A Conceptual Model for Meeting the Needs of Adult Learners in Distance Education and E-Learning

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Abstract—More than 40% of undergraduate students are 24 years of age or older [1], and over half of these students are enrolled in distance education [2]. However, adults do not fare as well as traditionally aged college students, who are four times as likely to graduate [3]. The workforce is both aging and becoming more age diverse, resulting in the need to provide ongoing training for a range of learners [4]. There is some evidence that training performance declines with age [5]. Understanding the needs of the adult learner in distance education and e-learning is important for improving their experience and outcomes. By combining cognitive, social, and emotional factors, while being sensitive to the impact of context, we can develop programming that meets the needs of the whole learner. Drawing from the science of learning, I will outline the components of my conceptual model for meeting the needs of adult learners in distance education and e-learning. There is a diverse body of evidence-based instructional practices to support each of the factors in this model, but additional research may show significant interaction effects that may be especially beneficial for adult learners in distance education and e-learning.

Keywords—adult learners, distance education, e-learning, learning sciences

1 Introduction

Increases in life expectancy, coupled with the financial need to continue to work past traditional retirement age, has led to an aging workforce where employees of different age groups are working together more than ever before [4]. Advances in occupational complexity has also contributed to more adults seeking postsecondary education, primarily through distance education [6, 7]. As learners, established adults have different characteristics and needs than children and young adults, and these needs impact their ability to learn. These include their prior knowledge and cognitive functioning, identity and social roles, affective factors, and life contexts.

Instruction for adult learners in distance education and e-learning needs to be more efficient and effective so that adult learners can meet course objectives without spending additional time that they generally do not have. Lee [8] reported that students often cite falling behind in their course work as a reason for dropping out of higher education. In their study of adult learner behaviors in distance education, Yin and Lim [9] found

that more than half of the students reported spending an average of at least 12 hours on completing an assignment, with nearly a third of adults spending more than 21 hours on each assignment. This is in addition to up to five hours a week of self-study that more than half of the adult learners spent on each class. The majority of students in this survey held full-time jobs in addition to their enrollment in higher education. For students who maintain several concurrent course enrollments to meet financial aid requirements, this can amount to a second full-time job. I question whether workload in college courses should be determined arbitrarily according to traditional notions of seat time or if assignments should be designed to maximize the limited time and cognitive capacity that adults have available to learn.

In organizational training and development, e-learning is a common means used for training employees on job-related knowledge and skills. However, adults over age 40 reported that e-learning was their least preferred learning modality [10]. These negative attitudes towards e-learning can have a direct impact on the effectiveness and transfer of this training in the workplace [11]. In this paper, I will describe salient characteristics of adult learners, argue for the importance of the study of this population, and outline a model of factors from the learning sciences that should be considered in meeting the needs of these learners in distance education and e-learning.

2 Characteristics of adult learners

In addition to the financial, personal, and family challenges that adults juggle, adding student identity into the mix poses additional challenges [12–14]. The mental load imposed by these other responsibilities follow them throughout the day, limiting available working memory for learning. Rather than focusing their identity on being a student, as is the case for many traditionally aged college students, adults often incorporate "student" as one of their many identities into their already complex lives [13, 15]. Often, their engagement in higher education follows a life crisis, adding to the emotional burden of developing a new student identity [15]. Socioemotional selectivity theory suggests that when time is perceived as limited, emotional goals take precedence; however, when time is perceived as unlimited, goals are more likely to be preparatory and information based [16]. Therefore, motivations for learning change throughout the lifespan, resulting in different approaches to learning opportunities by adult learners.

There are several changes in cognition throughout the lifespan that are relevant to learning, including processing, brain structure, and memory. While many developmental changes in the brain are linear, some follow different trajectories [17, 18]. Generally, crystallized intelligence, or depth of knowledge and wisdom, is maintained or increased throughout the lifespan, and fluid intelligence, or reasoning and inference that does not rely on background knowledge, begins to decline after adolescence (see Figure 1) [17, 19, 20]. These have also been referred to as cognitive mechanics, or the capacity of the neurophysiological architecture of the brain, and cognitive pragmatics, or the content-based, culturally shaped aspect of intelligence [21, 22]. Pragmatics, including knowledge and learning strategies, can be a benefit to adult learners, while decreases in mechanics can inhibit learning. Designing instruction to maximize the use of cognitive

pragmatics and minimize the dependence on cognitive mechanics can be beneficial for adult learners. It should be noted that there is wide variability in cognitive functioning of adults, and some of this is culturally mediated. While there is some commonality in brain functioning patterns throughout the lifespan, it is important to understand learner variability to optimize instruction [23, 24]. The Learner Variability Project from Digital Promise can be a useful resource in understanding and planning for this variability (https://lvp.digitalpromiseglobal.org/content-area/adult-learner).

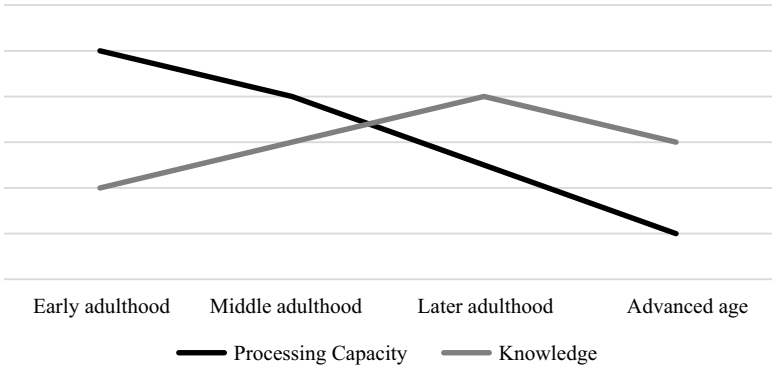

Fig. 1. Approximate trajectories of processing speed and knowledge levels throughout the lifespan [19, 20, 25]

The ability to quickly manipulate and integrate information and efficiently switch tasks peaks in adolescence and slowly declines throughout adulthood [17, 26]. More specifically, working memory performance begins to suffer in middle age, but adults recruit different and additional neural networks to complete tasks than children and adolescents, suggesting that their brains are adapting to the situation but that this may require more effort [26]. Some of these changes may be due to changes in brain structure. For example, myelination of neurons, which increases efficiency of signaling, continues throughout childhood in several areas of the brain and is not completed in the frontal cortex, where higher order thinking occurs, until an adult is in their 30s [17]. At that point, white matter in that area begins to shrink. Craik and Bialystok explained the importance of this, saying, "Efficient cognitive functioning depends on the degree of myelination and integrity of white matter, on the density and richness of synaptic connections, and on the specificity of synaptic pruning caused by fruitful interactions with the external environment" (p. 132). These structural changes may lead to the declines in cognitive mechanics seen throughout the lifespan. In addition to structural changes in the brain, lifespan changes can also be seen in the neurotransmitters that facilitate brain functioning. For example, dopamine, which is necessary for executive functions, has been shown to decline with age [27]. A variety of changes in the neurophysiology of the brain throughout the lifespan, which are influenced by life events, the environment, and normal aging, contribute to changes that may affect adult learning.

Lifespan development also includes a gradual decline in episodic memory (memory of our experiences) in the third decade of life, increasing more rapidly after age 60 [26].

Fandakova et al. [28] suggested that this is due in part to a diminishing ability to bind specific knowledge with experiences, and Craik and Bialystok [17] noted the challenges associated with age in accessing stored memories. As we gain knowledge and experiences throughout our lives, we tend to forget the source of the knowledge or exact details. If adult learners are assessed on identifying the source of their knowledge when it is unimportant to the learning objective, this may put them at a disadvantage, educationally.

Fuzzy-trace theory posits that we simultaneously encode verbatim (exact details) and gist (essential meaning) memories from the same stimulus and that children are more likely to use verbatim memory in decision making while adults show a preference for gist memory [29]. The shift to gist-based memory also assists adults in seeing the "big picture" and realizing implications when presented with new information [26]. Coupled with a bias toward pattern completion, adults have a strength in integrating across experiences and knowledge [26]. Instructional strategies that emphasize gist memory, like summarizing, integrating multiple sources of knowledge, or identifying principles and guidelines, may be beneficial to adult learners. However, assessments that require adults to recall arbitrary details may be unnecessary. While some cognitive changes put adults at a disadvantage in higher education and e-learning, others could be utilized to assist with learning if they are considered in instructional design.

3 Marginalization of adult learners in higher education

Many initiatives, policies, and reports in higher education focus primarily or solely on traditional aged students, such as a recent report sponsored by the Pell Institute for the Study of Opportunity in Higher Education, *Indicators of Higher Education Equity in the United States: 2020 Historical Trend Report* [1]. This report only looks at students who complete their degree by age 24, completely omitting adult learners.

> When those who have the power to name and to socially construct reality choose not to see you or hear you … when someone with the authority of a teacher, say, describes the world and you are not in it, there is a moment of psychic disequilibrium, as if you looked in a mirror and saw nothing. It takes some strength of soul—and not just individual strength, but collective understanding—to resist this void, this non-being, into which you are thrust, and to stand up, demanding to be seen and heard [30, p. 2].

Some scholars have labeled adult learners in higher education a marginalized population, often noting their absence from the discourse. Tinto [31] noted, "In some respects, the experience of adult students is not unlike that of minority students. They too can feel marginal to the mainstream of institutional life" (p. 76). Pascarella and Terenzini [32] observed the absence of adult learners in the literature, calling this a "substantial" bias in the research (p. 152), noting this gap again in their 2005 research on the impact of college on undergraduates [33].

In a systematic review of the literature, Donaldson and Townsend [34] categorized the discourse on adult undergraduates with four labels: (1) invisible (the traditional student experience is presented as universal), (2) acknowledged but devalued (portrayed as "deficient, problematic, different, or other" (p. 37)), (3) accepted (treated as a separate homogenous population), and (4) embraced (intragroup differences are acknowledged and their value in higher education is described). The authors looked at all articles in seven leading journals in higher education from 1990 to 2003 and found that only 1% of them were about adult undergraduates, as indicated by their titles. Similarly, in their content analysis of the literature on diversity, Sims and Barnett [30] found "a gross omission in the literature concerning adult students" (p. 9). Their searches identified only two journal articles that addressed adult learners in terms of diversity, and five books that provided recommendations for working with adults; however, none of these works addressed the intersectionality of adult identities.

> Minority, female, gay, military, and disabled college student experiences are widely discussed in diversity sources, yet those same students are disregarded in the literature based on their age, educational background, family status, or life experiences. All of these dimensions of diversity are not all mutually exclusive and should be discussed together (p. 9).

Moreover, adult students of color are more likely to have negative past experiences with school and complete degrees at a much lower rate than White adults [35]. Students of color in online learning face multiple risk factors at a much higher rate than their White peers, such as living in crowded conditions, lacking access to computers or adequate broadband connectivity, having disabilities, or living in poverty [36]. Understanding the beliefs faculty have about adult learners will be important as this will affect how they teach and whether they value the assets their adult learners bring to the classroom [37]. Faculty pedagogical preparation can have an especially significant impact on Black students and Pell-eligible students, closing the achievement gap in some cases [38].

4 Conceptual model for meeting the needs of adult learners in distance education

There is a range of cognitive, social, emotional, and contextual constructs that are likely to impact adult learners in distance education (see Figure 2). Several of these overlap multiple domains, but they all interact with the adult learner context which shapes their impact [26, 39, 40]. In this section, I will describe how prior knowledge, cognitive load, working memory/cognitive processing, attention, executive function, self-regulated learning, motivation and self-efficacy, social identity, teacher presence, and life roles are important considerations for the design of instruction for adult learners in distance education.

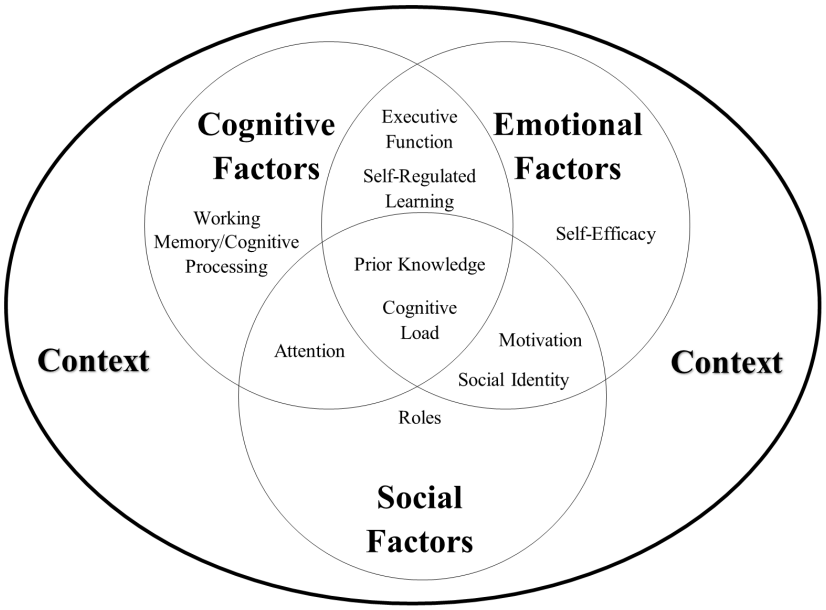

Fig. 2. Essential factors from the science of learning for meeting the needs of adult learners in distance education and e-learning

4.1 Cognitive factors

Prior knowledge. Overlapping all domains in this model are prior knowledge and cognitive load. Ambrose and Lovett [41] defined prior knowledge to include "content, skills, and beliefs, because all are 'knowledge' in that they result from past experiences and impact subsequent learning and performance" [41, p. 7]. Knowledge is a function of information and experiences stored in long-term memory which can be later retrieved and used [42]. It includes memories of our experiences (episodic memory), the knowledge we have distilled from these experiences (semantic knowledge), and our skills (procedural knowledge) [26, 43]. As learning is a matter of integrating new content and experiences into existing mental schema, distance education and e-learning can be improved when it activates and makes use of the prior knowledge and experiences of adult learners.

We form memories through a process of (1) encoding (the creation of memory traces through connecting new information, experiences, and meaning making with mental schema), (2) storage (consolidation and maintenance of memory), and (3) retrieval (using cues to recall and use the knowledge, reconstructing and strengthening the memory trace) [26, 42]. These knowledge stores are maintained and can be increased throughout adulthood [44, 45], although there is some evidence that identifying the source of the information becomes more difficult with age [19]. Effective instruction facilitates encoding, storage, and retrieval by providing authentic learning experiences

that integrate course content into prior knowledge, making connections to meaningful real-world challenges, providing adequate examples and practice, and encouraging students to explain their understandings.

As adults learn and grow through their formal education and life experiences, they accumulate a network of mental schema that can be an asset to them as students if tapped during learning activities [26]. This can be as simple as asking students to tell you what they already know about the topic, using a pre-test of the important content, or encouraging students to pause and reflect on what they have already learned in other areas of their life that might be useful in the lesson. However, it can also be a deficit as incorrect knowledge is harder to unlearn and biases us away from new information, and we often rely on these misconceptions to solve new problems [26, 46, 47]. Adults who have misconceptions may be resistant to unlearning and have a more difficult time replacing this knowledge in their minds. Even when they do replace these ideas, there is evidence that the original concepts still persist, creating a cognitive conflict and requiring inhibitory control, adding to the mental burden [48]. In fact, even scientists with PhDs in physics have been found to process information slower when the information conflicts with naïve understandings of physical phenomena [48]. Providing low-stakes multiple-choice questions with common misconceptions can be a simple way to identify these misunderstandings.

The prior knowledge and life experiences of adults effect not just their content and abilities but is also a component of their social and emotional interactions in learning and a product of their background and social context [26].This means that because they have a diversity of life experiences, adults are more variable as learners as they age. Universal Design for Learning (UDL) can be an effective pedagogical approach for addressing this learner variability in both higher education and workplace training [49, 50]. Providing multiple means of representing course content, multiple options and opportunities for engaging in learning, and multiple ways to act on and express their learning are the fundamental principles of UDL. For those new to UDL, the Center for Applied Special Technology (CAST) maintains a wealth of resources on their website at http://udlguidelines.cast.org.

Cognitive load. Cognitive load is the other central factor in this model to be considered in meeting the needs of adult learners in distance education. Cognitive load theory posits that working memory and mental processes have a limited capacity but are a combination of somewhat independent subprocesses interacting with mental schema from long-term memory [43]. These processes include intrinsic load (due to the complexity of the information), extraneous load (distractors or the processing required to access the information), and germane load (the remaining load available to devote to the intrinsic load) (see Figure 3). Intrinsic load can be reduced by breaking complex concepts into simpler chunks, using retrieval practice to automate prerequisite skills and knowledge, using metaphors or other cognitive scaffolds to structure new information, and connecting new information to prior knowledge [43, 51]. Efforts should be made to minimize extraneous load that detracts from the learning process. This might be overly complex explanations, disorganized content, the splitting of attention to focus on information in multiple places, or the load maintained by thinking about other life responsibilities and negative self-perceptions. The goal is to devote as much of a

learner's available mental capacity to the germane load required to process and learn the content. The more mental capacity available for germane cognitive load, the better the learning outcomes.

Cognitive load is variable for each learner because of their background knowledge [43], level of social and emotional skill and involvement [52, 53], and their background and situational context [54, 55], but there are instructional strategies that can be developed to mitigate extraneous cognitive load. Mayer [51, 56] suggested several strategies for reducing extraneous cognitive load. These include eliminating unnecessary words and images, highlighting essential words and pictures, integrating labels within diagrams rather than placing them side-by-side, narrating visual elements, avoiding narration that competes with written text on the screen, and presenting a preview of content before beginning the lesson. Cognitive load is an especially important consideration in distance education because of its interactions with cognitive and social presence [57]—and for adults in particular, as their working memory capacity and speed declines with age [19, 45].

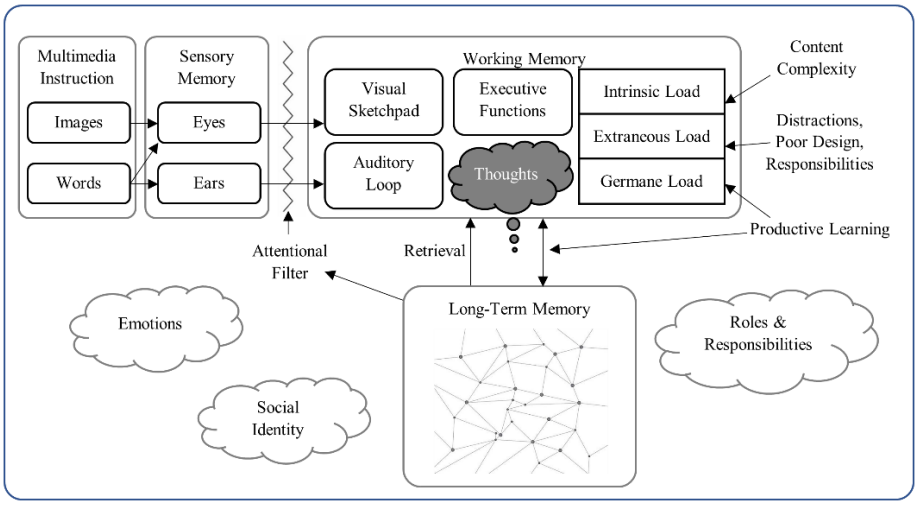

Fig. 3. A model of adult working memory based on Mayer's cognitive theory of multimedia learning with the addition of cognitive load and other related factors affecting memory [42, 43, 51, 58, 59]

There are several models of working memory, but the one most appropriate to distance education and e-learning is the cognitive theory of multimedia learning (see Figure 3) [51]. Mayer explained that words and images are presented in multimedia instruction which we perceive using our sensory memory. Our working memory helps us to (1) select the appropriate words and images to focus on, (2) organize the verbal and pictorial models, and (3) integrate these with prior knowledge from our long-term memory. Beginning in early adulthood, working memory and processing speed begins a gradual decline throughout adulthood, indicating that these three tasks are less efficient in adult learners [19, 45]. There is evidence associating this decline with a loss of volume in the prefrontal cortex [60, 61]. Mayer's theory of multimedia instruction,

described above, can be used to mitigate the demands of mental processing, while other research suggests that the ability to pace their own learning has positive benefits for adult learners [44, 62]. There are several other learning strategies that are particularly useful for limited working memory capacity, such as retrieval practice [63] or making non-threatened identities more salient for those that experience stereotype threat, as discussed below [64].

Retrieval practice is especially beneficial as it can automate necessary information and skills to free working memory to focus on more complex tasks. This can be accomplished through frequent low-stakes quizzes or knowledge checks, reviewing information with flashcards and games, and asking students to write about or verbally explain what they are learning, to the instructor or to each other. Recognition is a weak memory trace as it only requires a learner to identify something as familiar when they are presented with it again. However, free recall requires the learner to generate the information without cues, leading to stronger encoding, processing, and deeper memory traces. Faculty and e-learning designers should provide opportunities for information recall to assist with learning, rather than tasks that only require recognition.

Attention. Selecting which information makes its way into working memory is the role of attention (see Figure 3) [65]. Attention is a finite resource susceptible to depletion with high demands [66]. Because adult learners in higher education often have multiple roles [13, 67], their attention is more likely to be divided or used to maintain these other roles. Switching between tasks has a high cost in time and memory which negatively impact learning, putting learners at a disadvantage in distance education and e-learning where learners are often multi-tasking or working in distracting environments [59, 68]. Knowing in advance that there will be an interruption or switch allows the learner to clear their working memory and prepare to focus on something new. If the task is switched without preparation, like with an interruption, the impact on attention will be more negative in terms of cost. This supports other research that demonstrates the benefits of self-paced learning for adults as well as the benefits of chunking course content and learning activities into smaller segments [51, 62].

Executive function. The control processes responsible for "planning, assembling, coordinating, sequencing, and monitoring other cognitive operations" are referred to as executive functioning, a metaphor of a business executive who does not specialize in a particular task but manages all tasks [69, p. 566]. Craik and Bialystok [17] explained that executive functions "overcome the prepotent 'default mode' of automatic behavior and allow the person to attend selectively, to concentrate on a particular task, to make choices in line with current goals, and to facilitate new learning and adaptive responding" (p. 134). Executive functions are particularly important in distance education and e-learning which are often self-directed learning modalities, requiring the learner to plan, sequence, monitor, and control their learning activities, while inhibiting distractors, directing their attention, and adapting to change [68]. Executive functions are potential mediators of age-related cognitive declines, yet there is evidence that these skills can be improved with practice [70]. For example, there is some evidence that strategy training and core working memory training can have far reaching benefits for adults [71, 72]. While many of these executive functions are naturally supported in the traditional face-to-face classroom, they are often less present in the design of asynchronous online learning.

Self-regulated learning. Addressing executive functions in distance learning is important as these skills underlie effective self-regulated learning [73], which are significant predictors of academic achievement [74]. Adult learners are often lacking the strong self-regulation skills necessary for success [75–77]. Pintrich [78] defines self-regulated learning as "that which involves the active, goal-directed, self-control of behavior, motivation, and cognition for academic tasks by an individual student" (p. 5). This includes planning, monitoring, controlling, and reflecting on learning. Social-emotional aspects of self-regulated learning, such as self-efficacy, may be particularly relevant for adults in distance education [79]. Self-regulated learning is not improved simply by participation in online learning [75], but these skills can be taught and improve outcomes for adults in distance education [80]. Faculty and e-learning designers can help support self-regulated learning by modeling task analysis, breaking larger learning assignments into smaller parts, estimating the time it will take to complete each activity, planning when to complete the tasks, and using a checklist to keep track of progress. Another important component of self-regulated learning is reaction and reflection. Asking adult learners to reflect on their learning processes, feelings, motivation, behaviors, interactions, and environment can help them to accurately attribute successes and failures and identify strategies for improving their learning.

4.2 Social factors

Roles. Working adults in higher education are twice as likely to consider themselves "employees who study" than "students who work," identifying first as an employee [13]. Employees who study are older, more likely to be married and have children, attend school part-time, and work full time. Their goals for participation in higher education are to improve their career prospects, but also for personal enrichment [23]. Adults in higher education balance multiple roles, such as work, caregiving for children and older relatives, community engagement, and volunteer work [67]. Role strain can be particularly challenging for working mothers in higher education who can experience conflicting demands, overload, and guilt [68, 81]. It is important to consider the multiple roles of adult learners as these carry a time and attention burden that is not present for most traditional-aged college students [82]. These roles contribute to the amount of attention that can be devoted to learning activities as well as extraneous cognitive load. Instructors and e-learning designers can consider streamlining course content to minimize the time and attention required of the adult learner as well as using authentic contexts for course content that are personally relevant to the learner and align with their life roles.

Social identity. Marginalized identities place additional burdens on adult learners. General social identity threats come from perceived situational cues that imply the devaluing of one's identity [83]. When a learner experiences stereotype threat, or the fear that they will meet negative expectations set by society based on their identity [84], this taxes executive functions, increases worry and anxiety about failure, and places limits on working memory [26]. The effect is even greater in situations where the learner is especially motivated [85]. Adults with marginalized identities may attribute challenges or failures in higher education or e-learning to a belief that they don't belong there, not thinking that challenges are common to most learners [26, 86].

Stereotype threats arise from four conditions: (1) the individual is aware of a stereotype of their social group (e.g., suggesting that women are bad at math or older people cannot learn technology skills); (2) the individual is confronted with an evaluative task that will demonstrate their ability, like e-learning or assessment; (3) the task is challenging; and (4) the individual is motivated to perform well and identifies with the stereotyped group [83, 86]. The negative effects of stereotype threat can equate to performing one half of a standard deviation below one's actual performance [83]. Identity contingency cues that may promote stereotype threat include underrepresentation, interpersonal cues of incivility and negative behavior, critical feedback, color-blind statements and policies, and fixed-ability beliefs and messages [83]. Creating a warm and welcoming virtual classroom environment or workplace can lesson stereotype threat. Threats to social identity can produce a cognitive load [64, 87], but efforts to remind students of their other life roles and de-emphasize the salience of the threatened identity can mitigate this threat [88, 89].

Social identity is an important factor in the success of any learner, but there are particular components of identity and self-concept that are relevant for adults in distance education and e-learning. Higher education poses challenges for learning, and adults who have a more fully developed self-concept may be sensitive to their changing abilities and are likely to protect this self-concept through avoidance and compensation [23]. Adult learners may avoid learning activities that rely heavily on their declining cognitive mechanics, while also seeking to demonstrate their breadth of knowledge in areas of perceived competence. Protecting self-concept can lead middle-aged and older adults to choose certain types of career development activities and avoid others [90].

There is evidence that instructing adults on the benefits of committing errors during learning and giving them the freedom to make these errors has positive effects on their learning [91, 92]. For example, because older learners have more negative reactions to making mistakes in computer training, Carter and Beier [91] developed an error management training as an intervention. They found that this training was beneficial for adults, even in highly structured activities where there was less room for error, and especially so for adults with higher cognitive ability who might have been more likely to protect their self-concept by avoiding opportunities for mistakes. Carter and Beier argued that, while self-paced learning is beneficial for adults, it may take too long. They suggest that combining high structure and error management training can reduce the time for self-paced learning.

Social presence. Social presence of any kind online can be defined as "the degree of feeling emotionally connected to another intellectual entity through computer mediated communication" [93, pp. 1738–1739]. Learning is socially contextualized because it involves "the experiences, social relationships, and cognitive opportunities as subjectively perceived and emotionally experienced by the learner" [26], whether the learner is working alone or with others. Even in self-paced individualized online learning, students are still socially connected to a real or imagined instructor who is providing the instruction.

Social presence online has been studied in terms of cognitive presence (intellectual connection to course content), social presence (connections to other students), teaching presence (sense of connection to the instructor), and other forms of presence [94]. Indicators of social presence can be affective (expressions of emotions or mood),

interactive (acknowledgement of another), and cohesive (things that build or sustain group cohesion) [95]. Adult learners find teaching presence to be essential for their learning and seek deep interactions with content rather than surface learning, with peer interactions a bonus [96, 97]. Mayer [51] suggested that this connection helps to foster deeper processing during learning. The Community of Inquiry (CoI) model can be helpful in designing for cognitive, social, and teaching presence and addressing the emotional needs of adult learners [98, 99]. Embedding course content into social contexts, such as through stories, scenarios, or case studies, can help the learner connect to the content. Mayer [51] explained that using real human voices with conversational language in e-learning can increase a sense of social partnership with the instructor, leading to increased effort and attention on the part of the learner.

4.3 Emotional factors

Motivation. Adults are increasingly motivated to obtain emotional meaning from life [23, 98, 100], and their brains are too efficient and overloaded to learn something that is not meaningful—if there is no emotional connection to the content, such as curiosity or motivation to learn, the information will not be remembered [58]. Motivation is an important consideration for distance learning as some research has found lower levels of motivation in online learners with high correlations to course performance [101]. A meta-analysis of the research on motivation in adult learners found that adults who chose online courses were intrinsically motivated and had high self-efficacy, while instructional design strategies that were associated with high motivation included building on learners' life experiences and allowing for personal control in when, where, and with whom to learn [102].

Self-efficacy. One particularly relevant component of motivational theories for adult learners is self-efficacy [23] and its role in situated expectancy-value [40] as growth and accomplishment are important factors in motivation for adults [26]. Self-efficacy has been defined as "the belief one has in their own capabilities to perform certain tasks" and has a significant impact on the academic and training performance of adult learners [103, pp. 113–114; 104]. To be an adult means to be competent, although when adult learners enter higher education, "they compartmentalize their prior understandings of self-efficacy and competence in their adult life worlds, believing that their backgrounds have limited or no value in the academic world" [15, p. 31]. Many adults will try to protect their self-image by taking steps to avoid failure, rather than take risks to improve learning [91]. Educational environments that encourage risk-taking and provide psychological safety can allow for adults to engage more deeply in learning. Strategies for improving self-efficacy in learners include helping students to set appropriate goals, helping them to break them down into subgoals, and providing feedback on progress so students can attribute their success to their own efforts [26].

Eccles and Wigfield [40] contended that significant impacts on performance come from the individual's expectancies for success and subjective task values. Expectancies of success, or the learner's belief about how well they will do on a task, are influenced by their beliefs of personal efficacy, academic self-concept, and perceptions of task difficulty. Subjective task values are determined by intrinsic value (anticipated

enjoyment or interest), attainment value (identity-based importance), utility value (means to an end), and cost (including the amount of effort needed, time away from other valued tasks, and emotional costs related to anxiety and failure) [40]. Helping learners to reflect on these components and making them explicit can help them to increase their value, self-efficacy, and motivation. Faculty and e-learning designers can use this framework to design learning tasks that their adult learners will value and complete competently.

5 Conclusion

Understanding the needs of the adult learner in distance education and e-learning is important for improving their experience and outcomes. By combining cognitive, social, and emotional factors, accounting for unique contexts, we can develop programming that meets the needs of the whole learner. While the extant literature shows support for the individual factors in this model, further research should be conducted to test the significance of this model as a whole. Research in these areas has primarily been conducted on school-aged children or traditional college-aged students in classroom or lab environments, so ecological validity and focus on adult learners will be necessary. There is a diverse body of evidence-based instructional practices to support each of the factors in this model, but additional research may show significant interaction effects that may be especially beneficial for adult learners in distance education and e-learning.

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