

## Epistemological Development and Critical Thinking in Post-Secondary

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*Using Kegan's constructive-developmental theory, this study explores to what extent epistemological development is a factor in critical thinking performance and learning in reading and writing among a diverse group of six adult learners. Analysis of a developmental interview, a summative assessment and participant surveys indicated that learners constructing meaning from earlier developmental perspectives demonstrated lower critical thinking in reading and writing, and expressed successes and challenges in accordance with their developmental perspectives. Implications are discussed for supporting critical thinking growth for developmentally diverse adult learners.*

**Keywords:** *Adult development; critical thinking; reading/writing; academic literacy; constructive-developmental theory*

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### Introduction

Developing critical thinking skills in reading and writing is increasingly

recognised as important for preparing educationally disadvantaged adults for the post-secondary education they will need to compete in knowledge-based workforces. Canada's Language Benchmarks for adult English as a Second Language Learners and United States Adult Basic Education (ABE) guidelines include critical thinking skills such as identifying an author's purpose, main idea, intent, and line of reasoning, and communicating complex concepts using abstract language (Centre for Canadian Language Benchmarks, 2012; Pimentel, 2013). In the United States, the General Education Diploma, recognised by many states as a high school diploma alternative, was revised in 2014 to require and assess the ability to write logical, cohesive arguments with claims supported by evidence (GED Testing Service, 2013). As more adults enter post-secondary institutions, their ability to think critically in reading and writing is essential (Pimentel, 2013).

However, many adults entering post-secondary in the United States underperform in critical thinking in reading and writing (Flores et. al., 2012; Pitmann, 2010). A relevant theoretical lens not frequently considered in addressing this issue is that of adult epistemological development. The family of adult developmental theories that focus on epistemological growth are *constructive-developmental*, based on the tenet that adults actively construct rather than passively observe reality, and that the logics through which they make meaning become more complex over time. Constructive-developmental theories suggest that some adults will be "in over their heads" in facing "the curriculum of modern life," (Kegan, 1994). Few studies, however, have investigated how epistemological complexity shapes critical thinking in reading and writing (Kane, 2005; Shapiro, 1984), particularly among educationally disadvantaged adults.

The purpose of this study was to use a constructive-developmental lens to understand to what extent epistemological complexity is a factor in developing critical thinking skills in the context of reading and writing. The question guiding this research was: *How might adult learners' epistemological complexity impact their critical thinking performance and learning in reading and writing?* The adult learners in this study were enrolled as students at a tuition-based private university in the state of Minnesota in the United States, where they registered for English as a Second or Other Language (ESOL) or

remedial classes to prepare for admission to a degree program. Because they tested below twelfth grade reading levels, they also qualified to enrol in Minnesota's ABE system, which is publicly funded and non-tuition based, administered through the Minnesota Department of Education, and delivered through non-profit organizations and public school districts. Therefore these learners were also enrolled in an ABE class through a community-based organization partnering with their university. In this study, I found that learners demonstrated and described successes and challenges with critical thinking in reading and writing in ways that reflected their epistemological complexity as per constructive-developmental theory, suggesting that for these learners, epistemological development played a role in critical thinking in reading and writing, and that constructive-developmental theory may help explain their successes and challenges.

In focusing on academically underprepared learners, this study joins a small but growing body of research using a constructive-developmental lens to explore the learning and growth of educationally disadvantaged adult populations (Bridwell, 2013; Drago-Severson, 2004; Lindsley, 2011). Some scholars have noted the potential risk of investigating disadvantaged adult learners through a developmental lens, which may favour growth and higher stages of development often afforded by resource-rich environments and access to privileges such as formal education and time for reflection (Hoare, 2006; Brookfield and Holst, 2011). Popp and Boes (2001) also state that a constructive-developmental approach to competence risks being construed as deficit-oriented, as nuanced, abstract thinking is possible only at certain stages of adult development (Perry, 1970; Kegan, 1982, 1994; Loevinger, 1976). However, the importance of critical thinking in reading and writing warrants investigation from all relevant perspectives, and a constructive-developmental lens may help illuminate not only developmental challenges, but developmentally appropriate approaches to supporting learning and growth (Drago-Severson 2004; Kegan et. al. 2001).

## **Theoretical Framework**

Constructive-developmental theory is based on the constructivist tenet that people actively construct rather than passively observe

reality (Drago-Severson, 2004; Kegan, 1982, 1994). Critically, it is also founded on the empirically supported theory of developmentalism, which maintains that the logics through which people construct reality develop over time and follow predictable patterns, moving hierarchically toward increasingly complex ways of knowing (Baxter-Magolda, 1999; Kegan, 1982, 1994; Loevinger, 1976; Perry, 1970). Kegan's constructive developmental-theory, which informs this study, belongs to a family of theoretical models including Kohlberg's (1981) and Gilligan's (1982) models of moral development; Loevinger's (1976) theory of ego development; Perry's (1970) stages of ethical and intellectual development in the college years; and Belenky's (1997) stages of women's development. While distinct in emphasis, each constructive-developmental theory expands on Jean Piaget's work on child development.

Constructive-developmental theory describes why some adult learners are likely to struggle with critical thinking skills in reading and writing. In particular, a concrete, or *instrumental* thinker constructs meaning with the same black-and-white logic that characterizes Piaget's concrete operational stage. At this stage, a person cannot yet make abstractions or inferences (Kegan 1982). Longitudinal adult developmental research suggests that while fewer than five percent of North American adults construct meaning entirely with this epistemological perspective, up to 36 percent are partially instrumental knowers (Kegan, 1994). The epistemological structure of the instrumental way of knowing is *categorical* (Kegan, 1994). That is, instrumental learners think through one category at a time, and can't coordinate different categories of information. This in turn makes it impossible for a fully instrumental knower to make inferences, abstractions, or generalisations (Drago-Severson, 2004). Taylor (2006) describes the writing that instrumental learners are likely to produce as "a brain dump," of disconnected and unedited thoughts (p.207).

Kegan (1982) explains that with the *socializing* way of knowing, the underlying epistemological structure is *cross-categorical*. Socializing learners can cross-reference different categories, take others' perspectives, and, vital for critical thinking, make abstractions, inferences and generalizations. At the next, *self-authoring* way of knowing, adults can examine and take responsibility for their own

thinking, feelings and patterns, which Taylor et al. (2000) describe as “the mainspring of adult development” (p.30). A small number of adults construct meaning beyond the self-authoring way of knowing (Kegan, 1994).

The concrete, categorical thinking of the instrumental stage poses a challenge to tasks such as identifying the main idea of a text, because stating a main idea requires relating, synthesizing and generalizing different pieces of information. Constructive-developmental theory suggests that learners who are transitioning from instrumental toward socializing ways of knowing are still developing the very epistemological structures that will allow them to generalise and make inferences (Drago-Severson, 2004; Kegan, 1982, 2006). This study was motivated by the struggle that many learners demonstrate with critical thinking in reading and writing and the relevance of constructive-developmental theory to this challenge.

## **Methodology**

In a study with educationally disadvantaged and culturally diverse participants, it is important to note that the primary theoretical lens for this study, constructive-developmental theory, derives from the field of Western developmental psychology. Likewise, the critical thinking framework used in this study, from the Critical Thinking Foundation (Paul & Elder, 2006, 2008), derives from a Western lineage of analytic thinking (Brookfield, 2012). My understanding of adult development and critical thinking is informed by these theories, and is necessarily culturally constructed and predisposed.

In my dual role of teacher and researcher, I emphasised to participants, in writing and verbally, that the choice to participate or not would in no way affect their success in the class and that they could opt out at any time with no questions asked. I also explained that individual identities would be protected in any publication through using pseudonyms, avoiding naming their educational institutions, and including no content or identifying information from their Subject Object Interviews (SOIs). This study was held to high ethical standards as per approval by the Institutional Review Boards of my university and of the university where this research was conducted.

## **Method**

To examine how epistemological development might impact performance and learning in critical thinking in reading and writing, I engaged in an explanatory qualitative case study. A qualitative study is appropriate for exploring relationships between the interrelated processes (Maxwell, 2005) of epistemological development and critical thinking, and a case study is appropriate for doing so within a bounded system narrow in scope with finite participants (Savin-Baden & Howell-Major, 2013; Yin, 2009). An explanatory case study allowed me to explain the impact of epistemological development on critical thinking through the lens of constructive-developmental theory (Savin-Baden & Howell-Major, 2013; Yin, 2009). Yin (2009) states that the validity with which explanatory qualitative case studies can account for how and why one event leads to another is increased where additional explanatory factors are also considered. Accordingly, to take reading ability into account along with epistemological complexity, I measured reading ability through the Test of Adult Basic Education (TABE).

To enhance reflexivity, I regularly considered, “How might I be wrong?” (Maxwell, 2005). I also regularly discussed findings during the research process with the two experienced colleagues not connected to my research (Lincoln & Guba, 1985), and shared my interpretations with a colleague knowledgeable of constructive-developmental theory, inviting alternate interpretations to my own during the process (Krefting, 1991).

### ***Site Selection and Participants***

The participants in this study consisted of six diverse learners. Of the three American-born participants, one self-identified as African-American and two self-identified as Hispanic. Three were ESOL learners who arrived in the U.S. as adults and were from Ethiopia, Togo, and Somalia. Of the two Hispanic participants, one identified Spanish as her first language; the other identified Spanish and English as her first two languages. The African-American participant identified English as her first and only language.

1. Participation in the study was optional. Seven of eight students volunteered to participate. Six of seven met the following criteria and were thus included in the study: the seventh did

not meet the second criteria, demonstrating strong writing ability early on in the class, and thus was not included.

2. Participants were enrolled as ABE learners in a supplementary academic literacy class at the advisement of their post-secondary institution.
3. Participants demonstrated inability to clearly and accurately summarise a health news article in the initial course assignment.

Participants qualified as ABE learners by virtue of having a valid score at or below a twelfth grade reading level on a standardised TABE reading test at the time they joined the academic literacy class. One participant tested at an 11.1 grade reading level at the beginning of a class, but 12.9 by the time of the midterm. Her reading level is thus reported as 12.9; 12.9+ is the highest possible score on this test.

Four of the six participants were enrolled in the academic literacy class for both fall (September to December) and spring (February to May) terms. Two of the six participants joined the class in February of spring semester. I instructed the class, and participants were my students at the time of the research.

The primary purpose of the course was to teach the critical thinking in reading and writing skills assessed in this study. These skills are second and third level critical thinking skills in the Critical Thinking Foundation's *The Thinker's Guide to How to Read a Paragraph: The Art of Close Reading* (Paul & Elder, 2008), which was a core textbook.

### ***Data and Instruments***

To assess learner's epistemological complexity I used the structured Subject Object Interview (SOI), created by developmental psychologist Robert Kegan and colleagues (Lahey, 1988) to assess developmental levels. During the one-hour interview, participants described experiences connected to words written on index cards. For example, in response to a card labelled "important to me," a participant might describe a recent experience trying to meet a goal. The interviewer would ask follow-up questions to understand how the participant

constructs meaning about that experience, for example, “What did that mean to you?” or “How did you know whether you were successful?” While some participants spoke English as a second or other language, their verbal conversational English skills were strong, and they appeared to express themselves throughout the interviews with ease.

The SOI interviews were analysed according to prescribed procedures. Possible developmental stages range from instrumental (2), socializing (3), self-authoring (4) up to self-transcending (5). Between any two balance points, there are four possible sub-stages. In sum, the SOI measures 16 total developmental distinctions including developmental stages and sub-stages. Inter-rater reliability of the SOI is high at 87% complete agreement between two raters. Reliability is defined as agreement between two raters within a single sub-stage, or one-fifth of a stage (Lahey et. al., 1988). In this study, 100% agreement was achieved between a second scorer and me upon discussion. I was trained and certified as a reliable assessor of the SOI by Antioch University Midwest in 2011, and my co-scorer was a developmental psychologist with over 20 years’ experience administering the SOI. Co-scoring with an SOI expert decreased the likelihood of possible bias in my SOI assessments.

To understand participants’ critical thinking in reading and writing performance and learning, I analysed their performance on midterm and final exams. The final exams were administered eight weeks after the midterms. In each of the two exams, participants identified the purpose, main idea and most important information in each section of a multi-section article. These tasks were drawn from the Critical Thinking Foundations’ model of reading and writing (2008), and paralleled assessment items in the corresponding International Critical Thinking Reading and Writing Test (2006). The tasks drawn from this model were limited in accordance with what learners were taught in the class, increasing congruence between the instrument and instruction (Imel, S., and ERIC Clearinghouse on Adult, C. H., 1990). The midterm and final also prompted responses with *academic language frames*, including “*The purpose of this article is...; The author explains/shows/demonstrates...; and Important information the author includes is...*”. Language frames help scaffold academic language, recognising that Academic English is a language variety that some diverse learners need to explicitly learn (Leki, 1999; Swales & Feak, 2003, 2004; Zwiers & Crawford, 2011).



I analysed each critical thinking task using a rubric adapted from the International Critical Thinking Reading and Writing Test scale (2006). My rubric for scoring the midterms and finals paralleled that of the International Critical Thinking Reading and Writing test (Paul & Elder, 2006) with two adaptations. The first was the addition of the intellectual standard of *relevance* to those of *clarity* and *accuracy* to the rubric, which allowed me to distinguish between a response that was *inaccurate and irrelevant* versus *inaccurate but relevant*. The second difference was that my rubric included one, rather than two, points within each of the five possible evaluation levels. Before scoring the exams, I co-scored the first of three sections with a colleague with expertise teaching critical thinking and academic language skills to ABE and remedial college learners. We achieved 100 percent agreement on evaluations of each assessment upon discussion. Mackey and Gass (2005) suggest applying the high standards of clinical research for inter-rater reliability in second language research, in which “anything above 75 percent may be considered ‘good,’ although percentages over 90 percent are ideal” (p.244). Co-scoring with another instructor also decreased the likelihood of possible bias in my assessments of exams due to my dual role as instructor and researcher.

Tables 1 and 2 show the rubrics used to assess performance on identifying purpose, main idea, and important information.

**Table 1:** Rubric scores for purpose and main idea

4	3	2	1	0
The summary/analysis very <b>clearly</b> and <b>accurately</b> states all parts of the purpose/main idea, including nuance of meaning.	All major aspects of the purpose/main idea are stated <b>accurately</b> , with reasonable clarity. No parts of the main idea are left out.	At least one important part of the purpose/main idea is stated <b>accurately</b> , with reasonable <b>clarity</b> .	Author’s purpose/main idea is mis-identified, but what is written is <b>relevant</b> to the purpose.	Author’s purpose/main idea is mis-identified, and what is written is not <b>relevant</b> to the purpose/main idea.

**Table 2:** Rubric scores for important, or key information

4	3	2	1	0
Enough key information to support the whole purpose/main idea is stated <b>clearly</b> and <b>accurately</b> , explicitly connecting key information to the purpose/main idea.	Enough key information to support the whole purpose/main idea is stated <b>accurately</b> , with reasonable <b>clarity</b> , and is <b>relevant</b> to the purpose/main idea.	At least one piece of key information is stated <b>accurately</b> , with reasonable <b>clarity</b> , and is <b>relevant</b> to the purpose/main idea.	Key information is not <b>clearly</b> and <b>accurately</b> stated, or important key information is missing, but what is stated is <b>relevant</b> to the purpose or main idea.	Key information is not <b>relevant</b> to the main idea, or important key information is missing.

The midterm article analyses and the SOIs were administered within a month of each other, and the final was administered eight weeks after the midterm. Previous developmental research indicates that measurable growth takes a minimum of several months and more often years. Therefore, it is unlikely that participants’ developmental perspectives would have measurably changed by the time the midterm and final were administered, and that changes in performance reflected learning within the current stage of development rather than growth between stages of development.

In the tradition of qualitative research, I also coded errors in each response that was scored at 0 or 1 to better understand error patterns where participants performed most poorly. The two most common patterns were statements that were either too narrow or broad to be accurate. My co-scorer and I achieved 100 percent agreement on which patterns appeared in the data we co-scored. Co-scoring error patterns with another instructor also decreased the likelihood of possible bias in my assessments of exams due to my dual role as instructor and researcher.

To understand participants' perspectives on their learning, I administered a survey a week after the final exam, asking them to rate the level of difficulty of each critical thinking task at the beginning and end of the semester on a scale from 1 (very difficult), 2 (somewhat difficult), 3 (somewhat easy) to 4 (very easy). After each task, I prompted, "Please explain." I also asked two open-ended questions: "Describe in as much detail as you can what makes it easy or difficult to state the author's purpose, main idea, and important information" and "Describe in as much detail as you can how our class activities have or have not helped you with author's purpose, main idea and important information." I analysed open-answered questions by coding for patterns. I first eliminated data with no discernable relevance to their perceptions of their learning. I then separated responses relating to challenges versus successes, and coded themes within each.

Lastly, I brought participants' standardized TABE reading tests scores into consideration to understand to what extent their reading grade level may have impacted their performance and learning. Participants' TABE reading scores were administered a within a week of their midterms as scheduled by the community based organization requiring them.

## **Findings**

There are five sets of findings, including participants' TABE reading test scores, stages of epistemological development, critical thinking in reading and writing performance on the midterm and final exams, error patterns, and survey responses. The SOI data includes scores that reveal complexity of meaning-making, but no interview content, as per the purpose of the interview and conditions of the participant confidentiality agreement.

Findings suggest that participants' critical thinking in reading and writing successes and challenges were consistent with the strengths and limitations of their stage of epistemological development as per Kegan's (1982, 1994) constructive-developmental theory; that critical thinking in reading and writing scores more consistently reflected epistemological development than reading level; and that the ways participants perceived their learning were consistent with their developmental perspectives.

**Demographics and TABE scores**

Participants’ English reading level as measured by the TABE varied. Reading level grade equivalents ranged from 6.2 to 12.9, and did not directly reflect years of school in English or language background. (cf. Table 3 below).

**Epistemological complexity**

The SOI scores showed that participants constructed meaning between instrumental and socializing stages of epistemological development. Grace, Brittany and Maricella’s SOI scores of 2/3 indicated that their ways of knowing were between two developmental *balance points* with a dominantly instrumental (2) way of knowing, but also with a fully-operating socializing (3) way of knowing. Jahzara and Silvia’s SOI scores of 3/2 indicated that they were also in transition between instrumental and socializing ways of knowing, with socializing rather than instrumental being dominant. Only Khalli’s SOI score of 3 indicated a fully socializing way of knowing (cf. Table 3 below).

**Table 3:** Demographics and TABE scores

Participant	SOI score	Ethnicity	Age	Country of origin	Yrs. in an Eng.-speaking country	First language(s)	Yrs. Eng. in School	TABE score (1-12.9+)
Grace	2/3	African	19	Togo	2	Mina, French	4	8.3
Brittney	2/3	African-American	18	U.S.	18	English	15	9
Maricella	2/3	Hispanic	20	U.S.	20	English, Spanish	16	10.7
Jahzara	3/2	African	41	Ethiopia	20	Oromo	6	6.2
Silvia	3/2	Hispanic	20	U.S.	20	Spanish	15	12.9
Khalli	3	African	28	Somalia	13	Somali	8	6.2

**Critical thinking in reading and writing**

Critical thinking in reading and writing tasks on the midterm and final exams were assessed on a rubric indicating no demonstrated ability and

four levels of increasing ability. Each critical thinking task was scored individually, then averaged to represent overall performance (cf. Table 4 below).

**Table 4:** Rubric scores for purpose and main idea

Participant (with level of development)	Midterm: Author's purpose	Mid- term: Main idea	Midterm: Im- port- ant infor- mation	Midterm: Average score	Final: Author's purpose	Final: Main idea	Final: Im- port- ant infor- mation	Fi- nal: Av- erage score
Grace (2/3)	0.25	0.25	1	0.5	.75	1.25	1.75	1.3
Brittney (2/3)	0.25	0.25	0.66	0.39	1.75	1.25	2	1.7
Maricella (2/3)	1	1	1	1	1.75	1.75	2	1.8
Jahzara (3/2)	2	1	2	1.7	1.25	2.33	2.33	2
Silvia (3/2)	2.33	1.66	1	1.6	1.25	1	2.5	1.6
Khalli (3)	2	1.3	1	1.4	2.75	2.66	2.75	2.76

As a whole, participants with nearly dominant or dominantly socializing developmental stages performed higher with critical thinking in reading and writing than their dominantly instrumental counterparts on the midterm and final, with the exception of Silvia. Two of three dominantly socializing or socializing participants were able to improve to an average score of “2” or above, reflecting an ability to state at least part of a main idea and relate some supporting information to that idea. All three dominantly instrumental participants improved, but remained below a “2” average, indicating inability to consistently state at least part of a main idea and relate some supporting information to that idea.

Coding of each segment where participants scored a 0 or 1 showed that errors were often made by writing statements that were *too narrow* or *too broad* to be accurate. Other error types included going outside the text or being generally unclear, but those mistakes were fewer. Overall, all participants constructing meaning from a dominantly instrumental way of knowing more frequently trended toward erring too broad or too narrow.

Participants' TABE reading levels did not show a clear connection to critical thinking in reading and writing performance. While Grace and Brittney scored between eighth and ninth grade reading levels on the TABE, both performed below the first competence level on the midterm, with improvement on the final. Notably, Jahzara, dominantly socializing, and Khalli, fully socializing, scored higher on the midterm and final despite significantly lower TABE reading level equivalents, grade 6.2.

Length of time participants were enrolled in the class did not appear to impact performance consistently. Notably, among the three dominantly instrumental participants, there was a stronger pattern of association between developmental perspective and critical thinking performance than there was to TABE reading levels or length of time in the course.

Participants' perceptions of their learning and what helped them reflected their developmental perspectives. Both dominantly instrumental participants, Brittney and Silvia, described difficulty with distinguishing the author's purpose and main idea of an article, e.g., *"What makes it sometimes difficult to state the author's purpose or main idea is that they both seem similar to me, but there [sic] not"*. Jahzara, dominantly socializing, noted, *"Finding the main idea is harder than other three [sic] for me because sometime [sic] I can find more than one main idea. Once I find the main idea it's easy to find the rest."* In describing strategies that helped them, both dominantly concrete participants stated, *"Classroom activities."* In a similar vein but with emphasis on collaboration, Jahzara stated, *"I can learn from others."* Silvia spoke to the process of first identifying broader concepts, then relating details to those concepts: *"What makes it easy is reading the title and brainstorming what you can expect to find in the text, and once that was taken care of, reading the text, one can tell what is needed to support the main idea and purpose."* Khalli, the fully socializing participant, reflected on her previous inclination to over- or under-generalize: *"What makes difficult [sic] for me to state the main idea was that I was stating either broder [sic] ideas or details. And now I know to look [sic] the big picture. And about the importen [sic] information I was focusing too much on the daitals [sic] or other unnessesery [sic] information. Now I know to just look at the main points the author brings up."*

## Discussion

This study focused on how epistemological development might impact critical thinking performance and learning in reading and writing. I have argued that given the implications of constructive-developmental theory on adult learners' abilities to make the abstractions, inferences and generalizations required to analyse texts, and the significance of these skills for academic success, that it is important to raise the question of how development might impact academic performance to better support educationally disadvantaged learners. This study showed that participants demonstrated successes and challenges consistent with the strengths and limitations of their epistemological perspectives.

Findings of how these ABE/remedial college learners construct meaning is relatable to limited previous ABE and community college developmental studies, in which learners with limited educational backgrounds, and those younger than 25, are more likely to construct meaning from, or partly from, an instrumental way of knowing (Boyer, 2007; Drago-Severson, 2004).

Findings that learners who construct meaning from a primarily instrumental way of knowing demonstrated lower critical thinking performance is consistent with what constructive-developmental theory would anticipate based on the *categorical* epistemological structure that instrumental knowers construct meaning from. Kegan (1994) describes how from an instrumental point of view, what a movie is "about" consists of successive events on a linear narrative "on a concrete level" but that only by constructing meaning *cross-categorically*, at the socializing way of knowing, can they "organise an abstract theme of which this story is an expression" (p.33). It is logical, then, that the main idea would be challenging for categorical thinkers to identify, as demonstrated by the three dominantly instrumental learners in this study, even by the final exam.

The *cross-categorical* epistemology underlying the socializing way of knowing allows separate categories of information to be considered in relationship to each other. It is this "third order of consciousness" that allows socializing learners to look at, rather than through, durable categories. Socializing learners can relate durable categories to each other, and as a result generate abstractions. It is logical that the

participants constructing meaning further into the socializing way of knowing would be more successful in analysing an article than their dominantly instrumental colleagues.

All learners in this study also erred on the side of *too narrow* or *too broad* when stating author's purpose, main idea, or key information. Those participants making meaning with a dominantly instrumental way of knowing, however, made this type of mistake more frequently, especially erring on the side of *too narrow*, seemingly mistaking details for main ideas or purpose. This is logically consistent with instrumental knowers' concrete orientation to meaning-construction (Kegan, 1982, 1994). The fully socializing participant, and one of the two dominantly socializing participants, were able to eliminate this type of error on their finals.

Participants' descriptions of their learning reflected being in transition from the instrumental to socializing ways of knowing, as well as their dominant epistemological perspective. The two dominantly instrumental participants described confusing the author's purpose and main idea, consistent with the difficulty with distinguishing abstractions from an instrumental perspective. Both participants who were dominantly socializing described some difficulty identifying a main idea, consistent with being in transition between instrumental and socializing ways of knowing, but comfort with relating important information to those ideas once they've been clarified. The fully socializing participant's ability to see the "big picture," and to reflect on her thinking process for doing so are consistent with her socializing epistemological perspective (Kegan, 1982, 1994). That both dominantly instrumental and dominantly socializing learners identified group work as helpful is consistent with Kegan et. al.'s (2001) finding that cohorts can support learning and growth at all levels of development.

## **Limitations**

In this small case study with only six participants, connections between epistemological complexity and critical thinking in reading and writing apply only to the participants themselves. In seeking to understand cause and effect relationships, (Savin-Badin & Major, 2013; Yin, 2009), qualitative case studies necessarily favour a particular explanatory lens and de-emphasise others (Yin, 2009). Other factors beyond



reading level that may have impacted these participants' performance and learning in critical thinking in reading and writing, such as age, educational backgrounds, and learning styles, were not investigated.

At the same time, the dominantly instrumental to socializing ways of knowing found among these learners is consistent with ways of knowing found in research with three previous studies (Boyer, 2007; Bridwell, 2013; Drago-Severson, 2004). Additionally, the patterns of challenges with critical thinking in reading and writing in this small group were logically consistent with what could be anticipated based on their epistemological complexity, and is relatable to previous research connecting epistemological complexity to rhetorical maturity (Shapiro, 1984).

It would be useful to further investigate how epistemological complexity impacts critical thinking in reading and writing performance to better understand the inter-relationship between critical thinking development and epistemological development over time. It would also be helpful to further investigate what approaches most successfully support critical thinking learning at different stages of development, including from the perspectives of adult learners themselves.

## **Implications**

Constructive-developmental theory suggests that instrumental knowers are still developing the epistemological complexity needed for critical thinking in reading and writing. The findings of this study were consistent with that theory, suggesting that critical thinking may require not only learning but epistemological development itself. It also affirms the explanatory power of constructive-developmental theory in relation to critical thinking in reading and writing. The fact that five out of six participants improved after practicing critical thinking in reading and writing suggests that learners across developmental levels can improve critical thinking skills, and is consistent with Lai's (2011) assertion that critical thinking should be explicitly taught as well as integrated into instruction.

In supporting adult learners developing critical thinking skills, especially those constructing meaning from a partially instrumental perspective of development, it is important to recognise that skill development may

take more time and require distinct types of challenge and support, or *holding environments*. Drago-Severson (2004) explains that because of developmental variation among learners, “the very same curriculum, classroom activities, or teaching behaviours can leave some learners feeling satisfied and well attended while others feel frustrated or lost” (p.15). For some learners, therefore, it is important to scaffold abstract material (Drago-Severson, 2004; Taylor, 2006). Taylor (2006) likens developmental scaffolding in instruction to Vygotski’s (1978) notion of proximal development, the distance between what a learner can do independently and with support. Taylor recommends creating multiple opportunities for learners to experience, with support, constructing knowledge just beyond the level of complexity that the learner can construct independently, and to develop learners’ own “capacity for self-scaffolding” (p.209).

If instrumental learners struggle more with critical thinking in reading and writing, and the developmental growth that supports these competencies can take years, it follows that adult educators should strive not only to teach critical thinking in developmentally appropriate ways, but to create learning environments that support epistemological development itself.

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