, environmental constraints, and experience performing the behavior (habit). The three categories of factors contributing to behavioral intention are quite similar to TRA and TPB but differ in some ways. First, attitude, which is defined as how favorably or unfavorably one feels about performing the behavior, is characterized as having two dimensions—an experiential or affective component and an instrumental or cognitive component. The former refers to one's emotions or feelings about the behavior and the latter to beliefs about outcomes associated with the behavior. In the IBM, perceived norm refers to the social dimensions associated with the behavior (e.g., peer pressure)

and includes both an injunctive norm (what others think one should do and likelihood of complying) and a descriptive norm (how others are behaving themselves). Bagozzi and Lee (2002) have pointed out the important role that social influence plays in behavior and the multiple ways in which that influence is dispensed and felt. Finally, in the IBM the perceived control factor of TRA and TPB is placed within a somewhat larger conceptual category termed 'personal agency.' Agency in the IBM model consists not just of perceived control over behavioral performance as determined by factors that may serve as barriers or facilitators, but also includes self-efficacy, or how confident one is that he or she has the ability to perform the behavior despite barriers or obstacles.

While categories of beliefs in the TRA and TPB models may be more or less salient for given individuals, it should also be pointed out that the relative importance of the three categories of constructs in the IBM (attitude, perceived norm, personal agency) may vary for different behaviors as well as for different individuals and populations. This is particularly relevant to work with vulnerable populations. Several studies have shown, for example, that women, who often fare less well than men after divorce or the death of a spouse (Schmeiser 2010) are more risk averse than men when it comes to investments (Hira and Loibl 2008). And a growing body of research on the financial behavior of Hispanic Americans, who experience poverty rates that greatly exceed the national average (DeNavas-Walt et al. 2009), suggests that this population differs in important ways from others in terms of how they manage their money and why (Watchravensringkan 2008). For example, Rhine et al. (2006) found that although cost is a reason that Hispanic Americans avoid banks and use check-cashing businesses, other important reasons are that they do not trust banks and want to maintain their privacy.

The IBM, then, suggests some further avenues for financial education interventions and research. These are to give attention to the three categories of factors that may affect behavioral intention (attitudes, perceived norms, and personal agency); consider how these factors may vary in importance for individuals and population subgroups; and consider that prior knowledge and skills, salience of the behavior, environmental constraints, and prior experience with the behavior (habit) may all affect behavioral outcomes. Before leaving this set of individual models, it seems worth pointing out that there are a growing number of technology-based tools available for helping young children develop the saving 'habit.' Two of these are Ekomini, an interactive game that includes an electronic piggy bank that connects to a computer, and threejars.com, a website designed to help children practice the basics of money management—saving, spending, and sharing.

Transtheoretical Model of Change. The transtheoretical model of change (TTM) was developed in the early 1980s by Prochaska and colleagues (1984) who, at the time, were attempting to analyze leading theories of psychotherapy and behavior theory and apply them to the study of individuals engaged in smoking cessation. The TTM has since been used in research and practice covering a broad array of health and mental health behaviors and, in the last decade, has begun to be applied to financial behaviors as well (e.g., Loibl and Hira 2007; Shockey and Seiling 2004; Xiao, Newman, et al. 2004; Xiao, O'Neill, et al. 2004). TTM outlines six stages of change and 10 processes that are associated with behavior change and also posits a role for three other constructs: decisional balance (how a person weighs the pros and cons of changing), self-efficacy (ability to cope with risky situations involving the behavior), and temptation (the intensity of the urge to engage in converse behavior). One important attribute of the theory is its recognition that behavior change should not be thought of as a discrete event, such as starting to

save for retirement, but rather as something that emerges over time. Another important aspect is that people engage in a number of obvious and less-obvious activities as they move toward and into new behaviors.

One implication of the theory is that behavior change can be supported by understanding the stage of change at which an individual is located and then designing interventions that assist individuals with the processes that are used to move from that stage to the next. The stages of change and processes of change associated with them are outlined in Table 1 (Prochaska et al. 1992).

Table 1 here

Recognizing that changing one's financial behavior is a process rather than an event should prove useful in identifying new ways that technology might be employed to design educational programs that more strategically move people toward the action and maintenance stages of change. When it is possible to work with individuals, this may take the form of providing interventions tailored to the person's stage of change. Di Noia et al. (2008), for example, recently designed a computer-based program aimed at increasing fruit and vegetable consumption among low-income urban teenagers attending community-based afterschool sites. Lessons were tailored based on the youth's stages of change identified through an initial assessment. Stages of change theory could also be used to structure financial coaching interventions, such as those reviewed by Collins (2010), but using technology-based messages (e.g., e-mail or Twitter) tailored to the individual's financial issues and stage of change in addressing the issues. Even if it is not possible to work with individuals, the framework can still

be useful in sequencing activities in a stepwise manner. For example, a program to increase college savings might begin with video-based social marketing 'ads' aired at strategic times and locations, such as during middle and high school student and parent orientation sessions, followed by skills training on paying for college, assistance in setting up college savings accounts, and finally, establishment of an ongoing Internet forum focused on college saving tips and strategies. Intervention strategies suggested by one theoretical framework (such as TTM) could be combined with others (such as those discussed earlier in relation to the TRA and TPB, identifying and overcoming obstacles to action) for even greater impact.

Sample Models Focused on Interpersonal Behavior/Interactions with Others

Social Cognitive Theory. Rather than focusing primarily on an individual's characteristics as determinants of behavior, social cognitive theory (SCT) posits that behavior is a function of the dynamic reciprocal interaction between and among personal, behavioral, and environmental factors. Building on the work of Miller and Dollard (1941) and Rotter (1954), Albert Bandura (1977) originally termed the framework 'social learning theory' to reflect its focus on learning within the social context. He later refined it to incorporate concepts from cognitive psychology and renamed it SCT (1986). More recently, Bandura has emphasized the central role of human agency or self-efficacy in the theory, identifying methods for increasing self-efficacy (1997) and expanding the idea to include not only direct personal agency, but also proxy and collective agency, all of which enable people to exercise greater control over their destinies (2001). SCT has thus far been widely applied in fields such as marketing, public health, and education (Shegog et al. 2005).

A number of concepts are identified in SCT as key determinants of behavior. Central tenets associated with these concepts are that: 1) consequences are important determinants of

behavior but that cognition (e.g., intentionality, self-regulation) plays a mediating role between environmental stimuli and one's responses; 2) people can learn by observing others and not just by engaging in behavior themselves, and 3) people are more likely to imitate behavior exhibited by others whom they perceive to be most like themselves. Although there are numerous descriptions of SCT, most articulations contain specific concepts reflecting psychological determinants of behavior (e.g., outcome expectations self-efficacy, collective efficacy), observational learning, environmental determinants of behavior (e.g., facilitation, incentive motivation), and self-regulation/self-direction. Table 2 provides definitions for these concepts and examples of how they may apply to financial literacy education aimed at increasing financial security.

Table 2 here

SCT is useful in identifying ways in which technology may contribute both negatively and positively to financial behavior in the course of day-to-day living and in application to financial literacy education. A study of electronic commerce (LaRose 2001), for example, utilized SCT to identify ways in which e-commerce features may contribute to compulsive buying by disrupting typical means for engaging in effective self-regulation. Such features include enhanced quantity and intrusiveness of product-related sensory cues, spontaneous product recommendations, and delayed product delivery times. On the other hand, LaRose pointed out that some features of e-commerce sites may serve to nurture positive financial behavior. For example, online search engines facilitate product comparisons and wish lists may help defer buying urges.

Bandura (1997) has identified a number of additional specific strategies that may be useful in increasing self-efficacy, one of the concepts of social cognitive theory (see also Bandura 2001). These strategies include providing *mastery experiences* to enable the person to succeed in desired behaviors; providing social *modeling* to show that others like themselves are able to demonstrate the behavior; improving *physical and emotional states* by ensuring people are comfortable and by reframing negative emotions; and offering *verbal persuasion,* encouragement that the individual can perform the targeted behavior or goal. There are a number of personal finance education resources that illustrate how technology may support efforts of this kind. Ekomini (Racine and Racine 2009) is an example of an interactive computer program that has been designed to teach elementary school-age children about saving and provide opportunities for actual practice in earning, saving, spending, and sharing through use of an interactive 'piggy bank.' Mr. Earl—If He Can Do It, So Can You (Investor Protection Trust 2009) is one of a number of videos produced by the nonprofit organization Investor Protection Trust to model how individuals with even modest means can develop wealth over time and without engaging in risky financial behavior. Another video produced by the same organization, Mythbusters (2009), articulates and challenges myths that may create negative emotions and deter people from investing in the stock market. Frugal Living, a forum on the website Wisebread.com focused on 'dollar-stretching tips, green/simple living, DIY [Do-It-Yourself], budgeting and general home economics,' is an example of how technology may serve as a source of social support.

Social Networks and Social Support. Extensive bodies of research related to such topics as social class, social mobility, and the cycle of poverty have established a relationship between location in social networks and objective economic status. However, less is known about how

social networks contribute to financial behavior, financial satisfaction, financial knowledge, and attitudes, which, according to Joo (2008), are other factors besides objective economic status that affect financial wellness.

One social network that has received a good deal of attention and is particularly important in financial behavior research is the family, especially its role in the economic socialization of children. Research of this kind (Buetler and Dickson 2008) has revealed that families provide networks of financial information, financial role models, and financial grants and exchanges, sometimes with documented long-term effects. Webley and Nyhus (2006), for example, found that families who exhibited future-mindedness and discussed financial matters with their children positively affected children's economic behavior (saving) into adulthood. Allen et al. (2007), on the other hand, found that anxiety and negative attitudes about money could be transferred within families. Lareau (2003) argues in her book on child rearing that children raised in middle-class families learn specific skills and dispositions not taught in poor and working-class families that better enable them to acquire higher-paying, higher-prestige jobs. These include learning to give rather than just follow directions, using language to negotiate desired outcomes, and developing a sense of entitlement.

Although little research exists regarding the nature of peer influence on economic behavior, peer influence has been found to be more important when other socialization contexts, particularly the family, are weak (John 1999). Bachmann et al. (1993) did find that peers were more likely to affect attitudes about consumer goods that were publicly visible than about those consumed privately. Such findings highlight the importance of considering both individual and interpersonal theories of behavior and the relationships between them (illustrated in Figure 1) in designing financial education interventions, especially for vulnerable populations. Lower-income

students may, for example, not have the same opportunities as their more advantaged peers to learn behaviors in their families (e.g., negotiation and leadership skills) that translate into financial advantages through such things as higher-paying jobs. Family theory, which offers explanations about the role of family structures and interaction patterns in human development (Smith, Harmon, Ingoldsby, and Miller 2008), reflects a rich body of literature that should in fact, be examined more systematically in relation to financial literacy education. Many insights provided by family theory seem particularly relevant to designing educational interventions for vulnerable populations, for example, family stress and coping theory, family conflict theory, family development theory (e.g., family life cycle and normative versus non-normative events), and feminist family theory (e.g., gender and division of labor).

Family is, of course, only one of many social networks to which people belong. Others may also serve as important contexts which impact financial behavior. Recently, for example, Marks and colleagues (2009) conducted an interesting study to gain insight into why members of faith-based communities contributed financially to those groups. Although the study was not framed as an investigation of social networks per se, it provides an example of the growing interest in the role of other social networks besides families and peers in determining financial behavior. Insights into how social networks contribute to financial behavior can be useful in helping to identify and build upon resources available to support positive financial behaviors, recognize and mitigate factors that may hinder the attainment of individual financial goals, and develop culturally responsive financial education and counseling practices.

The role of social networks in financial behavior is important for those interested in how technology might be harnessed to improve results of financial literacy education and financial wellness because social networks are increasingly being mediated through Web 2.0. These are

web applications such as Facebook, Twitter, and other Internet forums that facilitate such things as interactive information sharing and collaboration. All indications are that the use of social media is going to continue to expand (Lenhart 2009). And while social media offer some of the same opportunities as face-to-face groups to provide and secure social support, they also offer more efficient and effective means for advertisers to promote increased consumer spending (Bradshaw 2010), and are fraught with some unique financial pitfalls because they are so public. Bankrate.com, for example, recently cautioned that one's social media presence can affect job offers and job performance decisions and serve as a source of data for both debt collectors and financial scam artists (Bell 2010).

Social networks can be understood in terms of both their structural characteristics and their functions (Glanz et al. 2008; House et al. 1988; Israel 1982). Structural characteristics include those pertaining to the network as a whole, such as homogeneity (demographic similarity), geographic dispersion (physical proximity), and directionality (extent of shared power) as well as those that describe the nature of relationships between individuals, such as density (extent to which members know each other and interact), formality (relation to organizational roles), complexity (number of functions served), strength (emotional closeness), and reciprocity (extent of resources and support given and received). Functions of social networks include providing noneconomic resources (social capital), influencing thoughts and actions (social influence), hindering attainment of goals (social undermining), sharing leisure or other activities (companionship), and providing assistance (social support). House (1981) theorized in a now-classic work that social relationships may yield one or more of four types of social support: emotional (love, trust, caring), instrumental (tangible aid), informational (advice, information), or appraisal (information useful for self-evaluation).

Such well-established frameworks could be extremely helpful in examining the content and quality of personal-finance-related communication now taking place via online social media and the relationship of such communications to financial behavior and financial well-being. No one, for example, has yet examined systematically the kinds and quality of personal finance advice, suggestions, and information (informational support) being provided within various social networks via social media or how social media function as networks to produce social capital for members, exert social influence, or undermine positive financial behavior. Concepts of social capital, such as those articulated by Coleman (1988), Bourdieu (1986), and Putnam (2000), are reflected in an extensive and interesting body of literature (Dika and Singh 2002) that could provide guidance for examining how social media provide access to such noneconomic resources as norms for behavior, information, reciprocal obligations, and trust, which have all been shown to be important determinants of opportunities—or lack of them—that can have personal financial consequences. Such findings will be useful in designing financial education interventions that can take advantage of new and existing social media and could be particularly helpful in efforts to enhance the well-being of financially vulnerable populations. Such interventions might include:

- Developing new social network linkages: creating linkages to financial mentors or coaches (professional financial coaches or peer mentors) or facilitating self-help groups like investment clubs.
- Enhancing existing network linkages: providing financial education for social network site administrators or training network members in skills for providing peer support.

- Enhancing social networks by engaging natural helpers (Collins 2010): identifying natural helpers such as financial services professionals in various agencies and organizations, analyzing natural personal finance helpers' existing social networks, and engaging natural helpers electronically via social media.

Sample Community and Group Models of Behavior Change

Until recently, there has been a tendency to address financial behavior primarily as though it were solely an individual concern. Most of today's personal financial education programs still reflect this bias, aiming to improve individual knowledge and perhaps attitudes and hope for individual behavior change, one person at a time (Vitt, Reichbach, Kent, and Siegenthaler, 2005; Way and Holden 2009b). The recent financial crisis, however, serves as a reminder that not only does personal financial behavior have critical social (as well as individual) consequences, but that it is determined by system (community and organization) and policy-level factors as well as individual behavior. This recognition is why behavior change initiatives involving education in many other fields such as health are being designed for communities, organizations, and targeted populations, and not just for individuals. The following models provide examples of frameworks that could be especially useful in harnessing new technologies to develop community and group-level interventions aimed at enhancing financial security.

Diffusion of Innovations. Many people may have first been introduced to the concept of diffusion of innovations through popular books such as *The Tipping Point: How Little Things Can Make a Big Difference* (Gladwell 2000). Gladwell argues that most influential trends are determined by a common set of factors that 'tip' them into popularity. He terms these a) the law of the few, or having influential champions; b) the stickiness factor, or having an attribute that is compelling and sticks in the mind; and c) the power of context, or having or changing

environmental conditions so they are just right to support the innovation. Today, most Internet users can call to mind YouTube videos or other pieces of information that have gone 'viral' (become extremely popular in a short amount of time), such as Susan Boyle's (2009) recent surprise stand-out vocal performance of 'I Dreamed a Dream' on the television show Britain's Got Talent. Berger and Milkman (2009) recently completed an interesting study of why some New York Times articles gained viral status. Their findings reflect concepts embedded in diffusion of innovations theories, although they did not cast the study within that theoretical perspective. Key attributes of the articles that were forwarded were that they were awe-inspiring, positive, emotional, and surprising. The authors speculate that these attributes enhance the ability to develop a social connection with others.

The diffusion of innovations model focuses on how, why, and at what rate new ideas and technologies spread through cultures. Some of the core concepts first emerged in the late 1800s among French sociologists and German and Austrian anthropologists, but the framework was popularized in modern times by Everett Rogers, who wrote the1962 textbook titled D*iffusion of Innovations*. According to Rogers more recently (2003), there are six stages in the diffusion of an innovation: 1) development (decisions/activities that occur from the inception to production of an idea), 2) adoption (acceptance/use of the innovation by the target audience), 3) implementation (planned efforts to initiate an innovation within the target setting), 4) maintenance (continuation of the innovation over time), 5) sustainability (continuation of the innovation after initial resources are exhausted), and 6) institutionalization (incorporation of the program into routine organizational functioning or broader social policy). Research indicates that there are five characteristics of innovations that affect the speed and extent to which an innovation will be adopted (Greenlaugh et al. 2004; Rogers 2003):

1. its *relative advantage* compared to what it replaces;
2. its c*ompatibility* with the intended audience's values, needs, norms;
3. its *complexity* (those perceived as easy to use are more likely to be adopted);
4. its *trialability* (those with which users can experiment before adoption will be more easily accepted); and
5. its *observability* (innovations that are more visible to others will be adopted more easily).

Community Organization and Community Building. Community organizing and community building are processes grounded in the idea of empowering individuals to take control of their lives and environments (Rappaport 1984) by identifying common problems or goals, mobilizing resources, and developing and implementing strategies to reach goals that have been set collectively (Minkler and Wallerstein 2004, 2008). A number of models of community organizing and community building have evolved in recent years. One of the most well-known typologies, articulated by Rothman (2001), includes three approaches to practice. Although often combined in actual practice, the three approaches are locality development (building consensus and cooperation), social planning (emphasizing an empirical approach to problem solving, often by outside experts), and social action (increasing the ability of community members to engage in their own problem solving). Newer models emphasize building on community strengths as opposed to just addressing problems or needs and focusing not just on community engagement and 'betterment,' but also on building the capacity of community members to be self-forming and socially active so that they can challenge outside interests seeking to exert power over the community and its members. Strategies that are used in most models include grassroots organizing, organizing coalitions, leadership development, political and legislative action, consciousness raising, and culturally sensitive practice.

Although diffusion of innovations theory and concepts of community organizing and community building have not yet been applied to any degree in research and development concerning financial behavior or financial literacy education, it is easy to imagine the potential. America Saves (www.americasaves.org), for example, is a national campaign involving over 1,000 nonprofit, government, and corporate groups and managed by the Consumer Federation of America (CFA). The goal is to help individuals save and build wealth. The campaign model is to engage groups, organizations, and coalitions in developing and implementing customized strategies to encourage saving. Campaigns usually incorporate components such as motivational workshops, informational resources, support services such as coaching, and marketing. Efforts have been made to reach out specifically to sub groups such as African Americans, Hispanic Americans, young Americans, and military personnel, as well as to expand saving generally. The hope is that the campaigns will go viral, and savers will enroll other savers.

Diffusion of innovation theory and research could be useful in examining the inception of savings campaigns as well as assessing their impact in terms of processes (rate and patterns of enrollment) and outcomes (number of savers enrolled and success in saving). Community building and community organizing concepts should also be helpful for similar purposes, particularly efforts to empower population subgroups to address financial issues and become empowered to confront community characteristics that interfere with members' efforts to become financially secure. In this vein, a community might, for example, choose not only to develop a savings campaign but also to develop community attributes that make it easier to save and perhaps also to modify community attributes that make it harder to save. This might include advocating for the establishment of credit unions in local high schools or forming action-oriented 'millionaire clubs' within youth-focused community organizations, such as Boys and Girls Clubs

(to establish new programs or complement existing ones such as Money Matters, which are often focused primarily on knowledge dissemination). It might also include challenging placement of soft-drink vending machines in schools and city parks and recreational areas and working with grocery store owners to create product-free (or candy and soda-free) check-out lanes that would be appealing to parents shopping with children.

Efforts to enhance financial security based on diffusion and community-building theories should be accompanied by carefully designed evaluation studies to gauge both processes and impacts. Connell and others (1995) have identified a few key characteristics of successful community collaborations including shared vision, strong leadership, and focus on process and not just tasks. But much more remains to be learned in general about such processes and, in particular, about how technology can be best utilized at the community level to address personal finance issues and enhance financial security. To this end, a number of excellent resources are available for evaluating community organizing and diffusion of innovation-based efforts. A classic reference is Connell and colleagues' *New Approaches to Evaluating Community Initiatives* (1995).

Sample Policy and Systems Models of Behavior Change

In recent years, there has been a trend toward development of more comprehensive, or ecological, models to promote behavior change aimed at improving well-being, particularly related to various health matters (McLeroy et al. 1988; Sallis et al. 2008). Such approaches, which appear to be highly applicable to efforts to improve financial well-being, typically include interventions at the individual, interpersonal, and community/organization level simultaneously, as well as at the broader social structure/policy level. Depending on the specific financial security issue, it may be desirable to draw upon more than one theory of behavior change in

designing interventions, even if the chosen intervention focuses on just one level or unit of practice. There are a number of models of behavior change that suggest strategies educators and community practitioners can adopt at this broader policy and systems level. These include social marketing and the use of choice architecture embedded in concepts of behavioral economics. Technology certainly has a role to play as a tool in facilitating such efforts.

Social Marketing. Although there are references to social marketing dating to the 1960s (for purposes of promoting birth control in India), the term is typically attributed to Kotler and Zaltman's 1971 work 'Social Marketing: An Approach to Planned Social Change' in the *Journal of Marketing*. They defined the term as 'a social influence technology involving the design, implementation, and control of programs aimed at increasing the acceptability of a social idea or practice in one or more groups of target adopters' (p. 5). Basically, social marketing involves using marketing tools and strategies to influence behavior for the benefit of individuals and society (Andreasen 1994, 2006).

Social marketing strategies may be especially useful in operationalizing recent calls to consumer researchers to pursue transformative consumer research (TCR) with the mission 'to make a positive difference in the lives of consumers, both present and future generations, through the chosen focus and conduct of specific research, *and in the communicating of its implications and usefulness* [emphasis added]' (Mick 2005: 2). These calls to action led to the publication of a special issue on consumer welfare in the *Journal of Consumer Research* in 2008. They have also resulted in a biannual TCR conference, under the umbrella of the Association for Consumer Research (www.acrwebsite.org), covering a range of issues including personal finance and financial literacy (e.g., Goldstein et al. 2008; Talukdar 2008).

To date, social marketing has been applied most widely in efforts to improve public health. It has, in fact, been of such use there that in 2004, the Centers for Disease Control and Prevention (CDC) formed a National Center for Health Marketing that, according to their website (http://www.cdc.gov/healthmarketing/aboutnchm.htm), is devoted in large part to using social marketing strategies for health programs and services and assessing their impact. There does appear to be growing interest in examining how social marketing could be used with financial education programs and other larger efforts to impact financial capability. Earlier this year, Lefebvre (2010) chaired a panel discussion on this topic at a workshop on measuring financial capability and the effectiveness of financial education programs sponsored by the World Bank and the Organisation for Economic Co-operation and Development (OECD).

Social marketing approaches typically adhere to five principles (Andreasen 1994, 2006):

1. Focus on behavior: The main objective of social marketing is to influence behavior, not just promote an idea.
2. Give priority to consumer benefits: In contrast to commercial marketing campaigns, which are designed to produce benefits for producers and stockholders, social marketing approaches are designed primarily to benefit consumers. In fact, campaign designers may not benefit directly at all.
3. Maintain a market perspective: It is important to acknowledge the market environment within which decisions are made. Decisions are dependent on consumers' needs, available information, and competition for consumer attention. Thus, strategies should be designed to account for these factors so the promoted behavior can compete favorably.
4. Design an optimal marketing mix: Elements that can be employed to design an optimal strategy for product promotion are often termed the 'Four Ps': *product* (highlighting

physical, economic, social, and/or psychological benefits of the behavior), *price* (illustrating positive payoff of adopting the behavior using a cost/benefit ratio perspective), *place* (maximizing convenience of adopting the behavior in terms of physical or virtual space, times available, and time and effort needed to locate and access), and *promotion* (the forms and content of the information provided about the other Ps, designed to match audience preferences and information processing styles). Many communication media are available for use including television, radio, and Internet (commercial and nonprofit organization websites, blogs, Internet forums, and social networking sites).

5. Use audience segmentation: Given that different population subgroups based on age or geographical, cultural, and/or socioeconomic background may vary in important ways in terms of behavior, communication strategies, and perceived problems/issues, social marketing strategies are usually designed to account for such differences. A savings campaign among youth might, for example, promote saving through automatic payroll deduction for older teens who are employed but, suggest banking holiday cash gifts among younger or nonemployed audiences.

These principles can be applied within broader approaches to communication as well as in conjunction with the other behavior theories identified earlier, depending on the goal, audience, and context.

Three broad approaches to social marketing are product-driven approaches, consumer-driven approaches, and market-driven approaches (Storey et al. 2008). Product-driven approaches emphasize branding or making a targeted good, behavior, or service widely distinguishable through use of things like a name, sign, symbol, or design. Consumer-driven approaches aim to go beyond product recognition to achieve sustainable consumer demand. This

is accomplished by focusing on influencing perceptions of what is a desirable social norm. Finally, market-driven approaches attempt to position the targeted choice as superior to the available alternatives.

The America Saves campaign website provides an example of how elements of all three approaches are being utilized, at least to a degree, and may provide insight into future uses of social marketing to enhance financial capability. The site reflects the product approach in that it attempts to promote savings by using a common phrase for the program across campaigns aimed at population subgroups, such as youth, Hispanics, military personnel (although this could also be audience segmentation), and over time for yearly America Saves Weeks, even though the logo is not exactly the same for all. The campaign also might be said to reflect an attempt to influence perceptions of what is a desirable social norm with respect to saving, given that it places the following statement front and center on its website: 'All over America people just like you are proving that you don't have to be rich to build wealth.' Finally, it features testimonials by two savers about how much better their lives are now than before they became active savers: 'Now I can decide where I want to be financially,' and 'At the age of 49, Cindi Roberts is doing a lot of things she never thought were possible—saving money and going back to school' [after having been on government assistance to pay her bills].

Choice Architecture. One other policy/systems approach to enhancing financial security is what has been referred to as choice architecture, or designing environments such that people are nudged to act in their own self-interest while still retaining freedom of choice, rather than fall prey to human behavior traits that research has shown work against them. These ideas are grounded in the area of study known as behavioral economics, which dates back to the 1950s[1] and focuses on how social, cognitive, and emotional factors modify rational choice. The field has

been popularized recently through publications such as *Predictably Irrational: The Hidden Forces That Shape Our Decisions* (Ariely 2008) and *Nudge* (Thaler and Sunstein 2008).

It is beyond the scope of this paper to attempt to review the entire field of behavioral economics, so just three key themes with implications for financial literacy and education are mentioned here. But these are just a few of the tools that might be selected as part of a comprehensive technology-based strategy to enhance financial literacy through education. These are framing—the idea that how information is presented can bias choice in systematic and predictable ways; heuristics—the notion that people often make decisions based on rules of thumb rather than strict logic; and the existence of other market inefficiencies that can be explained by nonrational forms of behavior, such as dynamic inconsistency and prosocial behavior.

In terms of framing, researchers have found that people have a loss aversion, or a tendency to prefer avoiding losses over acquiring gains, as well as a divestiture aversion, or a tendency to place a higher value on things they own than on those they do not. This often contributes to a tendency to stay with what is already known, or to have a *status quo bias*. While the status quo bias can work against one's personal financial interests, as in failing to enroll in a voluntary employer-sponsored retirement plan, staying with a plan that is underperforming, or failing to update life insurance beneficiaries on marriage or divorce, it can also work in one's financial interests. Thaler and Sunstein (2008) point out, for example, that changing the default rule for employer-sponsored retirement plans so the default is enrollment rather than nonenrollment would be a straightforward way to boost retirement savings. Pointing out how much money employees will lose over the lifespan if they choose not to contribute and thus lose

the advantages of employer-sponsored contribution plans and compound interest earnings over time (loss aversion) would be another way.

Heuristics are guidelines individuals adopt to make decisions when they are confronted with too much information. Tversky and Kahneman (1973, 1974) identified rules of thumb, or heuristics, of this kind that include anchoring and availability. Anchoring is the idea that people will start their decision process with something they already know. For example, suggesting levels of donation to charitable organizations beginning with $100 is likely to result in larger total contributions than if a lower floor or no floor is suggested. This trait could be used to boost retirement savings by increasing suggested savings rates for retirement plans ('anchoring' at a higher level). The availability heuristic is the idea that people make decisions based on what they have most recently experienced. Helping individuals identify recent incidents where saving helped a known person or group in positive ways could be expected to increase savings behavior.

Other findings from behavioral economics that could be used to structure choices to benefit individuals financially relate to the notion of dynamic or time inconsistency and prosocial behavior. Time inconsistency describes the situation where an individual's preferences change over time. Educators often find, for example, that financial literacy seminar participants express strong interest in establishing savings plans when they've just finished a program, but that follow-through doesn't match those plans. Alternatively, educators frequently observe that despite lessons on price and product-comparison strategies, individuals will choose higher-priced or second-choice items because they can have them now. Strategies for overcoming time inconsistency or the *now bias* would be to use commitment mechanisms that automate future decision making, like making detailed shopping lists or signing up for a savings plan with defined contributions, such as Thaler and Benartzi's (2004) program called Save More

Tomorrow, which invites participants to commit themselves in advance to savings contribution increases that coincide with expected pay raises.

Prosocial bias refers to research which has shown that people will produce a greater effort when their actions are visible to others, when they can communicate with others, and where they share a group identity (Gerber et al. 2008). Numerous Internet forums devoted to saving have already been established (see for example the finance and frugality forum at www.wisebread.com). Social networking sites also offer much potential for connecting people with shared interests around saving and other aspects of personal finance. The National Endowment for Financial Education provides one such example with Spenster.org, a website with a presence on Facebook and Twitter devoted to encouraging people to share their stories about wasteful spending. A lot remains to be learned, however, about how such sites can take advantage of theories of behavior, including those, such as prosocial bias, that emerge specifically from behavioral economics.

In summary, if the goal of personal financial education is to enable individuals to take action to improve long-term financial well-being (as asserted by the President's Advisory Council on Financial Literacy [2009]), we argue that behavior theories serve as an important initial set of criteria for identifying useful approaches to financial education, which can involve interventions within progressively broader ecological contexts from individual, to interpersonal, community/organization, and policy/system.

Designing or selecting financial education interventions would usually start with articulating educational aims and also assessing educational outcomes (knowledge, skills, and behaviors) as well as indicators of financial well-being. This part of the process of designing financial education interventions is depicted in Figure 2.

Figure 2 here

It is important to keep in mind that the behavior theories reviewed here reflect only a sample of those available. To recap, the eight models just reviewed, categorized according to their level of intervention, are:

Individual Theories of Behavior Change

Theory of Reasoned Action, Planned Behavior, and Integrated Behavioral Models

Transtheoretical Model of Change

Interpersonal Theories of Behavior Change

Social Cognitive Theory

Social Networks and Social Support

Community and Group Models of Behavior Change

Diffusion of Innovations

Community Organization and Community Building

Policy and Systems Models of Behavior Change

Social Marketing

Choice Architecture

Important as these behavior perspectives likely are, however, another set of perspectives is also particularly salient for harnessing the power of digital technologies to support personal finance education - the specific affordances of technology for learning. These are outlined in the next section.

Affordances of Technology for Learning

The terms 'information society,' knowledge economy,' and 'lifelong learning' have become almost-cliché references to the notion that to fully reap the benefits of society now and in the future, all citizens must be prepared to participate in education throughout the life course (from 'womb to tomb'). Certainly, in the area of personal finance, O'Neill (2006) and others have argued that more financial knowledge and expertise will be required in the future as individuals assume greater financial responsibilities and face a growing array of complex financial services and products. A number of scholars are arguing that the rapid convergence of computers, telecommunications, and broadcasting technologies during the past decade is making this learning society a reality by widening educational participation (expanding access); supporting diverse educational provisions or types, including informal and nonformal as well as formal education;[2] and providing better forms and outcomes of learning (Selwyn et al. 2006). Policymakers are now echoing these sentiments, as well as calling for educators to leverage technology to transform the American education system so that it puts students at the center and motivates and empowers them to take control of their own learning, both inside and outside of school (see, for example, the U.S. Department of Education's National Educational Technology Plan [2010]).

One way of thinking about these 'better forms of education'—particularly with respect to using technology to enhance teaching and learning—is in terms of affordances. 'Affordance' refers to the attributes of tools and resources but also to the interactions between the technologies and the people who use them (Gibson 1979). For the purposes of this paper, the focus is on the affordances of digital technologies for learning. The following sections discuss how technological tools and instructional designs support (provide affordance for) learning tasks and

processes and provide motivation for learning. We also discuss the issue of access—how digital technologies may serve to expand access to personal finance education—and the important constraints or barriers to such opportunities. These concepts, outlined graphically in Figure 3, reflect the final group of considerations that should help financial education practitioners and researchers examine and harness the potential of technology for nurturing financial literacy, particularly among vulnerable populations. The conceptualization is consistent with the trend in research in the field of educational communications and technology which has moved from an effort to determine if computers are effective in promoting learning to an understanding of how best to use them to support teaching and learning efforts (Hannafin et al. 1996).

Figure 3 here

Technologies to Support Learning. A majority of Americans now use the Internet (Rainie 2010). Of adults over 18, 74 percent use the Internet regularly, 60 percent have broadband access at home, and 55 percent connect to the Internet wirelessly. Teenagers are even more frequent users, with 93 percent online regularly. Although many people use the terms Internet and World Wide Web (WWW) interchangeably, they are not the same (Stewart 2009). The Internet is the global system of computer networks (a network of networks) that carry information and resources such as the hypertext documents of the World Wide Web (web pages) and provide communication services, such as electronic mail (e-mail) and Voice-over-Internet Protocol (VOIP) phone capability, and data transfer such as streaming media, and podcasting. The Internet can be accessed almost anywhere now by various means, including mobile Internet devices such as smartphones. Websites are accessed via browser software such as Firefox,

Mozilla, or Safari; search engines such as Yahoo! and Google help users locate relevant sites. Many websites permit users to create content through such means as blogs ('weblogs' that allow posts or comments to accumulate over time) and wikis (which permit users to add, remove, or modify existing content). YouTube is the leading website for hosting and playing free streaming video, and a number of social networking websites, such as Facebook, MySpace, LinkedIn, and Twitter, have become wildly popular for connecting and interacting with others for social, business, political, religious, and educational purposes (Brown 2010). Facebook, for example, has more than 500 million active users who log over 700 billion minutes per month on the site (Facebook 2010). A number of virtual learning environments, also referred to as course management systems, are available for designing and delivering courses in whole or part over the Internet. These systems, which include Moodle, Blackboard, FirstClass, and WebCT, typically provide tools for uploading content, administering student groups, facilitating synchronous and asynchronous communication, collecting and returning student work, assessing student learning, and reporting grades. Some now also provide 3D virtual learning spaces.

Technology Affordances for Learning Tasks and Processes: Conceptual and Empirical Insights. Although a number of scholars (e.g., Hill et al. 2004) argue that research to understand the impact of the Internet on learning has not kept pace with its growth and use, a number of important questions have been addressed, conceptually if not empirically. One question is how to think about Internet-based tools and resources in terms of the kinds of learning processes and learning tasks they are able to support. A useful distinction is one that has been made between learning *from* and learning *with* technology (Jonassen and Reeves 1996). The 'learning from' perspective is grounded in a behaviorist view of learning (e.g., Skinner 1971, 1974; Thorndike, Bregman, Tilton, and Woodyard, 1928) in which learning is seen as a matter of transferring

information from the medium so that it is absorbed by the learner (Hayes 2000). Sometimes also referred to as the 'banking' model of education,[3] this model's primary goal is to promote acquisition of basic knowledge and skills, and it prescribes a more passive role for the learner. The educator (if there is one in the picture) becomes a manager of typically predetermined content and activities. The 'learning with' perspective is grounded in constructivist learning theories (e.g., Dewey 1938; Lave 1988; Mezirow 2000; Piaget 1966; Vygotsky 1978) in which learning is viewed as the active construction of knowledge through one's interaction with the environment and with others. The goal is for learners to discover and construct their own meanings, and the role of the educator (if, again one is in the picture) is as a facilitator of learning (Merriam et al. 2007).

Constructivist Learning Theories, Learning Processes, and Technology-based Financial Education. There are a number of theories of adult learning that could be characterized as constructivist in nature (Merriam et al. 2007). One that may be useful in structuring personal finance education is Mezirow's (2000) transformative learning theory. Lusardi et al. (2010) recently pointed this out in a review of literature on learning strategies for financial literacy education commissioned by the National Endowment for Financial Education. Transformative learning is the process by which we recognize and alter our existing meaning schemes or 'sets of immediate, specific beliefs, feelings, attitudes, and values judgments' (Mezirow 2000: 18) through experience, critical reflection, reflective discourse, and action. Planning educational experiences that illuminate or build upon a disorienting dilemma (e.g., a financial trigger event) and support reflection, dialogue, and action would be consistent with this model.

Although much of the literature on how people learn has focused on individual learners, there has also been a theoretical interest in understanding how context, or the learner's situation,

affects learning (situated cognition). According to Fenwick (2003), for example, learning happens when people interact with the community (including its cultural values and assumptions), the tools available (such as technology, language, images), and the activity in question. The emphasis for educators interested in using this perspective would be to provide experiences that reflect authentic versus decontextualized contexts (Choi and Hannafin 1995). Two strategies that have been used to provide such authentic experiences are cognitive apprenticeships and anchored instruction.

Cognitive apprenticeship is a strategy designed to help learners apply different ways of thinking and skills to carry out an activity or given set of activities. Through a series of phases, the educator a) demonstrates or *models* the targeted activity, b) provides *support (scaffolding) and coaching* as needed as the learner practices the activity, c) decreases coaching and scaffolding as the learner gains expertise *(fading),* d) provides assistance only when requested as the learner proceeds with *self-directed learning*, and e) discusses with the learner the *generalizability* of what has been learned. Cognitive apprenticeship may be particularly relevant to those interested in financial coaching, a financial advice model that seeks to help individuals set and achieve financial goals (Collins 2010).

Anchored instruction is where the educator creates sustained experiences that are grounded in what the Vanderbilt University Cognition and Technology Group (2000) terms 'macrocontexts.' The goal is to provide experiences that help learners explore complex problems from different perspectives over time so that they may move from being novices to having more sophisticated expertise in the targeted sphere of activity. In financial literacy, *The Stock Market Game*, an online competitive simulation for middle and high school students, is one example of a teaching/learning activity that could be said to reflect the anchored instruction perspective. The

simulation, which was originally created in 1977, is designed to engage learners in sustained inquiry regarding wealth accumulation and has thus far taught over 10 million students.

A number of studies have suggested that cognitive apprenticeship and anchored instruction approaches are more effective than traditional didactic approaches to teaching and learning. Mayer and colleagues (2002), for example, found that college students who used a computer game to solve geology problems and received instructional support and scaffolding outperformed students who received instruction without those resources. A randomized controlled trial of over 600 classrooms of teachers and students that used *The Stock Market Game* (Hinojosa et al. 2009) found that students who played the game significantly outperformed students who did not play on both mathematics and investor knowledge tests. Students also reportedly enjoyed playing the game and concomitantly gained both communication and conflict resolution skills.

Research on the effectiveness of using computers to provide the learner-centered coaching and scaffolding that is often part of these approaches is limited (Dennen 2004) and has not uniformly found positive results (e.g., Davis 2003). A challenge is how best to use the digital environment to scaffold experiences in a way that matches learners' specific content needs and provides the appropriate level of difficulty,[4] which can vary widely among learners. Well over a decade ago, Hague and Benest (1996) suggested that the answer to the problem of accurately diagnosing students' learning difficulties was to build hot spots or hyperlinks into learning materials so learners could access clues as needed. This is probably still a realistic approach, provided that the clues are easy to access and learners have sufficient metacognitive ability to recognize their own learning needs and feel sufficiently committed to the learning goals for which the activity was designed.

Supports for Specific Learning Tasks. As described earlier in this section, the Internet serves as a rich source of tools and resources for learning. Most of them can support either perspective on learning (or not), depending upon how they are used. According to Laurillard (2003), Internet-based tools and resources can mediate a variety of specific tasks that support learning:

- *representing information* through text, images, video, audio, and animation;
- *facilitating communication between individuals and groups* through synchronous (chat, video conferencing, and instant messaging) and asynchronous (e-mail, discussion boards, blogs, wikis, and text and audio messaging) resources;
- *returning information based on user input* via search engines, portals, and position-aware systems (e.g., GPS);
- *manipulating data* through tools such as spreadsheets, databases, and quantitative analysis tools such as calculators and statistical packages;
- *continuously adapting to user input* through interactive and productive designs such as computer games, interactive tutorials, simulations, and virtual worlds; and
- *managing learning activities* through tools such as e-portfolios and assessment and task management systems that provide places to record achievement, review progress, and make plans for further learning.

As appealing as these learning supports appear, Laurillard (2003) cautions that they may offer disadvantages as well advantages over traditional learning resources, depending upon the nature of the learners and the ways in which the tools are applied. For example, multiple vehicles for providing and representing information may better address learners' various learning styles, provide access to information at more convenient times and places, and give learners greater autonomy and insight into their own learning processes. However, the technologies that make

this possible may also lead to information overload and encourage more passive rather than active involvement in learning (e.g., simply viewing text or photos online rather than taking notes or finding the photos on one's own). Further, while synchronous technologies for communication, such as text messaging via mobile phones and chat rooms, may have the benefit of immediacy leading to high motivation for some learners, other learners may find the demand for rapid response intimidating.

Mayes and de Freitas (2004) contend that while all learning designs acknowledge the centrality of activity on the part of the learner, it is appropriate to consider how technology-based pedagogic approaches differ in terms of attributes that may be more or less consistent with one's perspective on learning—behaviorist versus constructivist. These include the *authenticity* of the activity, the *formality* of activity structures and sequences, the role and importance of *other individuals* in mediating the activity, the emphasis on *reproduction of skills/retention of knowledge* versus *reflection on/internalization* of meaning, and *locus of control* (educator, learner, peers). Activities that are more behaviorist in nature will be less authentic and more formal, emphasize retention/reproduction to a greater degree, and have less learner control, while activities that are more constructivist in nature will be more authentic and less formal, have a greater role for other people in the activity, emphasize reflection/internalization to a greater degree, and provide for more learner and peer control than educator control.

It is interesting to consider such differences in learning design in relation to the theories of human behavior outlined earlier in the paper. One can infer from those theories that behavior is not just a function of one's factual knowledge and skills (although those are certainly important), but also of a complex array of other personal, interpersonal, and environmental factors such as beliefs and attitudes; goals and intentions; self-efficacy and self-regulatory

ability; and resources derived through authentic experiences, social interaction, and self-reflection. While either behaviorist or constructivist approaches to learning may be useful in developing knowledge and 'how-to' skills, the other important determinants of behavior may arguably be more likely to develop or be acquired through constructivist approaches.

Research on Internet-based Learning: Learner Perspectives. Consistent with a constructivist perspective, researchers have begun to give greater attention to the nature of the learner experience in learning with technology. These studies have focused on learner characteristics, learning activities, and learner achievement (Hill et al. 2004). In terms of learner characteristics, one line of inquiry has explored how learners evaluate the reliability and validity of information encountered via the Internet. Fitzgerald (2000), for example, found that university students' assessments of such information was influenced by many factors including prior knowledge, format of the information, and epistemology (beliefs about the nature of knowledge and how it is produced) as well as emotions, beliefs, and metacognition (patterns of thinking about one's own thinking). Fitzgerald suggests that more work needs to be done to understand the information evaluation process and to make it easier for Internet users to assess information. One might speculate that this will become even more important in the years to come as user-created Internet content continues to expand and compete with information created by professionals working in a variety of contexts.

A number of studies have also explored the impact of specific learner traits on participation and learning in online contexts. These include gender (Stewart et al. 1999), culture (Wilson 2001), and disability (Fichten et al. 2000). Stewart et al. found that male undergraduate students sent more and longer messages than female students, took learning tasks less seriously than women, and were more likely to try to take control of conversations than women, who more

often tried to reach consensus. In a qualitative study of how West African students experienced text created by Westerners, Wilson (2001) found that several cultural discontinuities emerged, including in worldviews, culturally specific knowledge, and linguistic challenges (meaning and not just grammar), and that these discontinuities impacted learning.

Fichten et al. (2000) gathered data in three studies of Canadian postsecondary learners with physical, sensory, and learning disabilities and found that 41 percent needed adaptive technology to use computers effectively. While study participants reported that assistive technologies helped overcome barriers associated with specific impairments, they indicated that they faced several challenges, including paying for the technology, obtaining the training needed to learn how to use it, and finding software compatible with screen-reading software for persons who are blind. Much more research is needed to determine how Internet resources can be designed to more fully support learning among individuals with disabilities. A positive development in this area is the passage by the U.S. House of Representatives of H.R. 3101: Twenty-First Century Communications and Video Accessibility Act of 2009 on July 26, 2010, the twentieth anniversary of passage of the Americans with Disabilities Act. This bill, among other things, provides financial support to help low-income individuals buy accessible Internet technology, makes it easier for the blind to access the Internet from smartphones, and requires that equipment used for making calls over the Internet be compatible with hearing aids. A companion bill, S. 3304: Equal Access to Twenty-First Century Communications Act, is pending in the Senate.

In terms of Internet activities, recent surveys indicate that other than sending or receiving e-mail, finding information using a search engine is the most widely used application of the Internet (InfoPlease 2008). In studies with adult learners, Fitzgerald (2000) learned that gathering

information from the Internet is a complex task in which users choose, analyze, critique, construct, argue, synthesize, and evaluate. One particularly difficult challenge for many learners, identified by both Fitzgerald (2000) and Hill (1999), is getting lost to the point where they lose track of where they are and what they were looking for to begin with. Hill (1999) concludes that learners need to be well supported to be successful in information retrieval, as the must know how to define problems effectively, determine information needs, identify and evaluate information, and question the credibility and quality of sources.

A number of investigations have reported both positive and negative impacts of the Internet on learning and achievement. In a study of undergraduate students involving interviews, a survey, and participant observation, Ali and Franklin (2001), found that the Internet has expanded access to resources, provided opportunities for supplemental and individualized learning via online tutorials, increased depth of learning, and enhanced motivation. However, participants also reported that the Internet interfered with concentration in class, was often time-consuming to use, and created dependency, so that students turned to the Internet even when it was not necessary or appropriate to use it to find information.

One especially interesting line of inquiry concerns the incidental learning that occurs within the Internet environment. Baylor (2001), for example, studied the incidental learning that occurs among adult learners during an Internet search task. Results indicated that learning did occur, especially when there weren't any distracting links. In another study to examine how a problem-based, Internet-supported learning design could aid development of generic skills, Oliver and McLoughlin (2001) found that learners incidentally acquired a number of generic skills, such as enhanced ability to manage self, others, information and tasks.

Given the rapid expansion of social networking sites and Internet forums, as well as use of the Internet for other purposes, such as gaming, examining incidental learning about personal finance matters via the Internet should be a priority area for further research. Incidental learning generally refers to things people learn when they are attending to something else. There is great potential for personal finance-related learning through casual online communication and playing games such as *Farmville* and *Fishville* or even the massively multiplayer online role-playing game *World of Warcraft*, all of which represent virtual economies. Information about the kind, quality, and quantity of personal finance behavior being modeled in such environments as well as about the kind, quality, and quantity of information individuals are acquiring via casual interactions through social networking sites could help personal finance educators better understand the kinds of learning opportunities that may be competing with structured educational interventions. Examining communications in online communities, which are often structured along demographic lines, could also provide more authentic insights than would otherwise be possible into how subcultural groups think about and act regarding financial matters. Building upon existing knowledge structures is a core concept in constructivist learning theories.

Research on Games, Simulations, and Learning. The potential of technology for enhancing the effectiveness of financial education, especially among vulnerable populations, is perhaps illustrated more clearly than anywhere else in the area of scholarship on games, simulations, and learning. Shaffer et al. (2005) assert that current approaches to education are inadequate to address the increasingly complex problems we face at home, work, and beyond. They argue that instead of traditional educational approaches which are 'about telling people stuff' (Gee 2008, n.p.), people need to become passionate about learning, learn how to gather and use resources to solve complex problems, and be able to meet individual needs as well as work across differences

based on factors, such as race, class, gender, and disability. Games provide an alternative approach to teaching and learning that can address these needs more effectively than traditional methods.

People who play videogames represent a different demographic profile than might be expected. According to a recent study by the Entertainment Software Association (Morris 2010), the average gamer is 34 years old, nearly half are between 18 and 49, and more than a quarter are over 50. The same study found that 67 percent of homes own a game console, such as PlayStation 3, Wii, or Xbox 360, or use a personal computer to play games, and 48 percent of parents play videogames with their children at least once per week. Although gaming is typically thought of as a male activity, 40 percent of gamers are now female.

Researchers interested in games and simulations trace their origins to the 1600s, when simulations and games were first employed to improve the performance of military groups. Games are defined as exercises in which players must use knowledge and skill to win, while simulations are more open ended. In a simulation, the goal is for participants to assume a role and address a problem or circumstance that arises (Gredler 2004). Many games and simulations now make use of virtual worlds or 3D virtual environments, and a number of them can be accessed via mobile technology such as smartphones or played online with others who pay a subscription fee and are known only through their online personas, or avatars. The bestselling computer game in history is *The Sims*, also available for game consoles and now iPhone and iPod (Brightman 2010*),* a simulation in which players create families and make life decisions about what kind of career to pursue, what skills to develop, how to fulfill basic needs, and even how to maintain a balanced budget. *World of Warcraft* is currently the most popular multiplayer online game, with 11.5 million subscribers in 2008 (Cavalli 2008). In *World of Warcraft*, players

engage in quests (tasks or missions), can join with others in guilds to enhance play options; gain skills and abilities; and earn points, items, and in-game money. The game incorporates a virtual economy where each player has access to a personal bank storage space and can buy and sell items. *Farmville* and *Fishville*, which are played via Facebook, are other games with virtual economies.

Although some games permit players to create their own personas, thus masking issues of demographic representativeness, not all do. And recent research suggests that this may be an issue within the game development community. One recent study (Williams et al. 2009), which involved a content analysis of 150 popular games across platforms, revealed a systematic overrepresentation of males, whites, and adults in game characters and systematic underrepresentation of females, Hispanics, Native American, children, and the elderly.

Despite concerns about potential bias in demographic portrayals and also what Shaffer et al. (2005) term an 'anti-gaming rhetoric'[5] among many educators, scholars in this area are convinced that games and simulations can offer powerful contexts for learning. Shaffer's (2006) research, in particular, has identified four features of games that can make them especially engaging and effective in connecting abstract ideas to real-world problem solving. He argues that games designed using an *epistemic frame*, or the deliberate attempt to engage the learner in a community of practice that reflects the skills, habits, and understandings needed to function effectively in that realm of human activity (e.g., as a manager of personal finance or a financial planner), allow players to realize the educational potential of games. Epistemic games, especially those that emphasize enlightened risk taking, entrepreneurship, and expertise rather than simply score accumulations or accreditation, promote *situated understanding* by using virtual worlds to allow learners to experience concrete realities that make understanding and use of foundational

concepts necessary and relevant, help learners develop a set of *effective social practices* by working with others to gather information and carry out tasks, permit experimentation with new and *powerful identities*, and develop *shared values* among learners. Although Shaffer et al (2005) point out that few epistemic games exist yet, the features can be designed into future resources and the attributes used now to assess the extent to which existing tools incorporate attributes that can aid in harnessing the power of technology for learning. Developing such games will require more than just an understanding of foundational factual and procedural knowledge; developers must also grasp the other attributes associated with expertise in the area of personal financial management, including the situated understandings, effective social practices, powerful identities, and shared values associated with expertise. According to Shaffer (2006), a set of questions and principles for examining the power of games for learning might look like this:

- *Epistemology:* What kinds of things do players in the game do and, as importantly, what justifies those actions? (Choose games where players need to think in order to play the game and where that kind of thinking also matters outside the game.)
- *Knowledge:* What kind of knowledge does the game require? (Choose games where the kind of knowledge used is worth knowing [e.g., current and appropriate in depth and scope] and matters outside the game as well as inside.)
- *Skills:* What kind of skills does the game require? (Choose games where the skills used in the game also matter outside the game and where appropriate risk taking and experimentation are encouraged.)

- *Values:* What really matters in the game and does the game help understand the perspectives of others? (Choose games that reflect values and not just interests, and values that matter outside the game.)
- *Identity:* What kind of person does the game encourage the player to be? (Choose games that encourage the learner to explore who he or she wants to be and that make it possible to link identity coherently with values, worthwhile knowledge, and skills.)

Digital Technologies and Motivation to Learn about Personal Finance

One of the foremost problems in designing educational interventions in any field for both youth and adults is getting learners interested in participating and then ensuring they maintain that interest to the end. This is often referred to as the challenge of learner motivation (Schunk et al. 2008). There is widespread belief that digital technology can help with this issue, although it is not yet completely clear how. One of the most comprehensive and empirically supported theories of motivation, self-determination theory, offers some insights that may be useful in thinking about how digital resources may enhance motivation to engage in and persist in personal-finance-related learning.

Self-determination theory, proposed by Deci and Ryan (1985, 1991) posits that there are three basic innate, psychological needs that motivate behavior. These are needs for competence, autonomy, and relatedness. Competence is the need to feel capable in interacting with others, with tasks and activities, and with the larger context. Autonomy is the need to feel a sense of agency or control over interactions within one's environment. And relatedness is the need to feel a sense of belonging to a group. Vansteenkiste (2008) posits that although individuals are inherently driven toward growth through these needs, they need nurturing in order to realize their

potential; without that nurturing, there are negative consequences. Thus, factors in the educational environment that restrict an individual's natural tendency to be self-determining (e.g., lack of choice or inability to pursue interests, tasks that are too difficult or easy, threats, or social isolation) will interfere with positive growth.

Csikszentmihalyi (1985, 1997) and Csikszentmihalyi and colleagues (2005) developed a related theory of emergent motivation and the concept of 'flow' through studies of the characteristics of individuals who were totally immersed in experiences—who were 'getting into the zone.' Emergent motivation is discovering new goals and rewards as a consequence of engaging in the activity, and 'flow' is becoming completely involved in an activity, even to the point of losing a sense of time and self. This notion of 'flow' is not the same thing as 'going with the flow,' which suggests giving up control to something that just feels good or natural. Rather 'flow' is something that requires skill, expertise, and perseverance, not just feeling good (Schunk et al. 2008). although feeling good about the learning experience, or having fun with it, has also been linked empirically with intrinsic motivation and learning (e.g., Bisson and Luckner 1996; Malone 1987; Parker and Lepper 1992; Prensky 2002).

Using self-determination theory as well as the concepts of emergent motivation and 'flow' as a backdrop, it is not surprising that personal finance practitioners are recognizing the potential of games and simulations as sources of motivation for learning (Bank Fiesta 2010). Other applications of digital technologies besides games and simulations also likely have the potential to enhance motivation for learning, including in the area of personal finance, by fostering a sense of competence, autonomy, and belongingness. Online credit courses and more nonformal or noncredit learning activities provide expanded choice of content and time flexibility (supporting need for autonomy) that would not otherwise be possible for learners.

Social networking systems provide almost continuous access to sources of informal learning (both intentional and incidental) by linking personal friends online with other friends and with the organizations, institutions, and products of which they are 'fans' (fostering a sense of belonging). Smartphones make it possible to have access to information from any location, attend to tasks continuously over time regardless of having to move about physically, and make use of time that would otherwise be wasted (facilitating competency).

Although there is a great deal of evidence to suggest that digital technology can play an important role in motivating learners to engage and persist in personal finance education, much more remains to be learned. Motivation theory has not been applied extensively to research on technology-based education (Denis and Jouvelot 2005; Dondlinger 2007), and it would not be appropriate to assume uniformly positive impacts. Some have suggested, for example, that not all learners will be equally motivated by technology-based educational tools such as games (Whitton 2007), that in any case, learning is not supposed to be fun or even engaging (Prensky 2002), and that emphasizing use of technology in education will further exacerbate the digital divide and do nothing to reach vulnerable populations (Selwyn et al. 2006). We argue that this will not be the case if financial education practitioners are mindful of the principles of motivation just reviewed, as well as issues associated with accessibility to technology that are discussed in the following section. Although a good deal of attention has been given to the ways in which technology can support and enhance learning tasks and processes, dimensions of motivation and accessibility have been given less attention, and these seem especially relevant to serving the needs of populations experiencing financial and other vulnerabilities.

Accessibility: The Power of Technology to Meet Financial Education Needs

Earlier, we argued that participation in continuing education throughout the lifespan will be increasingly necessary to secure and maintain financial well-being. Technology holds promise for realizing the vision of anytime/anywhere financial education targeted to specific needs by expanding possibilities for educational participation, supporting diverse educational types, and providing more engaging approaches to teaching and learning. However, the extent to which this vision is realized will depend on access being gained or provided. This is particularly important for vulnerable or underserved populations who have historically faced greater barriers to access of two kinds: access to the information and communications technologies per se and the ability to make full use of them when they do have access.

Studies of Internet use by the Pew Research Center have revealed that some of the historical gap in access to information and communication technologies according to income, education, and race is closing. The most recent data (Kang 2010; Rainie 2010; Smith 2010) indicate that minority Americans are leading mobile Internet access using handheld devices such as smartphones. Cellphone ownership is now higher among African Americans and English-speaking Latinos than among whites (87 percent compared to 80 percent) and these groups also lead whites in the use of mobile data applications, including accessing the Internet (46 percent of African Americans and 51 percent of English-speaking Hispanics use cellphones to access the Internet compared to 33 percent of whites). However, some observers (Smith 2010) have pointed out that wireless access to the Internet should not be considered a replacement for hardwired broadband.

Greater access to the Internet does mean greater use for learning. At the moment, cellphones are not used extensively in schools, and it is not possible to do many tasks associated with learning such as word processing or spreadsheet manipulation on a cellphone or smartphone

in any location. Extensive Internet searching is also tedious on handheld devices, given processing speed and small screen sizes.

We have reached what is now being referred to as the Digital Divide 2.0 (Hoar 2006). This is a situation where the issue is not just one of ensuring access to the equipment, although this is still a problem for many individuals and for some groups such as low and moderate-income households compared to higher-income households and children in low-income schools (Hoar 2006; Loftin 2009). Rather, it is more a question of ensuring that individuals are able to make access meaningful.

Personal finance educators have traditionally thought of vulnerable populations in terms of the kinds of financial strains they are facing, for example, chronic low income and/or disability or 'trigger events' such as a health crisis, unemployment, divorce, or bankruptcy. These are indeed critical kinds of vulnerabilities that deserve attention, and they can certainly be used to design content-specific instructional tools and strategies for particular groups of learners. We argue, however, that the ability to make meaningful use of technology should also be considered a potential vulnerability among those interested in personal-finance-related learning and financial well-being. In our view, this kind of vulnerability does not represent a deficit on the part of learners, but rather reflects limitations of instructional designs that have not adequately accounted for the nature of learners and how to best facilitate learning.

Several instructional design considerations have typically been overlooked in developing and selecting technology-based personal finance education materials and strategies:

- recognizing that the way individuals learn can be unique and providing for those uniquenesses;

- being aware that learners may need supports in learning how to learn as well in understanding and applying personal finance concepts and skills per se;
- being aware that historical biases may be reflected in technology-based financial education tools and resources and in how they are being used, and addressing those biases;
- acknowledging that personal and social context matters in learning and building positively on that context rather than ignoring or discounting its value.

Lack of attention to such considerations can needlessly contribute to financial vulnerability by restricting individuals' ability to take full advantage of financial education programs and materials.

The way individuals learn may vary according to a number of factors, such as past knowledge and experience, access needs including any physical or sensory disabilities, motives for learning, prior experience of learning with the specific technology, preferred learning style, social and interpersonal skills, and confidence and competence in using information and communication technology (Beetham 2007). One approach to considering such differences in designing educational resources and strategies is to begin the process expecting that there will be a diverse set of learners with varying skills and abilities. The concept of universal design, for example, originated in architecture with the passage of policies mandating physical accessibility in public spaces. When architects began incorporating such features as ramps, wide doorways, and elevators into buildings, they discovered that they benefited not just those for whom the features were originally intended—individuals with disabilities—but others as well, such as delivery people, parents with strollers, and the elderly.

Universal design for learning (UDL) (Rose and Meyer 2002) makes the same assumption—that everyone will benefit from educational designs that build in accessibility

features. According to UDL, this can be accomplished by ensuring that instructional tools and resources incorporate multiple means of representing information (e.g., text, graphics, sound, animation), multiple means of expression (e.g., alternative ways to reveal learning such as verbally or through writing or demonstration), and multiple means of engagement (e.g., by offering choices of content and tools and adjustable levels of challenge).

There are, of course, a number of assistive technologies for individuals with disabilities (e.g., Dell et al. 2008), such as screen reader software that uses synthesized speech to verbalize text, Braille terminals that render text as Braille characters, screen magnification software that enlarges what is displayed on the computer monitor, speech recognition software that can accept spoken commands to the computer, and keyboard overlays that can make typing easier. Although these accessibility tools can enhance web access for individuals with disabilities, educators should be aware that web design features affect the ability to make use of them. The Web Accessibility Initiative's (2008) Web Content Accessibility Guidelines 2.0 offer recommendations meant to enable all users to have equal access to information and functionality.[6]

An extensive body of research on the role of multimedia design in learning is available to inform the UDL principle of providing multiple means of representing information in personal finance education tools and resources. Richard Mayer (2005) and other researchers have found that students engaged in learning that incorporates multimodal designs exhibit greater achievement, on average than students learning using traditional approaches with single modes. They have developed a set of principles that include the following ideas:

1. *Multimedia Principle:* Learners will retain more through words and pictures than through words alone.

2. *Spatial Contiguity Principle:* Learning will be enhanced when words and pictures are presented near each other rather than far from each other.
3. *Temporal Contiguity Principle:* Learning will be enhanced when words and pictures are presented simultaneously rather than successively.
4. *Coherence Principle:* Learning will be enhanced when there are no extraneous words, pictures, or sounds.
5. *Modality Principle:* Animation and narration will support learning to a greater degree than animation and on-screen text.
6. *Redundancy Principle:* Redundancy will interfere with learning (that is, if information is represented in more than one modality).
7. *Individual Differences Principle:* Design effects will be greater for low-knowledge learners than for high-knowledge learners.
8. *Direct Manipulation Principle:* The impact of direct manipulation of the learning materials (e.g., animation, pacing) on transfer of learning will increase as the complexity of the materials increases.

Besides these multimedia design principles for representing information, there are a number of other practices that provide multiple means of engagement and expression for personal finance learning. Educators, for example, should consider using multiple channels to present content (e.g., Internet chat, participation in an online game, webquest), use a variety of materials and resources (e.g., online text resources or financial applications, YouTube videos, podcasts), provide cognitive supports (e.g. outlines and summaries in audio as well as textual form to scaffold learning), and provide opportunities for practice by making learning materials and

opportunities available at flexible times and places (e.g., open-access web pages, discussion boards).

Way and Holden (2009a) recently studied the preparedness of educators to implement financial literacy education programs and activities. Their findings, based on a national sample of K-12 teachers, indicated that a third of the teachers felt not well prepared in subject matter related to the topics of financial planning and credit and debt, and half felt not well prepared to teach about saving and investing and risk management and insurance. Further, well over half of the teachers felt not well prepared in key financial education pedagogies, such as using online financial literacy learning resources, modifying financial education teaching methods and content for diverse learners, and understanding how social and cultural background relates to financial literacy understanding. Expanded teacher education is likely going to be needed to optimize the reach and effectiveness of personal finance education, particularly if it is going to make use of the benefits of new and emerging technologies.

Past efforts to expand personal finance education have focused primarily on what might take place in educator-planned formal and nonformal contexts. The expanding use of information and communication technologies suggests that it is now more important than ever to recognize the nature and potential of learning that occurs in informal ways through, for example, self-directed learning. Studies conducted in the 1970s (Tough 1971, 1979) revealed that more than one-thirds of adults' intentional learning occurred outside formal contexts in places such as the home and workplace. There is evidence that this level of effort devoted to informal learning continues today. In a recent study of Canadian adults, Livingstone (1999, 2001) found, for example, that participation in informal learning activities outpaced participation in instructor-led courses by a ratio of at least five to one. The research also revealed that that 80 percent of study

participants averaged five hours per week in informal learning related to household matters, including budgeting. A majority of the respondents (87 percent) in Hira and Loibl's (2008) national study of investment behavior (n=911) indicated they enjoyed learning new things about investing and preferred to do so either by talking with 'knowledgeable others' one on one (87 percent) or by doing their own research (75 percent).

We don't yet know how many young people engage in informal learning related to personal finance. But the fact that 65 percent of young adults age 18–29 use cellphones to access the Internet (Hadhazy 2010) and 27 percent of teenagers do (Lenhart et al. 2010) means there is great potential for it. Thus, we argue that it makes sense to consider informal learning as an opportunity to impact financial well-being among both youth and adults. This opportunity can be realized in two ways. One is by making high quality resources available through the Internet in a format that will facilitate self-directed learning among individuals with a variety of learning needs, styles, and challenges. Ideally, this would also give attention to helping learners understand how to assess the quality of information that is available about personal finance topics. The other way is to help educators engaged in providing formal and nonformal personal finance education bridge the historic divide between teacher-directed and self-directed learning. Web-based resources will be an essential resource for both approaches.

MyMoney.gov represents a comprehensive collection of resources and information about personal finance available online from United States government agencies. However, the collection is primarily text based, makes no provision for varying reading levels, does not provide any guidance on how quality of the information provided is assessed or assured, and does not guarantee (in fact offers a disclaimer about) accessibility of resources for individuals with disabilities. One resource that may serve as a model for addressing these issues is

MedlinePlus (www.medlineplus.gov), the website on health issues sponsored by the National Institutes of Health and produced by the National Library of Medicine. Designed for lay users, the site does more than simply provide information; it has several built-in features that more deliberately support self-directed learning. For example, it provides interactive tutorials, videos, self-assessment tools, low-reading-level materials, guidelines, and a tutorial on evaluating Internet health information, and it is designed to conform fully to web accessibility guidelines.

Besides providing more high-quality Internet-based resources for self-directed personal finance learning, educators can also take specific steps to bridge the divide between teacher-directed and self-directed learning to nurture more of the latter outside of educator-developed interventions. Gibbons (2004) describes how this might take place. Educators can introduce self-direction in assignments, encourage learners to form their own judgments and craft solutions to complex problems, teach learners how to design their own plans for achieving teacher-developed learning goals and coach them as needed, and teach learners to formulate their own learning goals and plan how to work toward and evaluate them independently.

While steps can be taken to be more strategic in designing personal finance education tools and strategies to accommodate the needs of diverse learners (including vulnerable populations) and support informal learning, there are two other considerations that could better ensure learners are able to make meaningful use of technology-based personal finance education opportunities. One is to work to ensure that historic biases related to such factors as gender, race, and socioeconomic background are not reinforced through application of technology-based personal finance education tools and strategies. With respect to gender, research indicates, for example, that women are more risk averse than men in dealing with personal finances (e.g., Cohen and Einav 2007; Grable 2000; Grable et al. 2006; Hallahan et al. 2004) and that this

aversion can have negative consequences in terms of earning capacity and investment behavior (Ford and Kent 2009; Pritchard et al. 2004). Some scholars have suggested that educational methods may socialize girls and boys differentially, resulting in such disparities. As mentioned earlier in this paper, for example, girls have historically been underrepresented in video games (Williams et al. 2009) and engage in video game play less frequently than boys (Morris 2010). Future designers of personal finance games and simulations will want to make sure that they are as appealing to female learners as to male, so that women do not continue to miss out on what is arguably an important (though perhaps incidental) context for learning about reasoned risk taking and its payoffs.

Another area of potential bias is suggested by research that has revealed that lower-income students are exposed to different pedagogies involving the use of computers in schools. In a national survey of more than 4000 teachers, Becker (2000) found that students in lower-income schools used computers more often for repetitive practice while students in higher-income schools more often used them for sophisticated, intellectually challenging applications. Unless such differentials are intentionally addressed, the potential of financial education to improve life quality among all Americans will not be achieved.

Perhaps because the historical focus of financial education has been on preventing and addressing financial vulnerability, some scholars have argued that it is easy to get trapped into using a deficit perspective in thinking about how to provide or support personal finance education activities (Buckland 2010; Lusardi et al. 2010). Avoiding this temptation is a final strategy that can be employed to harness the full potential of technology-based tools for financial education. Lisa Dodson (1998), who documented the lives of women living in poverty over many years, told poignant stories about how, despite having little money, needy small children,

and ‘no man to help,’ the women in her study found the strength to manage to survive financially. In a recent study of financial literacy among Canadians, Buckland (2010) also found that many low-income individuals learn to cope with very limited budgets and that, contrary to what might be expected, they had fairly detailed knowledge about government programs and banking services. Yet the skills and understandings that underlie strengths of underserved populations are too often either not understood or discounted.

A testament to the importance of this insight was recently provided by Tisdell et al. (2010), who completed a national study of community-based financial literacy educators. They found that ‘drawing on the learners’ financial experiences’ was considered to be the most effective pedagogical practice used by the community educators. We believe new and emerging information and communication technologies provide many opportunities for building on learners’ strengths and financial experiences and helping individuals learn from each other. Social networking sites and Internet forums, for example, seem like excellent tools for this purpose. More important, however, may be avoiding the temptation to think of the personal finance ‘expert’ as the primary source of wisdom for personal finance education.

As we finished this literature review on perspectives that could be used to harness the potential of technology for expanding the reach and impact of personal finance education, it occurred to us that the question may not be so much what technology can do for us, but rather what we can do with technology. The subtle difference is that the former viewpoint represents a technological mindset, or a focus on efficiently reaching preset goals via technological means. The latter perspective asks, ‘What are the goals at which we should be aimed?’ In the case of personal finance education, we have yet to arrive at definitive answers to what those should be.

Technology can assist in achieving educational goals, but of course, it cannot be expected to determine them. Neither should it be permitted to drive them.

Summary Model

Our vision of the contribution that technology can make to personal finance education—how it may help and why—is summarized in Figure 4, Ecological Model for Technology-Based Financial Literacy Education Intervention. This literature review began with a discussion of how human behavior theories, which offer insights into how behaviors are formed and why, may be useful in identifying optimal strategies for designing and supporting financial literacy education interventions. These behavior theories suggest that behavior emerges as a result of characteristics of the individual, as well as interpersonal and societal (community/organization and policy systems) factors, which can be viewed within a nested (ecological) configuration. Although not all theories of behavior are totally unique in terms of how they are conceptualized, they can be categorized in terms of the emphasis given to how individual, interpersonal, community or organization, and policy or system characteristics affect behavior. These represent potential units of practice for educational interventions and efforts may focus on more than one level or unit of practice at a time. The model is meant to represent the idea that while education has a role to play in nurturing positive financial behavior change, it is not the only factor that may play a role.

Figure 4 here

This literature review then turned to a discussion of the how digital technologies can enhance financial education efforts through affordances or specific contributions. We argue that

technology, when applied in reasoned ways, can support learning tasks and processes, serve to enhance learner motivation, and expand or ensure access to learning opportunities, particularly for vulnerable populations. The bidirectional arrows in the model are meant to remind, however, that technology may not produce desired or optimal outcomes if possible applications do not carefully match learner characteristics and needs, learner context, desired behavioral outcomes, and units of practice. Throughout, we call for a learner-centered, 'learning with' (constructivist) rather than a 'learning from' (behaviorist) perspective as the foundation for technology-based financial education efforts. The space of educational intervention reflects the decisions that are made by educators and learners about how they wish to employ or engage with financial education tools, resources, and strategies. Educational interventions may take place in formal, informal, and nonformal settings and are potentially ongoing throughout the lifespan.

The model suggests that technology-based educational interventions can be expected to result in positive educational outcomes in terms of knowledge, skills, and behaviors, and that these outcomes will contribute to financial well-being. The arrows, however, are depicted within the larger overarching philosophical and ideological environments (financial, educational, governmental), which is meant to emphasize that these environments hold the power to frame, nurture, and constrain educational goals, educational possibilities, and thus educational and financial outcomes

Findings on Financial Literacy for Vulnerable Populations

Before turning to conclusions and implications, it is appropriate to underscore that the literature supporting the ecological model for technology-based financial literacy education intervention serves as a rich source of insight into how technology can be used to better address

the financial education needs of vulnerable populations. The behavior theories reviewed suggest how important it is to consider not just individual-level characteristics, including present and potential financial vulnerabilities, in designing financial education interventions, but also the interpersonal, group/organizational, and system-level contexts within which individuals reside. The theories also highlight the importance of using multiple intervention strategies simultaneously rather than just disconnected, 'single-shot' efforts. The scholarship related to affordances of technology, moreover, points out that, applied appropriately, technology can expand possibilities for educational participation (educator and self-directed) for those facing restrictions of time, place, or mode of access; accommodate diverse learner needs related to content or learning process more effectively; and provide more engaging approaches to teaching and learning. Finally, the literature points out that failure to address the potential role of technology in financial literacy education may not only serve as a missed opportunity to enhance educational outcomes and well-being among vulnerable populations, but may well exacerbate existing vulnerabilities.

Conclusions and Implications

Findings from this literature review suggest that there is good reason to be excited about the potential of technology for expanding access to financial literacy education and enhancing the effectiveness of educational investments for the general as well as special or vulnerable populations. The challenge is not really whether or not or how much to use information and communications technology for personal finance education, but rather how to harness the potential of these technologies. And the answer to that question lies in utilizing a theoretical basis for decision making about personal finance education interventions based on

understandings about what motivates human behavior related to personal finance, what motivates individuals to engage in personal-finance-related learning, and what makes learning meaningful for those who engage in it.

Implications for Practice

1. Technology-based tools and resources should be selected based on how they may contribute to positive financial behavior outcomes through educational interventions in targeted units of practice (individual, interpersonal, community/organization, systems). Knowledge acquisition may well serve as a foundation for development of financial capacity, but theories of human behavior suggest that knowledge (and even skills) will not be sufficient by themselves to effect positive financial behavior outcomes.
2. Some of the strongest personal finance education interventions may well stem from applying multiple behavior theories simultaneously in one or more units of practice. In combining theories, however, care should be taken to identify their unique contributions in order to avoid overlapping, redundant, or contradictory practice implications.
3. Personal finance practitioners should consider selecting and designing technology-based tools that help people *learn with* rather than just *learn from* technology. Such approaches, which are based on a constructivist learning perspective, are more authentic and less decontextualized, provide learners a chance to interact with others, emphasize reflection during learning rather than reproduction of knowledge, and provide for learner and peer control rather than educator control.
4. Educators should critically evaluate the factual and procedural knowledge contained in technology-based tools and resources, such as games, in terms of how it contributes to personal financial management expertise, including the situated understandings, effective

social practices, powerful identities, and shared values associated with expertise. Educators should choose resources in which the kind of thinking emphasized matters in the real world (epistemology), where the knowledge incorporated is worth knowing (knowledge), where appropriate risk taking and experimentation is encouraged (skills), where the values emphasized matter in real contexts (values), and where learners have an opportunity to explore who they want to be (identity).

5. Technology-based tools and resources should be developed based on what we know about how to motivate and support meaningful learning. 'Eye candy,' or fancy graphics and animations, cannot be counted on to produce positive experiences or outcomes. Designs that help learners feel a sense of competence, autonomy, and belongingness (reflecting self-determination theory) serve as important motivators for learning.
6. Learner needs vary in a great many ways and deliberate attempts should be made to accommodate those unique needs by designing interventions that provide for such things as language and literacy differences, cultural background, and learning styles as well as by ensuring that tools and resources meet up-to-date web accessibility guidelines. Universal instructional design principles can be helpful in this endeavor.
7. Educators and software developers should be on the lookout for historic representational and pedagogical biases (e.g., male-oriented game scenarios or passive or less-challenging instructional practices in low-income contexts) and work to ensure they are not perpetuated.
8. Professional development for educators needs to be expanded and should emphasize theory-based program development, supporting self-directed as well as educator-directed personal financial education, and the role that educational technology can play in these efforts.

9. More attention needs to be given to developing and organizing technology-based financial education tools so they can more effectively support self-directed informal learning. This effort should include an explicit attempt to help individuals understand how to evaluate Internet-based financial information.
10. Efforts should be expanded to employ new technologies to build upon existing positive financial behaviors within and among population subgroups by, for example, linking learners through social networking sites and discussion forums. Personal finance educators should also avoid using a deficit perspective in designing and implementing financial education interventions.
11. Personal finance educators should beware of the technological mindset, the overly optimistic view that there is a technological solution for most things. Technology cannot be expected to answer the question of what the aims for personal finance education should be—and should not be permitted to dictate those aims.

Implications for Research

1. Care should be taken not to confuse using or applying theory to financial education with testing or developing theory. Much research needs to be done to determine the utility of the behavior theories reviewed here for examining the role that technology-based tools and strategies can play in affecting financial education outcomes and financial well-being. This research should give attention to how technologies can be optimally used in interventions designed for various practice units (e.g., individual and interpersonal together).
2. Studies should be undertaken to examine how technology-based financial education tools can best be designed to make use of learning theories such as those related to learner motivation

(e.g., self-determination theory) and cognitive information processing (e.g., multimodal learning).

3. Further research is needed to understand how educators learn to use technology-based financial education tools and strategies, the relation of educator preparation to learner outcomes, and the role of teacher preparation relative to other educational context factors in determining personal finance education outcomes.
4. A translational research approach that engages practitioners and learners themselves as research partners and focuses on understanding what enhances adoption of best practices in various contexts would likely increase the speed with which technology-based interventions could be brought to scale by surfacing realistic implementation questions and challenges and contributing to the external validity of research designs. Correspondingly, the field would benefit by having a 'what works' clearinghouse of theory and research-based evidence that gives specific attention to the effectiveness of technology-based education tools, resources, and strategies.
5. Although it is clear that adults engage in a great deal of informal learning, little is known about how they or other groups, such as teens, emerging adults, and older adults, use technology-based tools such as social media for self-directed learning about financial matters. Since use of social media is expanding exponentially among all groups, research on this topic is greatly needed in order to design financial education interventions that can adequately account for learners' existing knowledge bases (the key to constructivist, learner-centered education approaches), build on existing strengths, and support lifelong as well as educator-directed learning.

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Notes

1. Nobel laureate Herbert Simon (1955) is known for developing the concept of 'bounded rationality,' which refers to the notion that people have only so much time and information-processing capacity and thus can be expected to (rationally) adopt rules of thumb in order to facilitate decision making.

2. Formal education refers to institutionally provided and credentialed learning opportunities; nonformal education refers to learning opportunities that are formally structured, but usually out of school and noncredited; informal education is learning that occurs by chance or during everyday activities (Merriam et al. 2007).

3. The concept of 'banking,' in which educators *deposit* knowledge and skills into students, was articulated by Paulo Freire in *Pedagogy of the Oppressed* (1970). He argued that this approach to education, because it privileges one group over another, is dehumanizing for both learners and teachers and stimulates both oppressive attitudes and oppressive practices in society.

4. The appropriate level of difficulty was termed the 'zone of proximal development' by Vygotsky (1978), who theorized that optimal learning activities are those that provide sufficient, but not too much, challenge for the learner based on his or her current level of development.

5. This 'rhetoric' includes references to such things as the violence associated with video games, the notion that they are a waste of time, and the belief that they prevent children and adults from engaging in more social and healthful activities such as group/community projects and outdoor pursuits.

6. Examples of design features that help make websites accessible are including text equivalents for images so they can be accessed by screen readers and Braille hardware, underlining links as well as coloring them so color-blind users will perceive them, and making clickable links large so users who cannot control a mouse precisely can use them.

Tables and Figures

Table 1
Transtheoretical Model Components

PRECONTEMPLATION	**No plans to take action within next 6 months**
Consciousness-raising behavior	Recognizing new facts and ideas supporting the change
Dramatic relief	Experiencing negative emotions associated with old behavior
Environmental reevaluation	Realizing the impact of the old/new behavior on social and/or physical environment
CONTEMPLATION	**Plans to take action within next 6 months**
Self-reevaluation	Realizing the behavior change is important to one's identity
PREPARATION	**Plans to take action within 30 days and has taken some steps**
MAINTENANCE	**Has changed behavior for less than 6 months**
Helping relationships	Seeking social support for the behavior change
Counter conditioning	Substituting new thoughts/behaviors for the old
Reinforcement management	Increasing rewards for new behavior and decreasing for old
Stimulus control	Removing cues to old behavior, adding cues to new behavior
TERMINATION	**Not tempted to relapse and 100% confident**
ALL STAGES	
Social liberation	Realizing social norms support the new behavior

Table 2
Major Concepts of Social Cognitive Theory

Concept	**Definition**	**Applications to Practice**
Outcome expectations	Beliefs about the likelihood and value of consequences associated with the behavior	Provide simulations to illustrate how even very small amounts of regular savings can produce large gains over time. Show video testimonials highlighting self-satisfaction or esteem gained from having a 'nest egg' for children and/or self.
Self-efficacy	Beliefs about one's ability to carry out the behaviors that will bring desired outcomes	Provide fundamental knowledge and skills but also address *confidence* in ability, for example, to select a qualified financial adviser and/or select savings/investment products given personal goals and risk tolerance.
Collective efficacy	Beliefs about the ability of a group to bring about desired outcomes	Provide examples of groups working together to build financial security (e.g., investment clubs).
Observational learning	Learning to perform new behaviors by viewing them and their consequences and/or by modeling them	Provide opportunities to observe peer models engaging in the behavior and experiencing positive outcomes.
Facilitation	Tools, resources, or environmental changes that make the new behaviors easier to perform	Automatically establish savings accounts for members of the class or work group; encourage participation in automatic savings payroll deductions.
Incentive motivation	Use of rewards and punishments to modify behavior	Provide matches for savings deposits and penalties for premature or inappropriate withdrawals.
Self-regulation	Controlling one's behavior through self-influence and social support	Provide practice in avoiding impulse buying; encourage participation in Internet forums on savings tips.

Source: Adapted from Glanz et al. 2008: 171

Figure 1
Units of Practice for Behavior Change

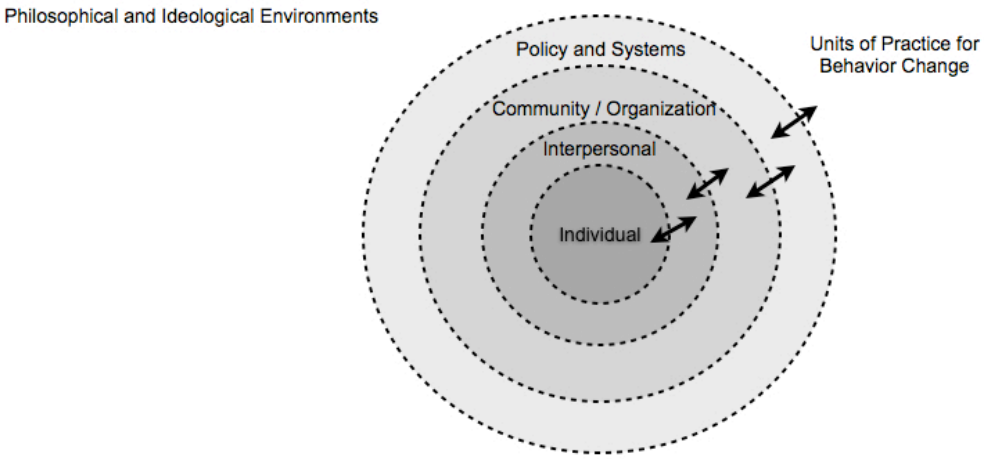


Figure 2
Space of Educational Intervention

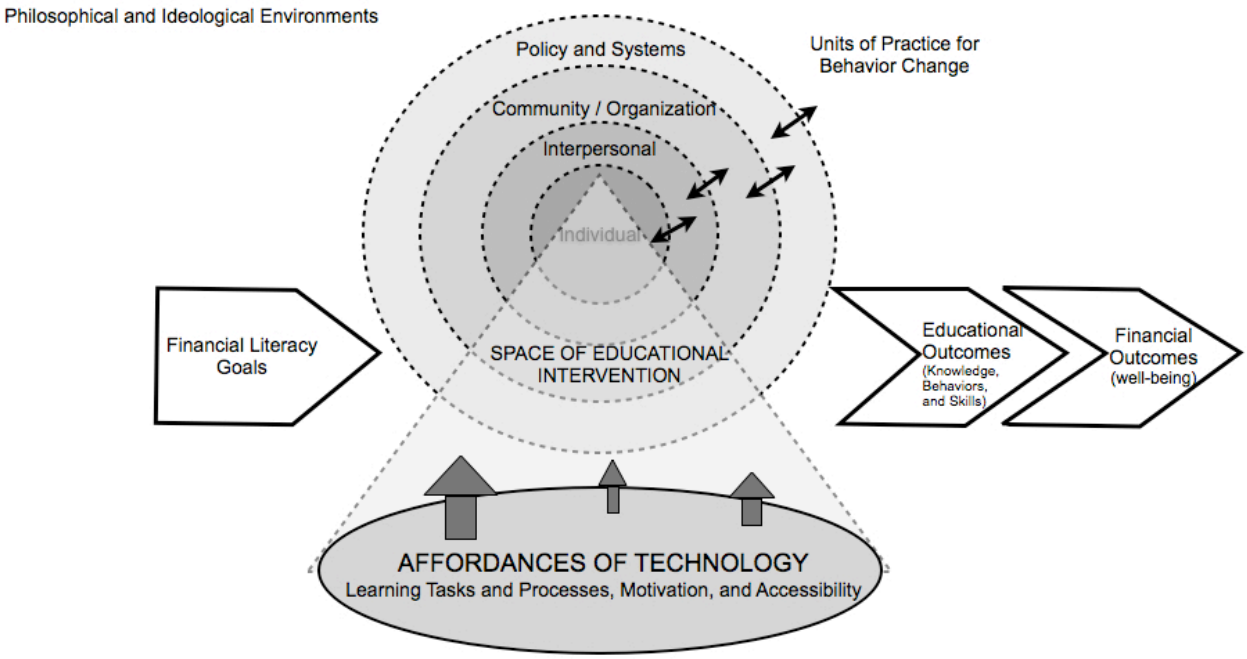


Figure 3
Technology Affordances and Learner Considerations

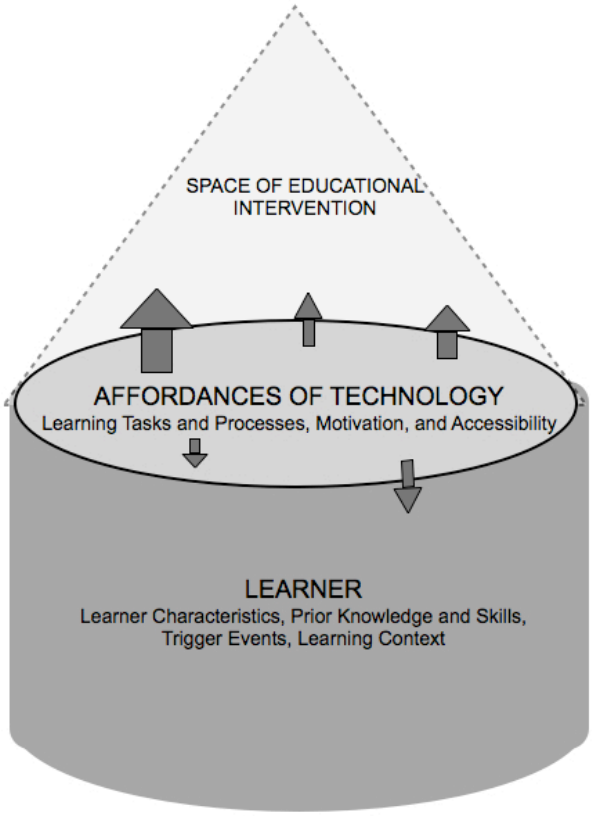
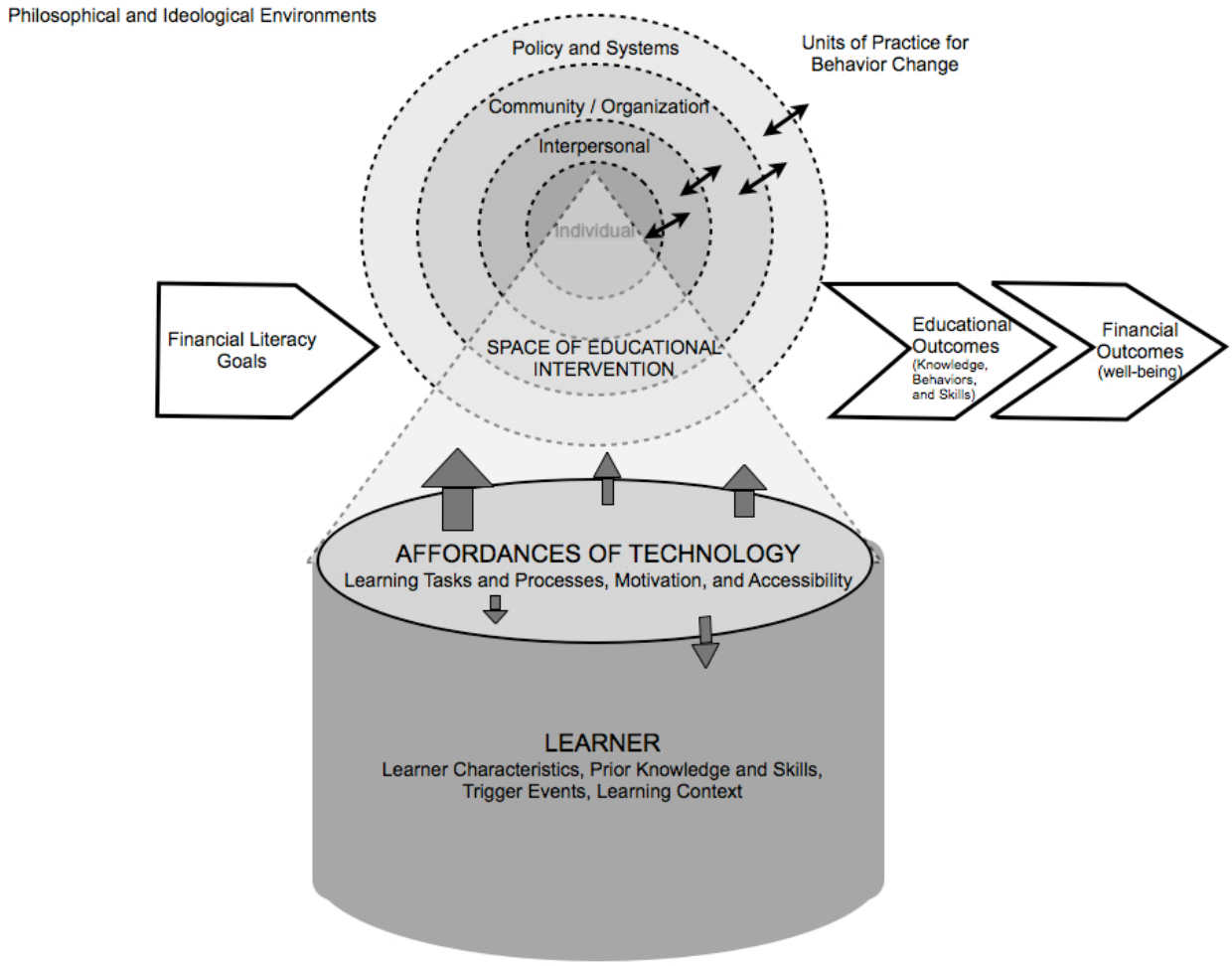


Figure 4
Ecological Model for Technology-Based Financial Literacy Education Intervention



The philosophical and ideological environments are the overarching contexts under which governments and financial and educational institutions reside. Beliefs about the purposes of financial literacy education, the nature of learners and learning, and the role of education and regulations are component parts that affect individual financial well-being.

Interactions between units of practice for behavior change are indicated with bidirectional arrows. Arrows do not depict interactions within the units of practice, but such interactions also can be expected to occur.

Affordances of technology for learning can be positive or negative depending on individual learners and the environments in which technology is employed.

Learner characteristics include both strengths and vulnerabilities related to such factors as economic and technological resources to which learners have access; gender, race, and ethnicity; life-cycle stage; nonnormative events that produce financial shocks; and cognitive and affective learner attributes. The learning context includes formal, informal, and nonformal settings for learning that are framed by time as well as space.

The Financial Literacy Research Consortium

The Financial Literacy Research Consortium (FLRC) consists of three multidisciplinary research centers nationally supported by the Social Security Administration. The goal of this research is to develop innovative programs to help Americans plan for a secure retirement. The Center for Financial Security is one of three FLRC centers and focused on saving and credit management strategies at all stages of the life cycle, especially helping low and moderate income populations successfully plan and save for retirement and other life events, including the use of Social Security's programs.

The Center for Financial Security

The Center for Financial Security at the University of Wisconsin-Madison conducts applied research, develops programs and evaluates strategies that help policymakers and practitioners to engage vulnerable populations in efforts which build financial capacity. The CFS engages researchers and graduate students through inter-disciplinary partnerships with the goal of identifying the role of products, policies, advice and information on overcoming personal financial challenges.

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