Information Literacy and Critical Thinking: Different concepts, shared conceptions.

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Abstract

Introduction. Information literacy and critical thinking are discussed as distinct concepts by authors in different disciplines. This paper seeks to analyse their conceptions to determine the extent to which they overlap, and identify areas for collaboration across disciplinary lines.

Method. A hermeneutic literature review was conducted, followed by a content analysis of information literacy papers discussing content evaluation, and critical thinking papers from key authors.

Analysis. Proportions of identified themes represented within the two groups of papers were compared. Similarities and differences were assessed in conjunction with findings from the hermeneutic literature review.

Results. Though divergent in their basic underpinning skills, critical thinking and information literacy conceptions pertaining to content evaluation were found to be strongly overlapping in their broader conceptions. Modern pressures giving rise to content evaluation concerns such as the 'fake news' phenomenon suggest a need for strong sense conceptions, and an avenue for integration between information literacy and critical thinking when evaluating information.

Conclusion. Taken in their strong sense, information literacy and critical thinking conceptions show a high degree of overlap. Engagement across disciplinary lines could offer an enrichment to both concepts.

Keywords: Information Literacy; Critical Thinking; Conceptions; Content Analysis

1. Introduction

Disciplinary boundaries can create arbitrary lines between participants in parallel discourses, and this paper will argue that this is the case in the academic conversation about information literacy and critical thinking. Information literacy and critical thinking share a highly similar timeline, rising to prominence as factors of interest in the 80s and continuing to be expounded upon until today (Ennis, 2015; Grafstein, 2002). Which concept one engages with is at least in part attributable to which discipline one falls under, with library and information science theorists and practitioners discussing information literacy, and philosophers, psychologists and education researchers more likely to discuss critical thinking (Albitz, 2007). However, the development of ideas around both concepts has shared features: both were initially conceived of as relatively simple, procedural abilities; both have since been diversified and viewed with increasing nuance and complexity. There has been some acknowledgement of a relationship between these concepts (e.g. Albitz, 2007; Weiner, 2011), however no thorough mapping of their similarities and differences including key views from all disciplines has been made.

This paper uses John Rawls' distinction between concepts and conceptions, the former being the defined meaning of a term, and the latter being the specifics ways the term is operationalised (Rawls, 1971). Robert Ennis, a prominent thinker in the field of critical thinking, has argued that debate over definition is often a result of authors presenting differing conceptions of the same concept, and in doing so largely speaking past one another (Ennis, 2016, 2018). For Ennis, the different ways of defining critical thinking are *"just different ways of cutting the same conceptual pie"* (Ennis, 2016, p. 9). A parallel argument has been made about attempts to define information literacy (Owusu-Ansah, 2005). These concerns highlight a potential narrowing in focus that can take place when emphasising a single definition of a concept rather than plural conceptions. This paper will not seek to define the concepts in question; it is not concerned with identifying the necessary and sufficient factors that constitute them. Instead, information literacy and critical thinking conceptions will be explored to highlight similarities and differences between them. It is worth investigating whether these different concepts in fact share the same conceptions, and if therefore participants in the different disciplines associated with them are missing out on an opportunity for shared dialogue.

2. Literature review

A hermeneutic literature review was undertaken in order to develop an understanding of the discourse around critical thinking, and around information literacy, as well as identifying the specific issues within them, in an iterative process (Boell & Cecez-Kecmanovic, 2010).

Though definition is not the aim of this paper, it is useful to briefly describe both terms to clarify how they are used in this paper. The Chartered Institute of Library and Information Professionals (CILIP) definition is used for outlining information literacy. It is summarised as:

> "Information literacy is the ability to think critically and make balanced judgements about any information we find and use. It empowers us as

citizens to reach and express informed views and to engage fully with society" (CILIP, 2018)

This is a highly contemporary definition that takes the focus away from a previous emphasis on searching for information (CILIP, 2017), and towards critical thinking as a primary concern. This is arguably representative of a wider shift in information literacy conceptualisation that makes understanding critical thinking a vital need. The concept of critical thinking as used in this paper is best captured by Ennis, whose definition has been widely adopted: *"Critical thinking is reasonable reflective thinking that is focused on deciding what to believe or do"* (Ennis, 2016, p. 8).

2.1. Existing comparisons

Other researchers have explored the relationship between information literacy and critical thinking, but this has predominantly been from a library and information science perspective. Allen (2008) maps what she views as the core concepts of critical thinking against the ACRL standards (ALA, 2000). However, her mapping is entirely from an information literacy perspective; she does not engage with critical thinking conceptions from authors in the philosophy, psychology or education literature. Wiener (2011) sought make a wider comparison by conducting a systematic review of the education, library science, and health literature that contained "information literacy" and "critical thinking" as terms. Philosophy and psychology publications were not included in this literature review. He found that information literacy is more general, while critical thinking is subject-specific. However, this finding may represent a cohort effect of having only included education publications; arguments for subject specificity are often associated with education (e.g. Bailin, Case, Coombs, & Daniels, 1999), while various critical thinking conceptions outside of education do consider it to be general (e.g. Ennis, 1990; Kuhn, 1991; Siegel, 1997). Wiener found that critical thinking is a more private, mental activity while information literacy is a more acquirable set of skills; again, this reflects specific conceptions and does not take into account many skills-based instructional approaches to critical thinking (e.g. Abrami et al., 2015; Ennis, 2018). Both of Weiner's claims about information literacy (that it is general, and skills based) are highly controversial, and do not represent many prominent conceptions (e.g. Webber & Johnston, 2000). However, despite the narrow view of both concepts presented, Weiner's review does identify a strong overlap in the language that appears alongside either of these terms in this literature. This gives an indication that there are similarities in these conceptions that are worth investigating further.

A common view of the relationship between these concepts from a library and information science perspective is that information literacy instruction increases critical thinking (Barnard, Nash, & O'Brien, 2005; L. H. Taylor, 2008; R. H. Taylor & Patterson, 2000). Some authors also suggest the causal relationship runs in the opposite direction, and that critical thinking can lead to increased information literacy (Carder, Willingham, & Bibb, 2001; Paul & Elder, 2005). Alternatively, information literacy can be seen as species of critical thinking, or an application of it, even by library and information science professionals such as Reece who says *"information literacy is a form of critical thinking applied to the realm of information"* (Reece, 2005, p. 488), and other authors also subscribe to this view (e.g. Reed

& Stavreva, 2006). Information literacy has also been described as a sub-component of critical thinking by Paul and Elder, who take the stance that critical thinking is broader because:

> "To understand any body of content, any human communication, any book, film, or media message, a person must understand not simply the raw "information" it contains, but also its purpose, the questions it raises, the concepts that structure the information, the assumptions underlying it, the conclusions drawn from it, the implications that follow from those conclusions, and the point of view that informs it." (Paul & Elder, 2005, pp. 11–12)

However, this appears to be a highly narrow construal of what information literacy is, not fitting with the ways it is generally conceptualised (e.g. CILIP, 2018). Conversely, Ward (2006) calls for a recognition that critical thinking is not all there is to information literacy, but that *"We use psychological processes of intuition and imagination as much as critical thinking to mediate our relationship to the world"* (Ward, 2006, p. 5), noting that information comes from within as well as from the external source at hand. However broader conceptions of critical thinking do take this into account, as will be discussed later. It is interesting to note here that library and information science authors such as Ward seem to have a very narrow construal of critical thinking, while psychology and philosophy authors Paul and Elder have an equally narrow view of information literacy. A thorough comparison of different conceptions that fall under both terms may therefore promote a widening of the comprehension of these concepts across disciplinary lines.

2.2. Weak and strong sense critical thinking and information literacy

Although his and Elder's view of information literacy is narrow, Paul took a strong stance against very narrow and atomistic conceptions of critical thinking. He distinguished between "weak sense" and "strong sense" critical thinking; the former being a procedural, skills-based approach, and the latter a much broader reflective, ethically oriented, and socially contextualised conception (Paul, 1981). It is noteworthy that information literacy has a similar dichotomy between "back to basics" skills-based approaches and wider conceptions (LaGuardia, 1992). The discourse around the basic or complex conceptions of both concepts is also associated with views as to whether they are subject-specific or generalisable in their application (Ennis, 1990; Grafstein, 2002; McPeck, 1981). As this highly analogous debate is present in both fields, Paul's (1981) division into weak sense and strong sense conceptions will be used hereon in for both information literacy and critical thinking. The weak sense conceptions of both concepts can be seen as a sub-component of strong sense conceptions; the basics are not rejected by strong sense conceptions, they are included and built upon. In critical thinking, strong sense conceptions are taken to be those that go beyond formal logic and syllogistic reasoning and include broader considerations (Paul, 1981), and in information literacy they are those that extend beyond the basics of searching and source evaluation (LaGuardia, 1992), but tackle the evaluation of content and wider contexts (CILIP, 2018).

3. Method

Following the hermeneutic literature review, a content analysis was conducted to explore the themes in strong sense conceptions of information literacy and critical thinking.

3.1.   Materials

Full text papers on critical thinking and information literacy were used. These consisted of critical thinking papers (n=42), selected from the hermeneutic literature review process to represent prominent strong sense conceptions from the fields of psychology, philosophy and education. Information literacy papers discussing content evaluation were first sought (n=186), in keeping with the CILIP (2018) definition, and strong sense conceptions. In addition to the academic papers, prominent information literacy frameworks (n=7) were also included, and are referred as papers. From this large information literacy paper set, a sub-set of papers containing "critical AND thinking" with a frequency of >0.25% were used for thematic analysis (n=64). Using the AND operator allowed for the inclusion of IL papers that do not necessarily directly utilise the language of "critical thinking", while still capturing 'thinking' and being 'critical'. Inclusion of only those papers that use the phrase "critical thinking" would have been redundant given that this was already captured in the search terms, and failed to captured those authors writing on IL who do not utilise this specific vocabulary. See Appendix A for search terms and full list of papers. Nvivo 12 pro was used for the coding of papers. Statistical analysis was conducted using R 3.5.3.

3.2.   Procedure

Critical thinking and the sub-set of information literacy papers were coded using an emergent coding process that drew upon the literature review and was further refined through cluster analyses. This process yielded 11 themes (see Appendix B). Any given reference could be coded with multiple themes. The number of papers containing each theme, and the number of references per theme, grouped by origin from information literacy or critical thinking sources, were extracted. The proportions of papers and references per theme from the information literacy and critical thinking sets were analysed. The standard inference criteria of $p < 0.5$ was used to determine whether differences in proportions were significantly different from the null hypothesis.

4. Results

The number of papers which made reference to each theme was identified. The proportions of information literacy and critical thinking papers containing each theme can be seen in Figure 1, ordered by the highest percentage of information literacy papers to the lowest.

Figure 1: Graph of the percentage of IL and CT papers containing each theme
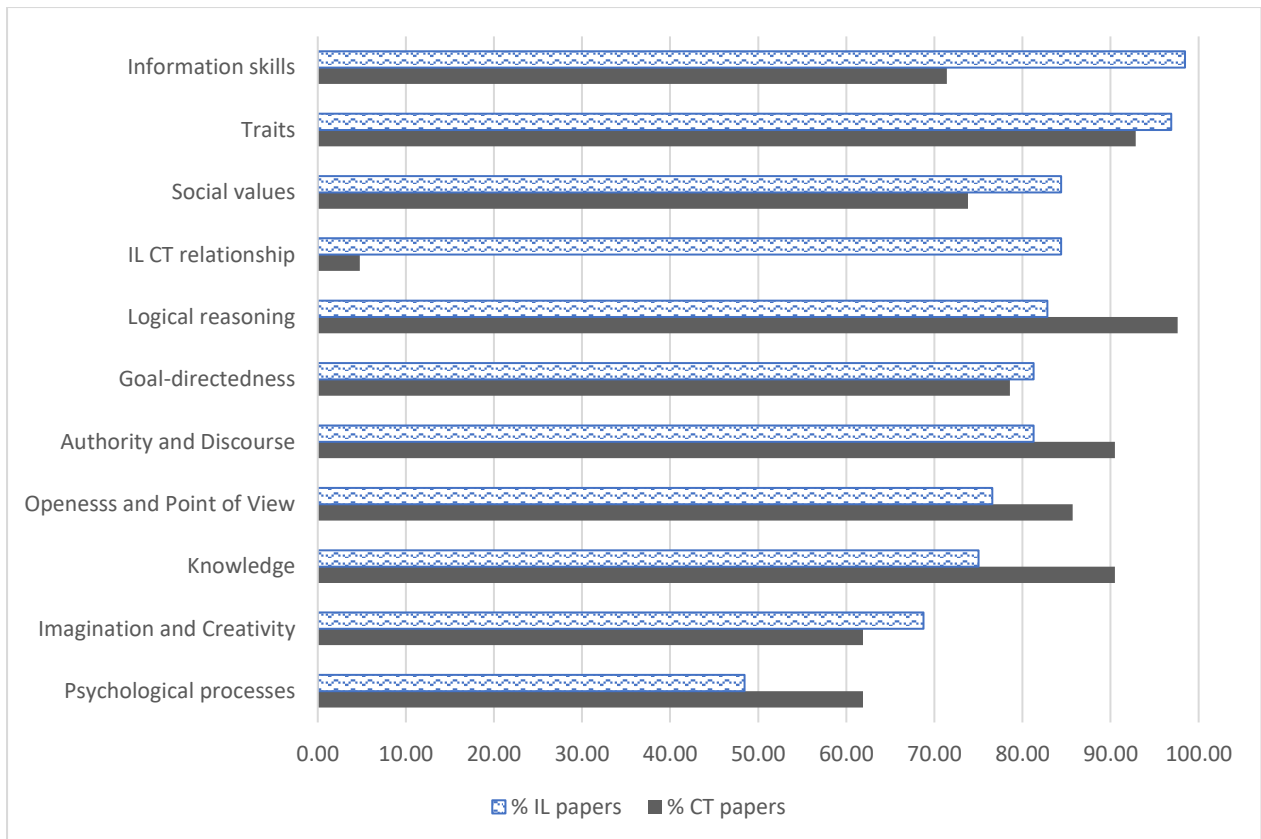

An independent proportion analysis was conducted to determine whether any of the differences between how many critical thinking and information literacy papers included material coded to each theme were significant. Fisher's exact test was used due to the low sample sizes (see Table 1 for results).

Only "IL CT relationship", "Information skills" and "Logical reasoning" showed a significant difference between the number of information literacy and critical thinking papers that contained references to them. Based on the odds ratio, the odds of a paper containing the theme "IL CT relationship" and "Information skills" were 99.814 (20.920, 975.154) and 24.506 (3.347, 1087.506) times higher, respectively, if it was from the field of information literacy than critical thinking. Conversely, for every critical thinking paper containing the "Logical reasoning" theme the odds of an information literacy paper mentioning it were 0.119 (0.003, 0.881). However, all of these effects have an extremely wide 95% CI, and therefore cannot be considered representative. A much larger sample size would be needed to confirm the effect (Assuming the same proportions in results, taking "IL CT relationship" as an example, multiplying the sample sizes of information literacy and critical thinking papers 32x would yield a 95% CI [81.373, 144.230], which is still wide, and 3,392 papers would need to be coded, demonstrating this to be unfeasible). For all other themes, there was no significant difference between critical thinking and information literacy papers.

The number of references made to each theme originating from critical thinking or information literacy papers were identified. The percentage of references originating from

each set of papers coded under each theme can be seen in Figure 2, ordered by the highest proportion of information literacy references to the lowest.

Figure 2: Graph showing the percentage of IL and CT references coded at each theme
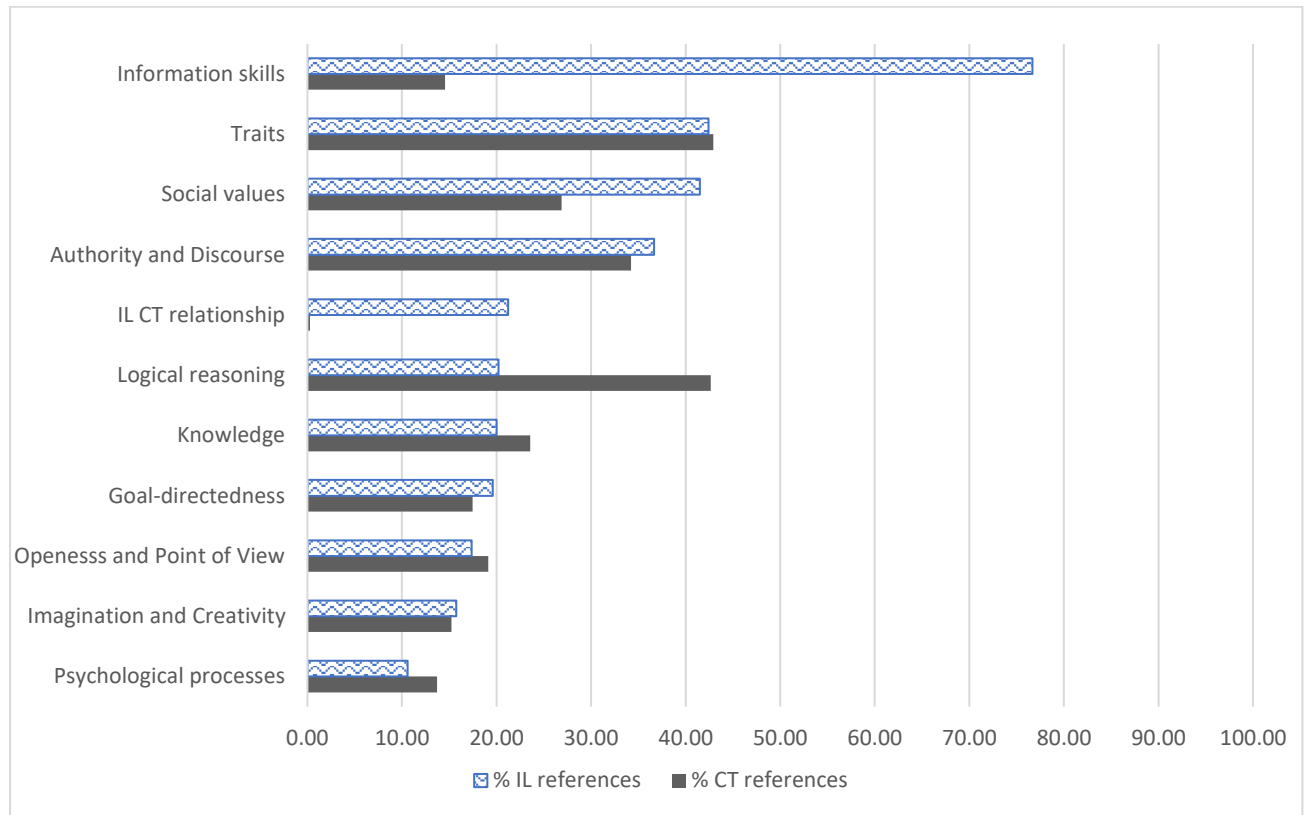
A comparison between proportions of critical thinking and information literacy references coded at each theme was made using a two-sample chi square test for equality of proportions with Yates continuity correction (see table 2 for results).

The themes of "IL CT relationship", "Information skills", "Logical reasoning" and "Social values" showed a significant difference between the number of information literacy and critical thinking references to them ($p<.001$). Based upon the odds ratios, the odds of a reference to "Information skills" and "Social values" coming from an information literacy paper were 19.263 (14.869, 25.123) and 1.931 (1.562, 2.392) times higher than it coming from a critical thinking paper, respectively. For every "Logical reasoning" reference from a critical thinking paper, the odds of an information literacy reference to this theme was 0.341 (0.273, 0.424). The odds of a reference to "IL CT relationship" coming from an information literacy rather than critical thinking paper was 96.778 (26.267, 799.106), however here the 95% CI is extremely wide, likely due to the very small sample of critical thinking references to this theme, and therefore this effect cannot be considered representative. References from each set for the theme of "Psychological processes" were barely insignificantly different ($p.$ .05966); however the 95% CI (0.551, 1.012) crosses 1, and therefore the direction of this effect could be opposite in the population value than in this sample. There was no significant difference between critical thinking and information literacy references coded to any other themes.

Table 1

Fisher's exact test of independence between proportions of Information Literacy and Critical Thinking papers containing each theme

Theme	Paper Type		df	P	OR	95% CI	
	Critical Thinking	Information Literacy				Lower	Upper
Information skills	30 (71.4%)	63 (98.4%)	1	.001***	24.506	3.347	1087.506
Traits	39 (92.9%)	62 (96.9%)	1	.3827	2.364	0.259	29.489
Social values	31 (73.8%)	54 (84.4%)	1	.2169	1.904	0.651	5.644
IL CT relationship	6 (4.8%)	54 (84.4%)	1	.001***	99.814	20.920	975.154
Logical reasoning	41 (97.6%)	53 (82.8%)	1	.0256*	0.119	0.003	0.881
Goal-directedness	33 (78.6%)	52 (81.3%)	1	.2698	1.180	0.392	3.444
Authority and Discourse	38 (90.5%)	52 (81.3%)	1	.8053	0.459	0.100	1.669
Openness and Point of View	36 (85.7%)	49 (76.6%)	1	.3219	0.547	0.158	1.677
Knowledge	38 (90.5%)	48 (75%)	1	.07386	0.319	0.072	1.100
Imagination and Creativity	26 (61.9%)	44 (68.8%)	1	.5317	3.304	1.350	0.549
Psychological processes	26 (60.9%)	31 (48.4%)	1	.2323	0.581	0.241	1.370
Paper totals	42	64					

Note. * = *p* < .05, *** = *p* < .001.

Table 2

Two-sample chi square test for equality of proportions with Yates continuity correction of Information Literacy and Critical Thinking references coded to each theme

Theme	Reference Type		χ2	df	P	OR	95% CI	
	Critical Thinking	Information Literacy					Lower	Upper
Information skills	105 (14.5%)	759 (76.7%)	642.100	1	.001***	19.263	14.869	25.123
Traits	310 (42.9%)	420 (42.4%)	0.026	1	.8712	0.979	0.803	1.195
Social values	194 (26.9%)	411 (41.5%)	38.551	1	.001***	1.931	1.562	2.392
Authority and Discourse	247 (34.2%)	363 (36.7%)	0.994	1	.3188	1.113	0.906	1.368
IL CT relationship	2 (0.3%)	210 (21.2%)	166.730	1	.001***	96.778	26.267	799.106
Logical reasoning	308 (42.7%)	200 (20.2%)	99.829	1	.001***	0.341	0.273	0.424
Knowledge	170 (23.5%)	198 (20%)	2.904	1	.08836	0.812	0.640	1.031
Goal-directedness	126 (17.5%)	194 (19.6%)	1.126	1	.2886	1.153	0.893	1.491
Openness and Point of View	138 (19.1%)	172 (17.4%)	0.739	1	.39	0.890	0.689	1.150
Imagination and Creativity	110 (15.2%)	156 (15.8%)	0.052	1	.8205	1.041	0.792	1.371
Psychological processes	99 (13.7%)	105 (10.6%)	3.547	1	.05966	0.747	0.551	1.012
Reference totals	722	990						

Note. * = $p < .05$, *** = $p < .001$. As for the "IL CT relationship" theme CT references had a value of <5, Fisher's exact test was used for verification of result, and also resulted in p .001.

5. Discussion

In the following discussion, both literature review and content analysis findings are discussed together to explore which themes overlap or diverge across critical thinking and information literacy conceptions pertaining to evaluating content.

5.1.   Similarities

5.1.1. Goal-directedness

Both information literacy and critical thinking conceptions are goal-oriented and purposeful. Frímannsson (2016) articulates the aim of critical thinking as formulating justified reasons warranting belief or action, which aligns with Ennis' definition (2015), and incorporates emphasis on reasons (Siegel, 1997). Making informed decisions and taking appropriate action are also the goals of information literacy (CILIP, 2018). The goal of fostering lifelong learning is also shared between information literacy and critical thinking authors (hooks, 1994; IFLA, 2006; Paul, 2005; Ward, 2006).

5.1.2. Traits

Critical thinking conceptions often delineate dispositions and abilities (Ennis, 2015; Facione, 1990). This division appears in information literacy conceptions also, if under different terminology such as Fitzgerald's (2004) "habits of mind" and "process skills", and notably in the ACRL framework (ACRL, 2016). Therefore, these conceptions share the same structure.

Strong sense conceptions of both critical thinking and information include an inward sensitivity, through reflection and metacognition. Ennis defines this as the ability to *"be aware of, and check the quality of, their own thinking"* (Ennis, 2015, p. 33). Reflective critique of one's own thinking has been found to be a key critical thinking factor (Kuhn, 1991). This echoes Ward's view that *"If we fail to develop our inner information capacities, we fail to become fully information literate"* (Ward, 2006, p. 22), and also fits very closely with recent calls for rich reflection to be included in conceptions of information literacy (Corrall, 2017; Critten, 2015).

5.1.3. Authority and discourse

As education is a key focus of authors working with both conceptions, it is not surprising that considerations over entering into and navigating academic discourses are strongly represented in their conceptions (e.g. Bailin & Battersby, 2009; Farrell & Badke, 2015; Vaughan, Smith, & Cranston, 2016). Authority is a central concern in information literacy (e.g. ACRL, 2016). Furthermore, radical/critical information literacy conceptions critique the conventions of academic fields, calling for deeper questioning of authority within them (Elmborg, 2006; Simmons, 2005; Whitworth, 2014). Problematising the traditions of authority within discourses is also a prime aim of many critical thinking authors (Holma, 2015; Mulnix, 2012). Therefore, especially in radical conceptions, there is strong alignment in approaches to authority and disciplinary discourses.

5.1.4. Knowledge

Knowledge building is a concern of both information literacy and critical thinking authors (Fulkerson, Ariew, & Jacobson, 2017; Thayer-Bacon, 1999), with a focus on what constitutes knowledge. The underlying epistemology and commitment to truth one holds is considered

essential for thinking critically (Holma, 2015; Kuhn, 1991; Siegel, 1997). The need for sophisticated epistemological understandings is also prevalent in information literacy conceptions (Deitering & Jameson, 2008; Weiler, 2005). However, there is a difference in epistemologies between some conceptions of each concept; in information literacy some authors express a commitment to relativism (Elmborg, 2006; Hall, 2010), which is often considered antithetical to critical thinking (e.g. Siegel, 1997).

5.1.5. Openness and point of view

Sensitivity and openness to other views are strongly represented in both information literacy and critical thinking conceptions. Weiler (2005), for instance, identifies resistance to critiquing one's existing beliefs as a barrier to information literacy. Analogous arguments for critical thinking entailing openness are a core feature of its conceptions (e.g. Ennis, 2015; Facione, 1990; Kuhn, 1991; Siegel, 1997). bell hooks views one of the aims of critical thinking instruction as leading to "*radical openness*" (hooks, 1994, p. 202). In a radical information literacy perspective, in which hooks is also a highly valued author, openness is also a key theme; Whitworth (2014) argues that IL entails polyphony, dialogue and openness to transformation. There is very strong alignment between authors from both fields with respect to this theme.

5.1.6. Imagination and creativity

Many critical thinking theorists have included creativity as an essential component of their conceptions, such as Bailin (1987) who argued that creative and critical thinking ought not be viewed as mutually exclusive, but that they are in fact necessary for one another. Paul and Elder (2005) also posit that the two are integrally related. In the information literacy literature, creativity is also a strong concern; instructors have argued that information literacy requires *"creative courage"* (Reed & Stavreva, 2006, p. 439), and that a librarian's role involves encouraging active creation of information (Hall, 2010). It is also a key factor in metaliteracy (Mackey & Jacobson, 2011). The inclusion of creativity fits with strong sense conceptions, and broadens the scope of both concepts beyond procedural skills.

5.2.   Differences

5.2.1. Information literacy and critical thinking relationship

It is noteworthy that information literacy authors discuss the relationship between the two concepts, but critical thinking authors very rarely do. In fact, only two references were made to their relationship in the selected critical thinking literature, and both references come from the same source (Paul & Elder, 2005). It should be noted that for the thematic analysis information literacy papers were selected to include the terms 'critical' and 'thinking' and therefore the extent of this difference is likely to be a result of this sampling decision. However, even the wider hermeneutic literature review yielded no further engagement by critical thinking authors with the concept of information literacy. This is perhaps indicative of the broad and interdisciplinary engagement with critical thinking as a concept, whilst the concept of information literacy is very tightly aligned with the field of library and information science. Despite an increase in the publication of papers on information literacy from other fields (Sproles, Detmering, & Johnson, 2013), this raises a concern for

information literacy authors as to whether they are using a rarefied term that is not recognised outside of library and information science.

5.2.2. Psychological process

In the comparison of references coded at each theme (though not at the level of papers), "Psychological processes" showed a marginally insignificant difference, with more critical thinking than information literacy authors making mention of the cognitive, affective and embodied processes that may underlie these concepts. However, the 95% CI for this effect did not confirm a direction in this relationship. A wider difference might have been expected given the inclusion of psychology papers for critical thinking, but not information literacy. Similarities were also discovered. For instance, Stanovich and Stanovich (2010) define critical thinking in terms of a dual-processing model. Interestingly, Metzger (2007) provides a model of dual processing in information literacy that is very similar. Both Stanovich and Stanovich and Metzger's dual process models imply that cognitive work is needed for thinking critically and being information literate. Both suggest these concepts can be defined through understanding the underlying processes that constitute them. Information literacy authors could expand upon Metzger's work through further engagement with psychological models of critical thinking.

5.2.3. Social values

The proportion of references made to the theme of "Social values" showed a strong significant difference between information literacy and critical thinking (though no significant difference was found between papers), with a higher proportion of information literacy references discussing this theme. This difference can be illustrated in the way human rights are discussed by the different fields, for instance Paul and Elder's framework requires critical thinkers to be familiar with human rights (Paul & Elder, 2005). By contrast, information literacy has been called a human right (Sturges & Gastinger, 2010; UNESCO, 2003). Therefore, the integration of human rights into information literacy conceptions is arguably far greater than into critical thinking. One possible explanation for this finding may be the difference between the professional identity of library and information science authors and the more varied backgrounds and aims of critical thinking authors. The information literacy literature often features discussion on the ethical values and principles that ought to be adopted by members of the profession (e.g. Koehler, 2003). These professional ethical concerns integrate with those associated with the concept of information literacy (Jacobs & Berg, 2011). Overall, this implies that when it comes to social values, conceptions of information literacy may have a lot to offer to critical thinking researchers. bell hooks views critical thinking as a route to *"education as the practice of freedom"* (hooks, 1994, p. 20), and argues that it is the primary enabling force for change, as all people of all genders, ethnicities, and backgrounds can use their capacity to think critically and thus change and shape society (hooks, 1994). The social and ethical framing of information literacy conceptions could be adapted and integrated into conceptions of critical thinking to give them a stronger grounding for furthering these social justice goals.

5.2.4. *Weak sense information literacy and critical thinking*

Both "Logical reasoning" and "Information skills" contained a highly significantly different proportions of information literacy and critical thinking papers and references. This aligns with the difference found in the hermeneutic literature review that the basic skills associated with critical thinking (syllogistic reasoning, formal logic, etc.) were distinct from the basic skills associated with information literacy (searching, evaluating sources, etc.), and can be considered weak sense conceptions of either concept (Paul, 1981). These findings suggest that movement towards the basics is a move away from the common ground between information literacy and critical thinking, narrowing them into smaller and more distinct entities. A move away from weak sense and towards strong sense conceptions may therefore be a move towards greater merging between information literacy and critical thinking. If the ARCL framework (2016) and latest CILIP information literacy definition (2018) serve as guides, it would seem that within information literacy the movement is in the direction of merging with critical thinking conceptions.

The movement away from the basics and towards strong sense conceptions of information literacy and critical thinking presents challenges that could be addressed through collaboration between their respective fields. For instance, it is sometimes contested whether content evaluation falls under the remit of library and information professionals at all, who often report a lack of training to sufficiently aid patrons in these deeper evaluative endeavours (Bruce & Lampson, 2002; Hart, 2006; Julien & Hoffman, 2008). There are many curricula and guides for teaching critical thinking available that could in part fill this training need (e.g. Ennis, 2018; Paul & Elder, 2005). These critical thinking approaches could be included in library and information science programmes, and in professional development courses, to equip library and information professionals to incorporate content evaluation in their instruction. Critical thinking authors may also benefit from moving in a direction towards strong sense information literacy conceptions. For example, conducting a search and finding information (prior to evaluating that information) is a basic information literacy skill that may also require some critical thinking in a weak sense, such as in understanding the logic behind Boolean operators. However, there are deeper concerns around locating different kinds of information where strong sense critical thinking could be utilised. Critical/radical information literacy approaches widen the scope of information searching to include a questioning of *why* particular results may be appearing rather than others, and concretely who may or may not get published through specific channels (Simmons, 2005). In the era of 'fake news', thinking critically about what information is presented on social media and in search engine results lists seems highly important (Batchelor, 2017). This serves to illustrate how weak sense conceptions are not sufficient in complex modern information settings, and how shared and integrated strong sense conceptions of both information literacy and critical thinking have much to offer those seeking to navigate these landscapes.

5.3.   Limitations

It is essential to note that in the analysis presented of information literacy emphasis has been placed on content evaluation. This means that only conceptions of information literacy that focus on content evaluation have been included, and many other conceptions more

focused on other aspects of the concept (such as search skills, information management, etc.) have been excluded. For the thematic analysis, papers were selected to include the terms "critical" and "thinking", further narrowing the scope of interest within information literacy conceptions. The comparisons made are therefore not between the entirety of critical thinking and information literacy. A single reviewer conducted the analysis, and therefore inter coder reliability could not be ascertained. Furthermore, the statistical analysis presented should be treated as illustrative only; the significance of differences between information literacy and critical thinking is dependent on the grouping of themes, and these could be re-organised from other perspectives and would thus yield different proportions. In addition, relatively small sample sizes limit the generalisability of these findings. For future analysis, a wider view of critical thinking and information literacy could be taken, and large corpuses of texts published on both subjects could be computationally analysed to yield a more far-reaching comparison.

6. Conclusion

Barbara Thayer-Bacon uses the metaphor of quilting to illustrate her conception of critical thinking. She writes:

> "Without ideas-information we will not have quilts of knowledge… The material makes up the bulk of the quilt. Given the importance of the specific, unique information-ideas, nevertheless, we still need pins and scissors and rulers to help us cut and fit together our ideas (critique our information), and we still need needle and thread (our intuition) to help us sew the pieces of material together. In addition, we still need our feelings and imagination to help us to decide what colours and patterns and textures to use and how to put these pieces of material together in a way that works and is aesthetically pleasing" (Thayer-Bacon, 2000, pp. 63–64)

If we conceptualise critical thinking in this collaborative and encompassing manner, it seems to fit very closely with conceptions of information literacy; the material of the quilt is the information, and both information literacy and critical thinking authors have many tools that can be shared and deployed together to work with that material and shape it in the intuitive and creative way Thayer-Bacon describes. Information literacy and critical thinking in their weak sense have been found to be distinct through emphasis on different sets of basic skills in this analysis. However, strong sense conceptions have much to offer authors working across all disciplines utilising both concepts.

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Appendix A: Papers used in content analysis

IL paper search terms

The UCL discovery system (UCL Explore) was used to conduct the following searches:

Term(s) 1	Operator	Term(s) 2	Database	Filter to	Hits	Papers used
"Information Literacy"	AND	"Content Evaluation"	Explore	Articles	84	20
		"Critical thinking"	Explore	Articles	4,581	55
		Critique	Explore	Articles	4,581	35
		Reason*	Explore	Articles	11,760	11
		thinking	Explore	Articles	9,886	12
		epistem*	Explore	Articles	1,245	9
		wisdom	Explore	Articles	1,282	6
		rhetoric	Explore	Articles	1,163	12
		argument	Explore	Articles	2,950	26

IL frameworks used in text analysis

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Appendix B: Coding scheme development

Initial themes derived from hermeneutic literature review:

evidence assessment; logical reasoning and argument; creativity and imagination; openness and sensitivity to point of view; reflection and metacognition; making judgements and reaching conclusions; democratic engagement and social justice; ethics; locating information.

## Full list of themes used in paper coding:

Affect
Authority
Bias detection
Citizenship and Democracy
Cognition
Content evaluation
Create new
Critical Theory
Curiosity
Disposition
Drawing conclusions
Embodiment
Empathy
Engagement
Epistemology
Ethics
Generalisability
       General
       Specific
Goal-directedness
Habits
IL CT relationship
Imagination
Inquiry or discourse
Knowledge building
Life-long learning
Logical reasoning
Managing info
Metacognition
Openness
Point of view
Reflection
Search skills
Social
Source evaluation
Specific

Tools and Technology
Truth
Values

Cluster analysis of themes:

Items clustered by word similarity
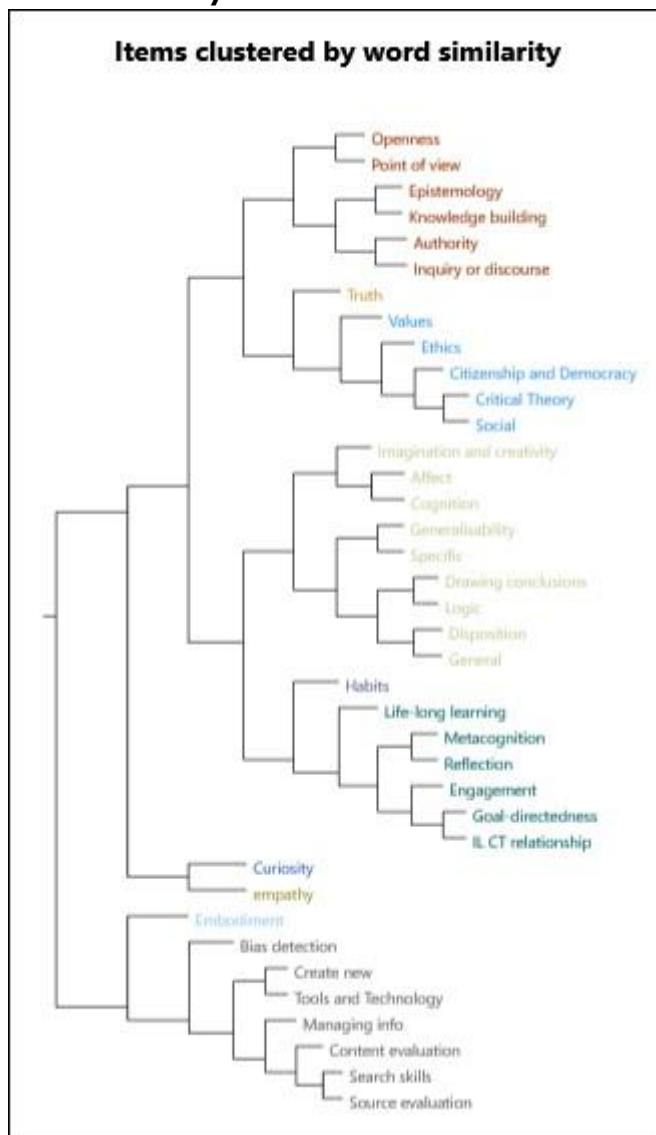
Newly derived coding scheme combining findings from literature review and cluster analysis:

Authority and Discourse

    Authority

    Inquiry or discourse

        Generalisability

            General

            Specific

Goal-directedness

IL CT relationship

Imagination and Creativity

    Create new

    Curiosity

    Empathy

Information skills

    Content evaluation

    Managing info

    Search skills

    Source evaluation

    Tools and Technology

Knowledge

    Epistemology

        Truth

    Knowledge building

Logical reasoning

    Bias detection

    Drawing conclusions

Openness and Point of View

    Openness

    Point of view

Psychological processes

    Affect

    Cognition

    Embodiment

Social values

    Citizenship and Democracy

    Critical Theory

Ethics

Values

Social

Traits

Disposition

Engagement

Habits

Life-long learning

Metacognition

Reflection