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Critical Thinking in Occupational Therapy Education: A Systematic Mapping Review

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Abstract

Critical thinking is a component of occupational therapy education that is often intertwined with professional reasoning, even though it is a distinct construct. While other professions have focused on describing and studying the disciplinary-specific importance of critical thinking, the small body of literature in occupational therapy education on critical thinking has not been systematically analyzed. Therefore, a systematic mapping review was conducted to examine, describe, and map existing scholarly work about critical thinking in occupational therapy education. Inclusion/exclusion criteria were set, database searches conducted, and 63 articles identified that met criteria for full review based on their abstracts. Thirty-five articles were excluded during full review, leaving 28 articles for analysis and coding using a data extraction tool. Eleven articles (39%) had a primary focus of critical thinking, and of those 11 articles, the majority were about instructional methods. Qualitative inquiry (n = 9) was the most frequently used method to examine critical thinking among the study full sample (N = 28). Four themes emerged: 1) critical thinking is a process with varied outcomes; 2) learner aptitude is essential for developing critical thinking; 3) critical thinking can be facilitated through various methods; and 4) critical thinking underpins other important constructs in occupational therapy. Needs that were identified were that critical thinking is best intentionally threaded across a curriculum with outcomes in mind; and more studies examining critical thinking in occupational therapy education, employing diverse designs, are needed.

Keywords

Critical thinking, instructional methods, occupational therapy education, pedagogy, systematic mapping review

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ABSTRACT

Critical thinking is a component of occupational therapy education that is often intertwined with professional reasoning, even though it is a distinct construct. While other professions have focused on describing and studying the disciplinary-specific importance of critical thinking, the small body of literature in occupational therapy education on critical thinking has not been systematically analyzed. Therefore, a systematic mapping review was conducted to examine, describe, and map existing scholarly work about critical thinking in occupational therapy education. Inclusion/exclusion criteria were set, database searches conducted, and 63 articles identified that met criteria for full review based on their abstracts. Thirty-five articles were excluded during full review, leaving 28 articles for analysis and coding using a data extraction tool. Eleven articles (39%) had a primary focus of critical thinking, and of those 11 articles, the majority were about instructional methods. Qualitative inquiry (*n* = 9) was the most frequently used method to examine critical thinking among the study full sample (*N* = 28). Four themes emerged: 1) critical thinking is a process with varied outcomes; 2) learner aptitude is essential for developing critical thinking; 3) critical thinking can be facilitated through various methods; and 4) critical thinking underpins

other important constructs in occupational therapy. Needs that were identified were that critical thinking is best intentionally threaded across a curriculum with outcomes in mind; and more studies examining critical thinking in occupational therapy education, employing diverse designs, are needed.

Background

Critical thinking is often confounded with other important constructs in the occupational therapy literature. For example, clinical or professional reasoning, rather than critical thinking, has been widely recognized, described, and studied in occupational therapy. Rogers (1983) initiated discussion about clinical reasoning from a theoretical perspective and Mattingly and Fleming (1994) explored reasoning of therapists in practice, while Schell (2014) and colleagues (Schell & Cervero,1993) defined various forms of clinical reasoning in practice. In contrast, scholars in other disciplines have examined and defined critical thinking and its development in their learners (Abrami et al., 2008; Brookfield, 2012; Tiruneh et al., 2014), and posited that the knowledge and attributes necessary for critical thinking must be uniquely defined by disciplines (Bonwell, 2012; Huber & Kuncel, 2015). As such, the purpose of this systematic mapping review was to examine, describe, and map existing scholarly work about critical thinking in occupational therapy education, to differentiate this work from the body of scholarship focused on clinical and professional reasoning, in order to identify future lines of inquiry about methods of teaching critical thinking in occupational therapy education.

Broadly, in disciplines such as philosophy, psychology, education, and allied health, critical thinking is defined as the cognitive skills and dispositions needed to make informed decisions through thoughtful reflection and systematic evaluation (Facione, 2013; Facione & Facione, 1996). Thus, critical thinking has both cognitive and affective components. Contemporary frameworks describing thinking have generally included six components: metacognition, creative thinking, cognitive processes, core thinking skills, and understanding the role of content knowledge (Moseley et al., 2005) and agree that learning needs to emphasize reflection on thinking rather than just equipping learners with process-following or decision-making skills. Moseley and colleagues (2005) proposed a single integrated model for understanding thinking and learning that delineates cognitive skills from reflective thinking processes. They proposed that cognitive skills include information gathering, building understanding, and productive thinking; whereas reflective skills are characterized by value-grounded thinking. Their integrated model for understanding thinking and learning emerged from an evaluation of frameworks for thinking and synthesized constructs from hallmark models across disciplines.

In occupational therapy, Schaber (2014) posed that “pedagogy is more than an instructional methodology, a teaching technique; it is larger than that ” (p. S41). This distinction suggests the importance of discipline-specific approaches for teaching skills and attributes, such as critical thinking, that describe learners’ development of disciplinary habits and thinking. Theory and evidence suggest that a discipline must determine the thinking skills necessary for understanding knowledge of that discipline

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and explicitly share that with learners (Bonwell, 2012; Huber & Kuncel, 2015). Given the importance of clinical and professional reasoning[1] in a discipline such as occupational therapy, it is not surprising that there has been less focus on critical thinking in occupational therapy education. However, defining critical thinking within occupational therapy as a separate and distinct skill that must be taught to learners is an important pedagogical consideration for making explicit the unique nature of disciplinary thinking in occupational therapy, establishing best educational approaches for fostering this disciplinary thinking, and identifying ways to measure changes in critical thinking in response to occupational therapy curricula.

The method of systematic mapping establishes the overall topography of a field through systematic examination and directs researchers in establishing new research topics and next steps. Roberts et al. (2015) described in their systematic mapping review of fieldwork education in occupational therapy that while fieldwork education is an integral component of occupational therapy education and has been the focus of scholarly inquiry, that the scope of this scholarly work has not been reviewed and organized. Similar to this, critical thinking is an important underpinning of teaching and learning in occupational therapy education and a foundation for professional reasoning, and while a small body of scholarship has examined critical thinking related to occupational therapy education, the scope of this work has not been reviewed or organized.

Therefore, a systematic mapping review was conducted to examine the broad guiding question of how occupational therapy education approaches teaching critical thinking, with the following research questions:

1. What primary topics about critical thinking in occupational therapy education have been explored?
2. What inquiry methods have been used to examine these primary topics?
3. What outcomes have been studied in relationship to critical thinking in occupational therapy education?
4. What themes emerged in the discussion section of articles (implications for education or practice), or what recommendations were given for future research?

Methodology

Study Design

Mapping review methods were used to conduct this study. A mapping review aims to describe the current state of research in a field and begins with a broad research question. The researchers specifically employed the approach of Roberts et al. (2015) which included the systematic review process set forth by Best Evidence Medical Education (2020). The researchers employed a broad research question and inclusive search process, defined inclusion and exclusion criteria, and created a data extraction tool.

[1] Going forward, we use professional reasoning when referring to the constructs of clinical and professional reasoning.

Database Searches

The main constructs used to guide the search were “occupational therapy,” “occupational therapy education,” and “critical thinking.” The search terms used in each database are provided in Table 1. These terms were searched in June of 2018 in collaboration with a research librarian using Academic Search Premier, CINAHL, ERIC, PubMed, and PsychINFO. Databases were searched for 1980-June 2018 because the critical thinking movement started in the 1980s (Paul, 1985). To ensure comprehensive collection of data, manual searches were also conducted in the following open access occupational therapy journals: *Journal of Occupational Therapy Education*, *Open Journal of Occupational Therapy*, *Occupational Therapy International*, *Hong Kong Journal of Occupational Therapy*, *Irish Journal of Occupational Therapy*, and *South African Journal of Occupational Therapy*.

Table 1

Databases and Search Terms

Academic Search Premier	(((DE "OCCUPATIONAL therapy") OR (DE "OCCUPATIONAL therapy education")) AND ((DE "CRITICAL thinking") OR (DE "CRITICAL thinking education in universities & colleges"))
CINAHL	((MH "Occupational Therapy") OR (MH "Education, Occupational Therapy")) AND (MH "Critical Thinking")
ERIC	((DE "Occupational Therapy" OR "occupational therapy education") AND (DE "Critical Thinking"))
PsychINFO	((DE "Occupational Therapy") OR "occupational therapy education") AND (DE "Critical Thinking")
PubMed	("Occupational Therapy"[Mesh] OR "occupational therapy education") AND “critical thinking”
OT journal hand searches*	“critical thinking”

**Note*. The six different open-access occupational therapy journals which were hand-searched using the same search term were collapsed into the category “OT journal hand searches:” *Hong Kong Journal of Occupational Therapy*, *Irish Journal of Occupational Therapy*, *Journal of Occupational Therapy Education*, *Occupational Therapy International*, *Open Journal of Occupational Therapy*, and *South African Journal of Occupational Therapy*.

Data Inclusion and Exclusion

The final number of articles retrieved from the initial search was 188. Next, two researchers reviewed each article abstract against the inclusion and exclusion criteria. The inclusion criteria for the review were articles about occupational therapy education, published between 1980-2018, and about critical thinking. Articles were excluded if they

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were a thesis, magazine article, or presentation, were written in a language other than English, concerned a discipline other than occupational therapy, or focused on professional reasoning rather than critical thinking. Key to this review is the belief that critical thinking is a separate construct from professional reasoning which employs critical thinking. Therefore, articles that only used the terms professional or clinical reasoning were excluded. Disagreement about fulfilment of exclusion criteria resulted in an article automatically being retained for the next round of review. Seventy-eight articles remained, and duplicates were removed, resulting in 63 articles for full review.

The full review process included thorough review of each article to determine if inclusion criteria were met. Of the 63 articles, 35 did not meet criteria for inclusion. Articles were most commonly excluded because they were about professional reasoning. Eleven articles were excluded because they were about the development of professional reasoning in practice.

Data Extraction

The data extraction tool created by Roberts et al. (2015) was modified and subsequently used to analyze each article. Articles that met the inclusion criteria were reviewed using the tool (see Appendix A). Following the process set forth by Roberts et al. (2015), the data extraction tool was initially piloted by the full research team and modifications were made to the tool to accurately code the articles in alignment with the concepts stated in the research questions. Each article was analyzed and coded in each of the following areas: a) country of origin, b) purpose of the study, c) focus of critical thinking being primary or secondary, d) population/setting, e) articles primary emphasis as defined by the “Occupational Therapy Education Research Agenda” (American Occupational Therapy Association [AOTA], 2018), f) identification of whether or not the article was a research study and corresponding analysis of the research, if applicable, per the Research Pyramid levels of evidence (Tomlin & Borgetto, 2011) and the Kirkpatrick Hierarchy level of impact (Kirkpatrick, 1967), g) qualitative themes of the article, and h) future needs as identified in the article. All members of the research team evaluated the same article to finalize and clarify interpretation of the instrument. Next, each article was analyzed using the data extraction tool. Based upon the Research Pyramid levels of evidence (Tomlin & Borgetto, 2011), articles were categorized as qualitative, descriptive, experimental, or outcome research. In the event of mixed methods, both types/levels of inquiry were coded. To address interrater reliability, 18 articles were each independently reviewed by two different researchers on the team. Interrater reliability was 97% across the 18 articles.

Data Analysis and Synthesis

Researchers entered qualitative and quantitative data gathered via the data extraction tool into a Microsoft Excel database. Descriptive statistics were used to analyze the data via SAS v 9.4. Qualitative analysis was guided by the methods of Roberts et al. (2015), with extracted texts analyzed for broad themes represented across the full sample of articles. Qualitative texts from each article that represented broad themes and future needs were moved from the Microsoft Excel database into Microsoft Word for analysis. The first author analyzed the texts by organizing them into categories.

Categories were reviewed by the full author team and discussed for alignment with broad themes and future needs emerging from the mapping review. Overall, the quantitative and qualitative data analysis provided an overview of findings across the data extraction items of interest to the research questions.

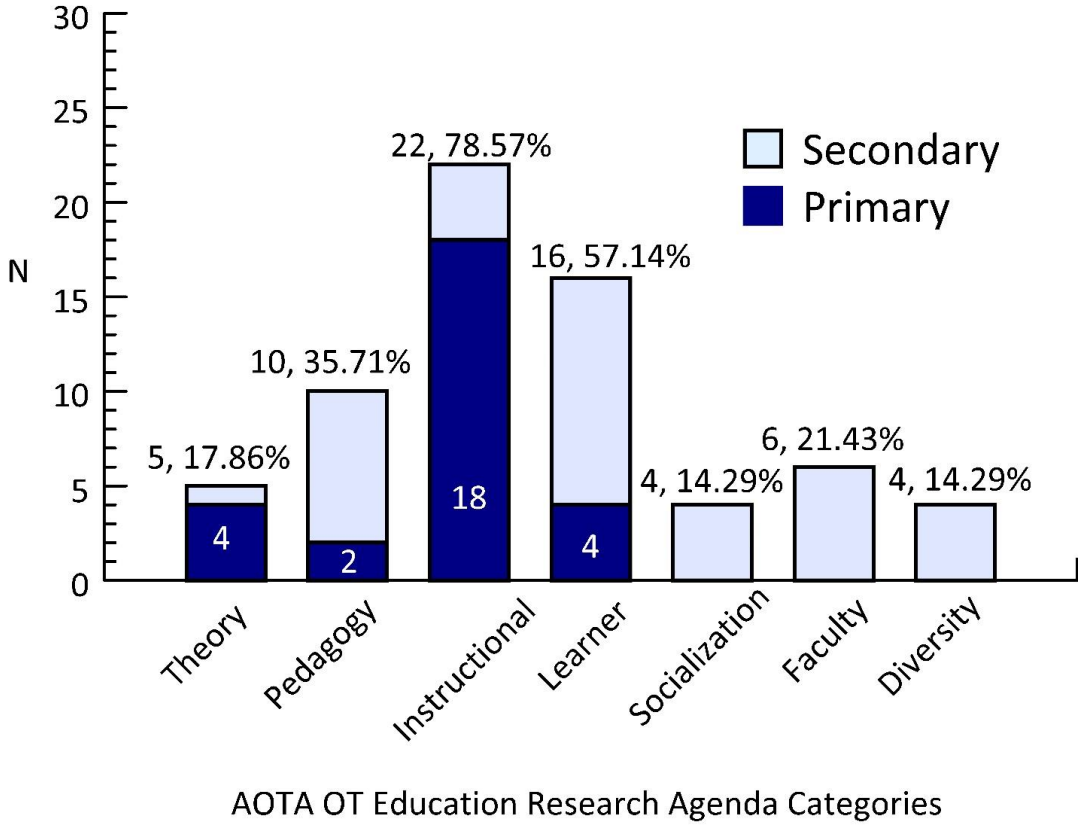
Results

Of the 28 articles included in the review, 21 (75%) were published in the United States, followed by Canada (*n* = 5, 18%). Hong Kong and the Netherlands each had one article. Twenty-one of the articles (75%) pertained to didactic education, five (18%) to Level II fieldwork, and the remainder to Level I fieldwork. Twenty articles (71%) were research studies.

Research Question 1: What are the primary areas of focus of critical thinking research in occupational therapy education?

For each article, the authors identified whether or not critical thinking was a primary or secondary focus of the paper (see Figure 1). Overall, only 11 (39%) of the articles had a primary focus on critical thinking. Each article was also analyzed to identify which area of the "Occupational Therapy Education Research Agenda" (AOTA, 2018) the article focus best reflected. All of the AOTA education research agenda categories were represented in the critical thinking literature. By far, critical thinking articles most often reflected the category of instructional strategies (*n = 22,* 78%). See Appendix B for a list of all articles included in the review and their primary and secondary focuses.

Figure 1: Primary and Secondary Focus Areas



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Research Question 2: What inquiry methods have been used to examine these primary topics?

The majority of articles (*n* = 20; 71%) were classified as research studies using the criteria put forth by Tomlin and Borgetto (2011). The other eight articles (29%) were philosophical in nature, proposing curricular models, curricular organization, and pedagogical practices, or were opinion papers discussing critical thinking. Considering the study full sample (*N* = 28), qualitative inquiry was the most used methodology for studying critical thinking (*n* = 9; 32%). Upon further investigation, of the nine articles using qualitative methods, six (21%) used mixed methodology to address the research question (Baarends et al., 2017; Campbell et al., 2015; Coppola et al., 2017; Crabtree et al., 2001; Reed, 2014; Schaber & Shanedling, 2012). Mixed methodology is a form of inquiry that solidified after Tomlin's and Borgetto's (2011) published work; therefore, these articles were categorized based upon the procedures reported in their method section. Baarends et. al. (2017) identified their methodology as mixed methods, using Creswell's definition (2014), while Coppola et al. (2017) stated mixed methods in the title and used the qualitative findings to add depth and integration to the quantitative results, consistent with Creswell's operational definition. Thus, of the 20 articles classified as research in the study full sample, 11 (55%) used quantitative methods, three (15%) used purely qualitative methods, and six (30%) employed mixed methods. Qualitative methods included two single informants, three groups with rigor and three without rigor, and one meta-synthesis. No meta-synthesis of qualitative studies was included in the review. Descriptive methods (*n* = 8; 29%) incorporated six multiple case studies/descriptive surveys, an individual case study (*n* = 1) and an association/correlational design (*n* = 1). No articles were categorized as systematic reviews of descriptive studies. Seven (25%) of the study full sample articles were outcome research: two meta-analyses, two used pre-existing group comparisons, and three used one-group pre-posttest studies. No articles fit the categorization of preexisting groups comparison with covariate analysis. Experimental research was the category with the least articles found within the study sample (*n* = 2; 7%). One article was coded individual randomized controlled trial and the other was a controlled clinical trial. No articles reviewed were single subject designs or meta-analyses of experimental studies. The majority of articles in the study full sample used methodologies classified as having less rigor on the Research Pyramid levels of evidence (Tomlin & Borgetto, 2011). Articles classified as research studies evaluated outcomes at Level 1, Level 2A, or Level 2B on the Kirkpatrick Hierarchy (Kirkpatrick, 1967). See Appendix B for the level of impact of each analyzed article.

Research Question 3: What outcomes have been studied in relationship to critical thinking in OT education?

As previously reported for the first research question, 11 articles (39%) were identified as having critical thinking as the primary focus. The remaining 17 (61%) articles studied critical thinking as a secondary focus while examining other related constructs as outcomes of critical thinking. Four (14%) of these articles focused on *Professional Practice,* and one (4%) each focused on *Reflection,* and *Cultural Competence.* Eleven

(39%) articles were coded as “Other.” Outcomes to be coded were established by the researchers through an iterative process of refining the data extraction tool and based on constructs observed in the initial phase of abstract review as articles were appraised for inclusion in the full review. The data extraction tool did not require coding of constructs describing “Other” focuses.

Research Question 4: What themes emerged regarding critical thinking, and what recommendations were given for future research?

Data extracted from the discussion section of analyzed articles were coded in two separate items in the data extraction tool: themes and future recommendations. Qualitative analysis identified four major themes regarding critical thinking in occupational therapy education and two distinct future needs across the range of articles considered in this review. The four themes were: 1) critical thinking is a process with varied outcomes; 2) learner aptitude essential for developing critical thinking; 3) critical thinking can be facilitated through various methods; and 4) critical thinking underpins other important constructs in occupational therapy. Table 2 summarizes which major themes were represented across the analyzed articles.

Articles that illustrated the first theme described complex thinking processes with discrete steps that scaffolded learners towards outcomes such as writing and problem solving. For example, O’Brien et al. (2016) examined an intentional process of teaching scholarly writing to occupational therapy students with evaluating and synthesizing literature as outcomes of the process; whereas Mitchell (2013) described the importance of epistemic and ontological cognition, individual’s beliefs about knowledge and knowing, for problem solving within a discipline such as occupational therapy. The second theme, learner aptitude for developing critical thinking, was reflected in articles that examined a range of learner skills, characteristics, or abilities thought to support successful critical thinking. For example, Campbell et al. (2015) identified adaptability, responsibility, and time efficiency, among other skills, as essential for critical thinking about professionalism during fieldwork experiences. Articles that expressed this theme also reflected on the lack of critical thinking abilities among entry-level occupational therapy learners. The third theme, critical thinking can be facilitated with various methods, served to validate the finding in the quantitative descriptive analysis that instructional strategies was the primary focus of articles analyzed in this mapping review. Articles examined a range of instructional strategies from simulation, to problem-based learning, to art-based modules as methods for developing critical thinking. While varied methods were found, one commonly expressed belief underpinning these methods was the grounding of learning in hands-on, experiential activities as a potential means for developing critical thinking. Finally, the fourth theme across the mapped articles also validated quantitative descriptive findings that critical thinking is linked with other constructs that are considered important outcomes in occupational therapy education, particularly cultural competency. This theme helped to illustrate that critical thinking is a distinct construct, and most notably, that a small body of occupational therapy education literature has examined critical thinking separately from professional reasoning, and in relationship to various learning outcomes.

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In addition to the four themes that emerged, there were two distinct needs related to critical thinking that were identified across articles: 1) critical thinking needs to be intentionally threaded across a curriculum with outcomes such as professional reasoning in mind; 2) more studies examining critical thinking in occupational therapy education, employing diverse designs, are needed. The theme of intentionally threading critical thinking across a curriculum emerged from analysis of textual comments extracted from articles in our dataset. Some authors reflected on the effectiveness of their studied instructional method for fostering critical thinking, such as guided reciprocal questioning and problem-based approaches and concluded that to best support development of critical thinking these instructional methods need to be integrated throughout occupational therapy coursework and not isolated learning experiences. Across articles, authors consistently identified that further study of critical thinking is needed. Because studies are often employed within the setting of a single occupational therapy program, replication is needed in order to generalize findings to the broader population of occupational therapy learners and inform understanding of the relationship between demographic characteristics and critical thinking. Other recommendations for future studies included the use of varied designs, such as quasi-experimental and mixed method approaches, better instruments for measuring critical thinking, and studies of longer duration to better examine the development of critical thinking in occupational therapy learners.

Table 2

Themes and Future Needs in Article Discussions

Article	Themes				Needs	
	Process with varied outcomes	**Learner aptitude**	**Instructional methods**	**Critical thinking underpins other constructs**	**Intentional threading of critical thinking**	**More studies needed**
Ahmad & Behr, 2002	x				x	
August-Dalfen & Snider, 2003			x		x	
Baarends et al., 2017	x	x	x			x
Bannigan & Moores, 2009	x				x	
Boisselle & Baxter, 2017		x				x
Brown et al., 2009			x			
Campbell et al., 2015		x				x
Chung, 2001		x				x
Coker, 2010			x			
Coppola et al., 2017			x			x
Crabtree et al., 2001			x		x	
Fain, 2011			x		x	
Hammel et al., 1999		x	x	x		x

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Jaffe et al., 2015			x			x
Kramer et al., 2007	x					x
Lederer, 2007			x			x
Madill et al., 2001			x			
Mitchell, 2013	x	x				x
Nielsen et al., 2017			x	x		x
O'Brien et al., 2016	x	x				x
Reed, 2014			x			x
Salvatori, 1999			x			x
Schaber & Shanedling, 2012		x	x			x
Shea, 2015			x		x	x
Velde et al., 2006				x	x	
Vogel et al., 2009		x			x	x
Wittman & Velde, 2002				x	x	
Zachry & Nash, 2017		x	x		x	

Discussion

This systematic mapping review revealed that over a span of thirty years, a small body of research examining critical thinking, employing both quantitative and qualitative methods, exists in the occupational therapy education literature. This mapping review found that a majority of the articles' primary focus was on instructional methods for teaching critical thinking, followed by theory building, learner characteristics, and pedagogy related to critical thinking. While the majority of analyzed articles were research studies, they lacked rigorous methods and had small sample sizes. Considering the Kirkpatrick Hierarchy (1967) all articles analyzed for this mapping review were at levels one or two, subjective experience of learning or change in attitudes, perceptions, and behaviors (see Appendix B). The focus on critical thinking across the mapped articles was also inconsistent and lacked distinction, with critical thinking often intertwined with other constructs, which is further discussed below.

While the findings of this mapping review illustrate that critical thinking is considered in occupational therapy education, and sometimes as a distinct construct from professional reasoning, less than a third of the analyzed articles specifically defined and measured critical thinking. When critical thinking was defined, the definition drew from other disciplines and usually failed to identify any unique components of thinking required by learners specific to occupational therapy education, and particularly to thinking about occupation. Critical thinking, like other constructs that underpin the practice of occupational therapy, is complex and multi-faceted, and therefore difficult to measure. Related to measurement, a challenge demonstrated by this analysis was the lack of adequate measurement tools for critical thinking, when critical thinking was actually measured. Both the lack of measurement of critical thinking and the lack of existing measurement tools may be related to critical thinking itself – there are varied allusions to it, but scant explicit research about it within occupational therapy. As so complex a construct, it is difficult to define and measure. How do we know we are human? We breathe, eat, touch, move…yet each aspect is measured on its own. Add "think" or "critical thinking" and there are multiple elements to define and measure, yet woefully few instruments to do so.

Another consideration for definition and measurement is that because critical thinking is such a vital element of professional reasoning it often is assumed or subsumed rather than differentiated by the profession of occupational therapy. Critical thinking gets intertwined with other constructs in teaching and learning in occupational therapy education. This was demonstrated by the finding that less than half of the included articles identified critical thinking as the main focus. Rather, critical thinking was examined in relationship to other outcomes, particularly professional practice, reflection, and cultural competence. Yet extracted data, when mapped to priority areas in the AOTA (2018) "Occupational Therapy Education Research Agenda" demonstrated that the majority of existing literature regarding critical thinking in occupational therapy education pertains to instructional methods. This may be problematic considering the previously discussed need to define critical thinking within the discipline of occupational therapy, which would serve as a foundation for then measuring it and examining instructional methods best suited to fostering it in occupational therapy learners. Further

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considering the “Occupational Therapy Education Research Agenda” (AOTA, 2018), few if any articles included in the final analysis addressed critical thinking in relation to socialization to the profession or promotion of diversity, equity, and inclusion as a primary focus. However, there were a few articles from the abstract review phase that were excluded after the full review stage that alluded to critical thinking about diversity but were practice- or scholarship-focused rather than education-based (Pitonyak et al., 2015; Whalley Hammell, 2015). Again, defining critical thinking as a distinct construct within occupational therapy education may create opportunities for examining it in relationship to a wider range of identified priorities in occupational therapy education research (AOTA, 2018).

As discussed, there is some evidence that occupational therapy is addressing critical thinking within its educational programs and, judging from the literature in other healthcare disciplines (Huang et al., 2015; Morris et al., 2019; West et al., 2000), critical thinking should be of importance to occupational therapy education. However, occupational therapy educators need to do more inquiry about teaching critical thinking, and especially about teaching critical thinking about occupation. Occupational therapy is a unique discipline in that it values doing, not just thinking. As the profession expands its understanding of how doing enhances critical thinking, occupational therapy education researchers will need to develop measurement instruments that address all aspects – cognition, affect, and engagement, as the hallmark of critical thinking in occupational therapy education. While critical thinking teaching strategies can be borrowed from other disciplines, occupational therapy educators must add their own enhancements to prepare future practitioners to use critical thinking about occupation creatively and effectively. It also may be beneficial to look to other fields for measurement instruments that can be adapted as occupational therapy researchers and educators deepen their understanding of instructional strategies that are most effective for fostering critical thinking (Facione & Facione, 1996; West et al., 2000).

The profession of occupational therapy has subsumed critical thinking within professional reasoning in our body of literature or body of knowledge, while other professions have distinctly separated these two entities. Now is the time for occupational therapy educators to demonstrate the value of introducing critical thinking, particularly about occupation, with deliberate teaching strategies. This is foundational for thinking about occupation and would integrate the distinct value of occupational science constructs within higher ordered thinking and reflection, further informing outcomes such as professional reasoning.

Recommendations

- Critical thinking needs to be defined within the discipline of occupational therapy.
- Development of critical thinking should be threaded across occupational therapy program curriculum.
- Active instructional methods foster critical thinking (guided reciprocal questioning, simulations, problem-based approaches) when integrated throughout occupational therapy coursework rather than as isolated learning experiences.

- Further study of critical thinking is needed, both collaborative and replicative, using varied designs.
- Better instruments for measuring critical thinking are needed.
- Further research is needed examining the relationship between critical thinking and diversity, inclusion, and equity in occupational therapy education.

Study Limitations

This review may have erred by being too inclusive, keeping some articles with marginal allusions to critical thinking as long as they were within occupational therapy education. Yet, if the inclusion criteria were stricter, it shows the dearth of evidence on critical thinking produced within the discipline of occupational therapy. The pragmatics of this relates to the breadth of occupational therapy education and practice – as students mainly want to be practitioners, society tends to want to know if interventions are effective, not how their therapists were instructed. The challenge of too much to do in too little time underpins this area of educational scholarship.

Implications for Occupational Therapy Education

Educational scholars in occupational therapy must generate scholarly contributions about critical thinking that move beyond the lower levels of evidence within Tomlin and Borgetto's Research Pyramid (2011) and capture impacts other than subjective experiences and change in attitudes, perceptions, and behaviors (Kirkpatrick, 1967). There is much to be learned about the teaching of critical thinking from other disciplines, and then adapted to support signature pedagogies in occupational therapy education. Collaborative, multi-site studies could be initiated across different occupational therapy programs, with a central focus on methods for teaching critical thinking about occupation and measuring changes in learning outcomes. Educators and researchers need to determine if this change can be measured, or if it is just too subtle or situation specific. Longitudinal studies of critical thinking change in occupational therapy learners may help inform the design of measurement tools. It is an opportune time to address the topic of critical thinking within occupational therapy education. There is a foundation of evidence that informs elements of learning assessment and effective instructional strategies; however, this foundation must be further informed by diverse inquiry methods examining critical thinking in occupational therapy education.

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Appendix A

Data Extraction Tool

Critical thinking in occupational therapy education: A systematic mapping review

Pitonyak, J. S., Nielsen, S., O'Brien, S. P., Corsilles-Sy, C., Lambert, D. Jaffe, L. E.

Item	Categories coded for each item	Sub categories coded for each category
Demographics *Where was the study completed?*	USA Other	List the journal List the country and/or journal
Overall purpose of paper	Stated Unstated	
Focus on critical thinking	Main construct Other construct is focus, with links to critical thinking	Professional thinking Clinical practice Reflection Cultural competence Other
Population/Setting	Didactic Education	Associates Bachelors Masters Doctorate
	Fieldwork	Level I Level II Doctoral experiential Other
	Practice Other	
What is this paper *primarily* about?	Theory building Pedagogy Instructional methods Learner characteristics and competencies Socialization to the profession Faculty development and resources Promotion of diversity, inclusion, and equity	
What else does this paper address?	Theory building Pedagogy Instructional methods	

Item	Categories coded for each item	Sub categories coded for each category
	Learner characteristics and competencies Socialization to the profession Faculty development and resources Promotion of diversity, inclusion, and equity	
Research determination, *Is this research?*	Yes No	Author's expert opinion Author's direct experience Literature review Other
What level of evidence does the article reflect? Reviewers should refer to Tomlin & Borgetto (2011) for descriptions of levels of evidence	Is it descriptive research? No If it is descriptive research enter one of the following levels (Tomlin & Borgetto, 2011) Systematic review Association, correlational study Multiple-case studies (series, normative studies, descriptive surveys) Individual case studies Is it experimental? No If it is experimental research enter one of the following levels (Tomlin & Borgetto, 2011) Meta-analysis of related experimental studies Individual (blinded) randomized controlled trials	If an intervention was provided, briefly describe the intervention (name) and: Length of intervention One time One semester course Intensive short course Multiple semester courses Thread across curriculum Duration of exposure not described If an intervention was provided, briefly describe the intervention (name) and: Length of intervention One time One semester course Intensive short course Multiple semester courses

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Item	Categories coded for each item	Sub categories coded for each category
	Controlled clinical trials Single subject studies Is it qualitative research? No If it is qualitative research enter one of the following levels (Tomlin & Borgetto, 2011) Meta-syntheses of related qualitative studies Group qualitative studies with more rigor (a,b,c) Group qualitative studies With less rigor (a,b,c) Qualitative studies with single informant	Thread across curriculum Duration of exposure not described
Research Question	Stated Unstated	
Research Hypothesis	Stated Unstated	
Research participants Described	Yes No	Code in column 4: Sampling frame Sample size Characteristics

Item	**Categories coded for each item**	**Sub categories coded for each category**
Data collection method	Student outcomes data: Objective measures class assignment; final grade; NBCOT, Grad results Survey-perception measure (course evaluation; student opinion/self-rating) Validated, published instruments such as Health Science Reasoning Test Qual: interview, focus, observation	Code in column 4: *Note: The following info is captured under the Kirkpatrick hierarchy: was the data collected subjective (student perception) or objective (grading, outcome, evaluation tool)* *Name the measure or tool used*
Researcher engagement Described	Yes No	Single encounter Multiple encounters No engagement Unclear
Level of impact of Intervention (Modified Kirkpatrick Hierarchy)	Level I: Participation - covers participants' views on the learning experience, its organization, presentation, content, teaching methods, and aspects of the instructional organization, materials, quality of instruction Level 2A: Attitudes/perceptions - outcomes here relate to changes in the attitudes, beliefs, or perceptions as a result of the intervention (including self-assessment of knowledge, growth, and self-efficacy)	

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Item	Categories coded for each item	Sub categories coded for each category
	Level 2B: Knowledge/skills - for knowledge, this relates to the acquisition of concepts, procedures and principles; for skills, this relates to the acquisition of thinking/problem-solving, psychomotor and social skills Level 3: Behavioral change - documents the transfer of learning to the workplace or willingness of learners to apply new knowledge & skills Level 4A: Change in organizational practice - wider changes in the organizational/delivery of care, attributable to an educational program Level 4B: Benefits to clients – any improvement in the health & well-being of clients as a direct result of an educational program	
Themes within discussion (new)		
Future needs, as identified in paper		
Post review – does this article meet inclusion criteria for the mapping review?	Inclusion	***Inclusion:*** OT education, 1980 to present; Peer reviewed papers, thesis, OT Practice/SIS Quarterlies

Item	Categories coded for each item	Sub categories coded for each category
	Exclusion	***Exclusion:*** Other allied health disciplines; not in English. Articles focused on professional reasoning/ clinical reasoning, defined by Schell (2014, p. 384) as "process that practitioners use to plan, direct, perform, and reflect on client care." Presentations, posters, other magazines

https://encompass.eku.edu/jote/vol4/iss4/3
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Appendix B

All Articles Included in the Review and Analyzed by Primary Focus, Areas of Secondary Focus, and Level of Impact

Critical thinking in occupational therapy education: A systematic mapping review
Pitonyak, J. S., Nielsen, S., O'Brien, S. P., Corsilles-Sy, C., Lambert, D. Jaffe, L. E.

[a]Areas of secondary focus: na = not applicable, 1 = Theory building, 2 = Pedagogy, 3 = Instructional methods, 4 = Learner Characteristics, 5 = Socialization, 6 = Faculty Development, 7 = Promotion of Diversity and Inclusion

[b]Kirkpatrick Hierarchy Level of Impact: level I = subjective experience of learning, level 2A = change in attitudes/perceptions, level 2B = change in knowledge/skills, level 3 = change in behavior, level 4a = change at organizational levels, level 4b = impact on clients

Authors	Primary focus	Areas of Secondary focus[a]	Level of impact (Kirkpatrick Hierarchy[b])
Ahmad & Behr, 2002	Learner characteristics	na	Level 1
August-Dalfen & Snider, 2003	Instructional methods	4	Level 1
Baarends et al., 2017	Instructional methods	4,5,6,7	Level 2B
Bannigan & Moores, 2009	Theory building	na	Not research
Boisselle & Baxter, 2017	Learner characteristics	1	Level 1
Brown et al., 2009	Theory building	3	Not research
Campbell et al., 2015	Learner characteristics	5	Level 2A
Chung, 2001	Pedagogy	3,4	Level 1
Coker, 2010	Instructional methods	2	Level 2B

Coppola et al., 2017	Pedagogy	4,7	Level 2A
Crabtree et al., 2001	Instructional methods	na	Level 1
Fain, 2011	Instructional methods	6	Not research
Hammel et al., 1999	Instructional methods	2	Level I
Jaffe et al., 2015	Instructional methods	2,6	Not research
Kramer et al., 2007	Instructional methods	4,6,7	Level 2B
Lederer, 2007	Instructional methods	3	Level 2B
Madill et al., 2001	Instructional methods	3	Level 2A
Mitchell, 2013	Theory building	2	Not research
Nielsen et al., 2017	Instructional methods	4,5,7	Level 1
O'Brien et al., 2016	Instructional methods	4,6,	Level 1
Reed, 2014	Instructional methods	2,4,5	Level 2B
Salvatori, 1999	Instructional methods	2	Not research
Schaber & Shanedling, 2012	Instructional methods	4	Level 2B
Shea, 2015	Instructional methods	na	Not research
Velde et al., 2006	Instructional methods	3,4	Level 2A

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Vogel et al., 2009	Learner characteristics	2,3	Level 2B
Wittman & Velde, 2002	Theory building	4,7	Not research
Zachry & Nash, 2017	Instructional methods	4	Level 1

Appendix C

Articles Included in Analysis

Critical thinking in occupational therapy education: A systematic mapping review
Pitonyak, J. S., Nielsen, S., O'Brien, S. P., Corsilles-Sy, C., Lambert, D. Jaffe, L. E.

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