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Information literacy is a subversive activity: developing a research-based theory of information discernment

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Abstract

The theory of information discernment discussed here is firmly based on models, research and scholarship of information literacy coupled with theory and research in information behaviour. This paper will explore original research conducted by Walton and Hepworth and how it has developed over the last 10 years – the pilot study was reported in the very first edition of this journal in 2007. It will show that it has led to the emergence of the concept of information discernment and how Foucault's discourse analysis theory has been used to further critically analyse its application. This paper will show how the research has been applied in a range of contexts, from enabling students in their first year of A-level study in the UK to carry out better research for their extended project qualification (EPQ), to teaching information literacy to undergraduates in various disciplines. This research will then be synthesised to create a new theory of information discernment summarised as: *the ways in which social, psychological, behavioural and information source factors influence peoples' judgements about information*. I argue that information discernment should be included in future notions of information literacy and, in particular, informs the ACRL (2016) key threshold concept that *authority is constructed and contextual*. Attendant psychological notions of worldview, misinformation, confirmation bias, motivated reasoning and epistemic beliefs will be explored to determine how these articulate and enrich this new theory. The paper explores how this theory can be applied in practice beyond the learning environment, and argues that, ultimately, information literacy is a subversive activity which challenges received notions of the construction, communication and exchange of information and knowledge.

Keywords

information literacy; information discernment; information behaviour; cognitive questioning; epistemic beliefs; motivated reasoning; confirmation bias; misinformation

1. Introduction

It is hard to believe that it is ten years since the first edition of the *Journal of Information Literacy* (JIL) hit the online world. In that time it has grown from the new kid on the block to a highly regarded home for information and digital literacy research across sectors and contexts. In those early days of 2007 Mark Hepworth was my PhD supervisor and encouraged me to submit my pilot study as a paper to JIL. I'm pleased to say that it is still in the top 20 (joint 13th at the time of writing) of most cited articles in JIL. Mark was an inspiring supervisor who became my colleague and friend. His advice, guidance and sometimes painful but incisive critique helped to shape my thinking and inform my work; I miss his wisdom and fellowship. This article is dedicated to his memory.

What emerged very clearly from that original pilot study by Walton, Hepworth, Barker and Stephens (2007), contrary to the findings of the CIBER report (University College London, 2008), was that students' inability to engage with information effectively can be changed,

especially the ways in which they make judgements about information. This was very encouraging, because it not only provided us with the basis for a theory but, perhaps more importantly, showed that the profession has a role in realising and supporting this change in learners. My focus was on higher education at the time, but we have demonstrated since that this can be achieved in 16-17 year olds and are confident that the same techniques will bear fruit in older populations. There is of course a wealth of research from a range of authors showing how other models and approaches can be employed to enhance the capability of evaluating information, for example, Pickard et al. (2010; 2012; 2013); Shenton & Pickard (2012; 2014a; 2014b).

In this paper I will discuss my original theory and model and how it has been applied, and explore the diverse influences which have further honed and shaped my theory into a usable tool for further research. Finally, I will express my vision for the future of information literacy (IL) and how its place is not just in education and the workplace, but part of an emerging set of capabilities for the political sphere and the armoury of the engaged citizen.

2. Developing a theory of information discernment

My original model is a bricolage of five distinct but overlapping areas of theory, research and practice: information literacy, information behaviour, learning theory, pedagogy and e-learning. I still regard Bloom's original taxonomy of cognitive learning goals as an informative way of framing how we view learning (Bloom, Engelhart, Furst, Krathwohl & Hill, 1956) and how this matches much of what we originally thought as the stages to becoming information literate. The work of Kuhlthau (1991) and her notions of emotion in the search process also struck me as important – especially in the context of encountering the frustrations of students at the help desk and their inability to find the information they wanted through the standard databases, for example Web of Science.

The Big Blue project and its iterative model of IL also chimed with my experience of searching as often a messy and frustrating process, in contrast to the Society of College, National and University Libraries (SCONUL) Advisory Committee on Information Literacy model (1999) with its order and precision. I've never been a big fan of this model and have been a vocal critic of its approach (Walton, 2010). Even the revised model (SCONUL, 2011) lacks a great deal of the cognitive, emotional and recursive states inherent in engaging with information. The pillar schema is an engaging metaphor, admittedly, but it creates a misleading picture in people's minds of the IL process as an almost concrete and fixed set of stages. I don't know of any empirical research that has confirmed the SCONUL model as a credible representation of IL.

The work of Christine Bruce et al. (2007) and Annemaree Lloyd (2012) has informed and influenced my work. I was attracted by Christine Bruce's early holistic view of information literacy where she describes people as having an individual personal information construct and information experience (1995). The more developed 'relational frame' view of information literacy with Sylvia Edwards and Mandy Lupton I also found useful, with the notion that information literacy is enabled via discussion. They argued that discourse allows learners to move from using surface notions of evaluating web pages such as authority, relevance and reliability to deeper and more critical notions where 'ideas, opinions and perspective apparent in the source and the quality, style and tone of the writing' are examined (Bruce, Edwards & Lupton, 2007, p.53).

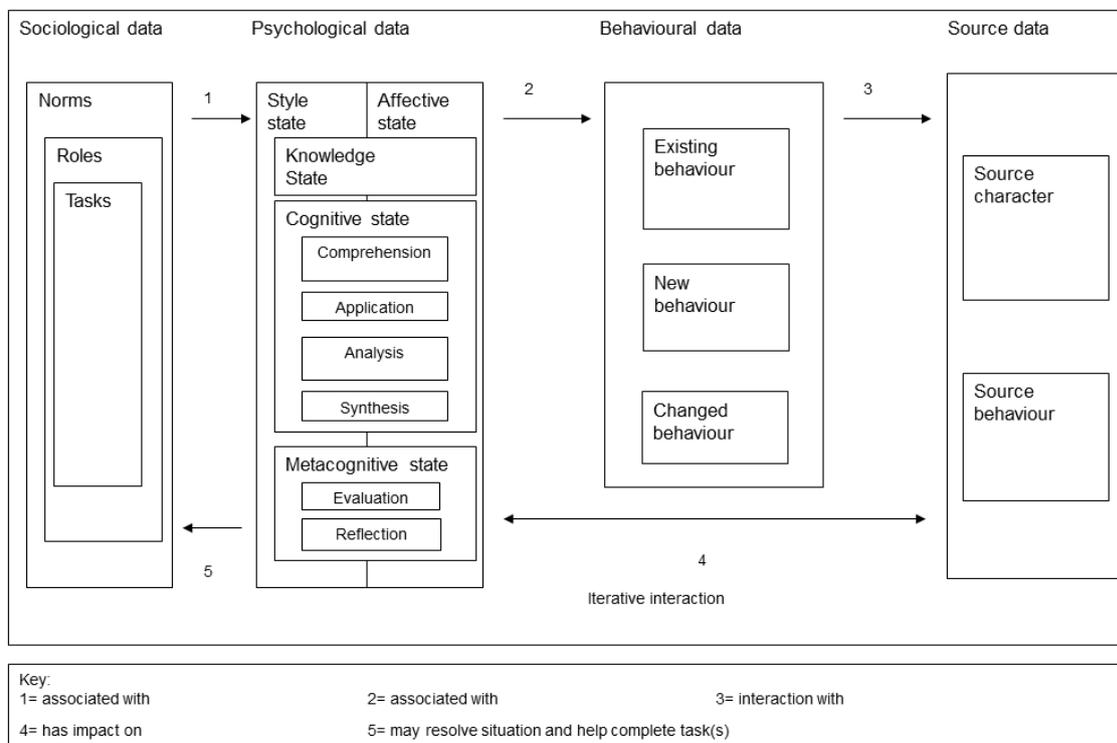
Annemaree Lloyd's ideas bring an entirely different perspective to information literacy, that of a complex collective practice that is negotiated between people in a particular information landscape (2011). In other words the information literacy of school teachers is far removed from that of fire fighters, each determined by where they work and what they have to do in their daily routines. Drew Whitworth's Radical Information Literacy (2014) has also widened my thinking,

particularly from a political perspective. Wilson (1999), Savolainan (1995), Ford (2004) and others (e.g. Fisher, Erdelez & McKeachie, 2005) working in the field of information behaviour confirmed that engaging with information is a complex process, involving many factors and is not orderly or linear in character.

It was, however, Mark Hepworth's model of information behaviour (2004) based on his research into informal carers that resonated with my, as yet, tacit and unformed views of information literacy. He identified sociological, psychological, behavioural and informational source factors as playing a fundamental role in how people engage with information. It is this model that I used as the basis of my research.

I used Hepworth's model as a basis for exploring undergraduates' capabilities in evaluating information (Hepworth, 2004). My aim was to see whether I could shift these capabilities in making judgements about information from relatively simple, low-level approaches to more nuanced and complex thinking and behaviour involving an element of critical response to what they read. I found that a wide range of factors come into play and impinge on students' IL, as shown in the diagram below.

Figure 1: Model of information behaviour underpinning information discernment (Walton & Hepworth, 2011, p.470)



A range of norms, roles and tasks contextualise and shape a person's interaction with information sources. This process is associated with different psychological states which have an impact on information behaviour and which are, in turn, moderated by the affordances (character and behaviour) of the information sources that they used.

In my research the participants were first-year undergraduates in Sport & Exercise Sciences and so the norms that shaped their context were that of the university environment (intellectual and physical) and the subject area. Their role was that of student and their tasks were to attend learning and teaching interventions such as lectures and workshops and to produce assignments of various sorts including written essays. When students engage in a task, for

example creating an annotated bibliography, they may have some prior knowledge about the process. They will comprehend a piece of information and some evaluation criteria, and apply these to new information by analysing it and then synthesising this new knowledge into a report.

At first the students in our study demonstrated an uncritical response to the task. However, after the IL intervention, in which they worked through the examples given and explored sources of information (online websites, peers and tutors) about evaluation criteria, they began to exhibit new behaviour: they stopped taking information at face value. Subsequently, they then changed their behaviour: tutors reported that students showed evidence of exploiting their new skills in assignments for different modules. Students also exhibited metacognition in that they realised that they needed to evaluate information before using it and now had the skills to do it. Finally, this showed they had reached a new knowledge state and could complete an information literacy task.

Underpinning these cognitive and metacognitive states are style state (including individual learning preferences) and affective state (emotions) which also appear to play a key role in the learning process. Students reported they enjoyed the work (affective state) and liked the active nature of the tasks set, in other words they liked learning by doing (a positive style state).

This clearly demonstrates that becoming information literate is highly depended on a person's context (for example, studying at university) and how that environment shapes their actions (norms), their role (student), task (in this case evaluating information) their level of cognition (some web sites are better than others, applying evaluation criteria and so on), how they are feeling (they like doing online tasks and discussing them), what they know about themselves (realisation that they can now make judgements about information that they weren't doing before) and their own learning (they have a new skill they can apply in a different context). This in turn shapes their behaviour (they will always use their evaluation criteria to judge websites) and creates an understanding that the information sources themselves (online databases, teachers, family and peers) also have an effect on how people go about engaging with information.

Get all of these conditions right – in our case it was via the use of online discussion boards to discuss how to evaluate information for an assignment – and we found that they fostered a *cognitive questioning state* in the learner (Walton & Hepworth, 2011, p.459). In my view, this is the holy grail of information literacy. It should be noted that the idea of questioning as an educational technique is not new: it was explored as far back as 1969 by Postman & Weingartner (1971), who labelled it the inquiry method or 'crap detecting', which was prosaically but colourfully put.

Postman & Weingartner's work signalled a new way of thinking in which the inquiry method fosters 'good learners' who are 'questioning'; 'have a confidence in their ability to learn'; are 'capable of solving problems' recognise that 'an incredible number of people don't know what they are talking about'; and 'are suspicious of authorities, especially any authority who discourages others from relying on their own judgement' (Postman & Weingartner, 1971, p.41-42). This approach is about learning as a process as opposed to digesting 'facts'. Today we might use the label 'lifelong learning' to indicate this mindset, which has particular relevance to the burning current issues of 'post-truth' society and fake news. This directly challenges the wrong-headed notion that we need software to protect us from 'fake news'. What we need to create, via the capability of information discernment, is personal cognitive firewalls not digital ones.

3. Are there levels of capability in evaluating information?

What emerged from our study of 2011 was a definition for evaluating information. We named this particular capability ‘information discernment’ and defined it as ‘the ability to use higher order thinking skills in order to make sound and complex judgments regarding a range of text-based materials’ (Walton & Hepworth, 2013, p.55).

It emerged in this and subsequent studies (Cleland & Walton, 2012; Walton, Pickard, Hepworth & Dodd, 2016; Walton & Cleland, 2017) that learners exhibit discrete levels of information discernment, and that these change depending on the specific task that the learner undertakes. Table 1 shows the levels of information discernment summarised from 4 studies. Level 1 denotes the lowest level and level 5 the highest level of information discernment. Levels 3-5 characterise the *cognitive questioning state* which is essential for higher order information discernment (Walton & Hepworth, 2011).

Table 1: Levels of information discernment

| Level of information discernment | <i>Students reporting how they evaluate information, 2011 – updated 2016</i> | <i>Students commenting on how others have evaluated information (2014)</i> | <i>Students commenting on how others have evaluated information (2017)</i> |
|--|---|---|---|
| Level 1 Indifferent to quality or expressed as an amount/ degree of effort or no realisation that it this capability is required, no questioning of sources | Don't know or don't care how to be discerning, " <i>When you first go on a website you don't read all the information.</i> " | Students tended to comment (positively or negatively) on peers' work in terms of quantity and with little detail: " <i>you could use some more references</i> ", " <i>good use of a number of references</i> " | The person operating at this level tends to express the need to evaluate information in terms of quantity e.g., " <i>You have only used some references</i> " (critical) " <i>You use lots of references</i> " (uncritical) |
| Level 2 Unspecified detail or range, no questioning of sources | Expressed as level of effort, " <i>I have learnt to go into more detail with my work.</i> " | Students commented on the variety of 'references' used in their assignment to support an argument but with no real detail: " <i>good reference list in alphabetical order and contains a range of references from different sources</i> " | Those operating at this level tends to express their view in terms of a range e.g., " <i>Nice and varied amount of references</i> " |

| | | | |
|--|--|--|--|
| <p>Level 3 True/false, good/bad dichotomy/ binary directly stated or implied, some questioning of sources</p> | <p>Expressed by true/false statements, “see whether it is from a big company where it’s very probably going to be factual or [...] someone’s own personal website [...] that’s less formal”</p> | <p>The quality of information is implied but not directly revealed: “You have included references but like a previous comment said they are all of (sic) the internet, try and use journal articles or books if you can”, implying the true/false dichotomy</p> | <p>At this level the student is aware of the need to evaluate information but sees it in terms of types of reference where the quality is implied, “You have used websites as references, try to use more books and journals”. This implies the notion of authority and true/false dichotomy</p> |
| <p>Level 4 Relative value of evaluation criteria demonstrating emergent critical thinking by questioning of sources</p> | <p>Expressed as the relative value of criteria for a given purpose, “Some of them initially are important like reliability obviously if you are going to reference something in an essay etc. you need to know that the source is reliable.” “[The e-learning training] helped [me] decide which resources were reliable and useful and why.”</p> | <p>Students have used specific evaluation or discernment criteria (relevance, validity, reliability, and currency). Though these are short, the use of evaluation criteria reveals emergent critical thinking: “References back up argument all through essay and very up to date”, “valid references which back up your main points”, “[...] a reference from the NHS which is good as they are a reliable source”</p> | <p>Here the use of specific evaluation criteria (in bold) is mentioned e.g., “References are relevant and support the information presented.”</p> |

| | | | |
|--|---|---|---|
| <p>Level 5 (highest) Putting both sides of the argument demonstrating critical thinking by complex questioning of sources</p> | <p>This particular group did not reach this level of sophistication</p> | <p>Students commented specifically on linking 'references' to content and concepts in order to support both sides of an argument with much more detail in their comments: <i>"You have used references to support your points, although I think you could have included a few more just to show off your understanding! It would have been nice for you to include 2 other themes also, such as the social benefits and psychological benefits to show your knowledge, and add in the negatives to give an argument!"</i></p> | <p>Typically expressed as the linking of references to specific content or concepts to support both sides of an argument e.g., <i>"You have looked at both sides by including refernces (sic) that oppose each other such as the reference that stated there was no change and then another reference that stated there was a change".</i></p> |
|--|---|---|---|

It was clear from initial studies carried out on first year undergraduates (see Table 1) that they presented with an information discernment capability at level 1. It was only through providing a task where they created their own evaluation criteria via online discussion that their levels of information discernment increased to level 4. In the first study no learners exhibited level 5, the capacity to put both sides of the argument in a considered and balanced way. This is perhaps because the task was very different to the second and third studies where the task involved students' analysing a topic from more than one perspective rather than simply identifying evaluation criteria. In the second and third studies, students were required to comment on others' work after having used the Assignment Survival Kit (ASK) information on how to evaluate information. This appears to create a more successful outcome for some. Students were applying their new capabilities not on their own work but on that of others, and their comments were in the public domain (an online discussion board), so they had to consider more than one viewpoint and were moderated by tutors.

More practically, this table could be envisaged as a rubric for assessment. Table 2 shown below demonstrates how this might be achieved (the grade boundaries are typical for UK undergraduate courses).

Table 2: A rubric for assessing information discernment

| Information Discernment assessed component | FIRST 70%-100% | II(i) 60%-69% | II(ii) 50%-59% | III 40%-49% | Fail 0%-39%- |
|---|---|--|--|---|---|
| Apply complex judgements to any form of information by analysing its content with a view to using it as evidence to address a task, question or solve a problem | Excellent thorough* application of complex judgements to address a task, question or solve a problem by considering <u>both sides of an argument as well as demonstrating critical thinking by questioning sources by using specific evaluation/ discernment criteria</u> (for example, authority, relevance, validity, reliability, and currency) to consider the evidence. | Very good convincing* application of complex judgements to address a task, question or solve a problem by <u>using specific evaluation/ discernment criteria</u> (for example, authority, relevance, validity, reliability, and currency or other relevant criteria) to consider the evidence. <u>Use of evaluation criteria reveals emergent critical thinking.</u> | Good confident* application of limited set of judgements to address a task, question or solve a problem with an awareness of the need to discern quality and authority and <u>views information as either true or false</u> | Adequate appraisal and application of a very limited set of judgements to address a task, question or solve a problem. May use a variety of references in their assignment to support an argument but with a <u>limited sense of what constitutes quality or authority</u> | Inadequate appraisal and no application of complex judgements to address a task, question or solve a problem. Don't know how to be discerning or no evidence of applying evaluation criteria, <u>no sense of what constitutes quality or authority</u> |

*NB: The words 'thorough', 'convincing' and 'confident' are assessment terms recommended by the Centre for Excellence in Learning and Teaching (CELT) at Manchester Metropolitan University.

4. Increasing information discernment in non-traditional students

A study with Eleanor Johnson (which is still ongoing) also demonstrated that learners' information discernment can be increased. This was further confirmed in a British Academy-funded project with Ali Pickard (Johnson & Walton, 2014; Walton, Pickard, Dodd & Hepworth, 2016 – see next section).

In a long-term study on a set of prospective students, who were thinking about studying at university but had some reservations and nervousness about their capabilities, it was found that, with a three-week IL intervention, learners' information discernment could be increased typically from level 1 to level 3/4. These were small cohorts (between 15 and 30) of prospective students (a self-selecting group of women returners, male and females without any family experience of university, or former students who had dropped out of previous courses for various reasons) who experienced the three-week IL intervention as part of a four-week 'taster' course called 'Step-up to HE'. Students experienced a hands-on task-based session on

evaluating information and were asked their views on evaluating information before and after the session. A snapshot from one cohort is shown in Figure 2.

Figure 2: Step-up to HE session snapshot of feedback on critical evaluation

Before the session: "Write what you think 'critical evaluation for webpages' means"

| Students had no concept (x4) | Navigation/ease of use (x3) | Some analysis (x5) | Aware of the need to analyse and judge (x3) |
|--------------------------------------|--|--|---|
| No idea x2 Not sure Don't know | Knowing how to navigate webpages A detailed summary of a webpage User friendly/easily accessed | Testing to see faults Reflect on and document opinion To extract reliable and relevant information Evaluate whether they are safe Following opinions and conclusions | Assessing pros and cons Analysing the website looking for good and bad points Making as judgement of a web page |

After the session: "What have you learned in today's session?"

| Students had no concept (x0) | Navigation/ease of use (x0) | Some analysis (x14) | Aware of the need to analyse and judge (x3) |
|------------------------------|-----------------------------|--|---|
| | | I have learnt sites are not trustworthy (x4) Don't judge a web page purely on a Google quick search Peer review (x2) Do not be too quick to judge a website by its Google description To be very careful about the reliability of websites/search engines It's worth checking the author/host before looking at the content to ensure accuracy Don't trust a website who's tagline is "The truth about..." Not all .org websites can be trusted Don't believe everything you see on the net. Do your own search on subjects Provide feedback, reliability, accuracy, authors etc. | It is deciding whether a webpage is reliable or not To check: site owner, reliability, accuracy, peer evaluation, double check work before using it Learnt to be open-minded as to the reliability of websites. In evaluation interpretation will go a long way |

It can be seen from the data presented in Figure 2 that prospective students arrive at the first session with a mixed understanding of what evaluating information entails. They generally tend to present views which show very low levels of information discernment. However, the post-intervention responses show a distinct change in their views regarding evaluating information. This is a very promising result, as most participants show a shift to a higher level of information discernment.

A closer look at the data shows that these students have yet to reach level 5, apart perhaps from one prospective student who stated that, "[I] learnt to be open minded as to the reliability of websites". They recognise that not all information is accurate, but have yet to attain the higher-level capability of considering both sides of the argument. This higher-level capability can be achieved, as shown in Figure 1. However, when we consider the notion of 'motivated reasoning' (Kahan, Peters, Wittlin, Slovic, Ouellette, Braman & Mandel, 2012) and its implications, see below, moving young peoples' thinking from level 4 to level 5 may be more of a challenge than we originally thought.

5. British Academy Extended Project Qualification (EPQ) study

This shift in information discernment from level 1 to level 3/4 was further demonstrated in a British Academy project with students in their first year of A-level study in the UK who were working on their Extended Project Qualification (EPQ) (Walton et al., 2016). The EPQ is the first time that students have the opportunity and challenge of finding information to support a project on a topic of their choice. It was described by the head of sixth form in the school as akin to a mini-dissertation.

In line with previous work we found that, with an appropriate IL intervention, students can be moved from lower- to higher-order information discernment. One student reported that they, 'hadn't thought about' whether webpages were of variable quality. We spent two 2-hour sessions with students in which they used the evaluating information tool devised by Shenton & Pickard (2014a) as a means for discussing how to evaluate information. They worked in groups and captured their thoughts on flip-chart paper.

The results were very promising: data from the flip-charts and student and staff interviews clearly demonstrated that students had reached a cognitive questioning state, while in follow-up interviews with sixth form teachers and the school librarian, they all noted that the students had, 'realised the need for quality information' possibly for the first time. There was a very definite view that the workshops had aided students in producing work of a higher quality for their EPQ. The school librarian noted that since the delivery of the workshop students no longer 'passively accept what they see'. The most consistent and revealing remark that all interviewees made was that students had adopted a 'questioning' approach (i.e., a cognitive questioning state) when engaging with information sources: for example, 'It got them to question what their source was, where it was from, how credible was the source'; students were 'questioning the credibility of the sources they used' – behaviour they had not shown before the workshop. Teachers mentioned that this questioning led students to make more informed decisions and, as a result, choose information sources of a higher quality than previously. The head of sixth form reported that this was the case for the majority of the cohort.

6. The power/knowledge duality, misinformation and related concepts in understanding the process of evaluating information

Despite the view that the results discussed above are encouraging, I remain dissatisfied with this approach. It is highly normative and suffused with assumptions about the very nature of what constitutes good quality information. It is, additionally, narrowly based on text rather than all forms of information and tends to encourage students to evaluate information in a very particular, context-driven way, determined exclusively by academics (or teachers) and librarians in a Western educational context.

Drawing on the works of Michel Foucault (1972) and other works on discourse analysis (particularly Limberg, Sundin & Talja, 2012), I wanted to explore to what extent this critical approach was, in fact, limited by its context and what factors were at play in shaping this limitation. What particularly struck me about Foucault's work on discourse analysis was the interplay of power and knowledge in shaping discourse. In a university setting (and indeed schools) there is a power relation between academics (or teachers), librarians and students. This power/knowledge discourse determines the parameters of critical thinking that students are exposed to. Although they are introduced to the ideas of what constitutes legitimate information and knowledge, but framed within the context of a strong discourse of a Western educational system, supported by a weaker discourse of information literacy promulgated by librarians operating within this narrowly constituted knowledge frame.

In addition to discourse analysis, several other issues need to be addressed in order to understand how to engender higher-order information discernment. These include misinformation and the related concept of worldview, the long-standing issue of confirmation bias, motivated reasoning and lastly, epistemic beliefs.

6.1 Discourse analysis

Discourse analysis provides a set of tools for analysing information literacy practices by revealing the constraints imposed by specific discursive contexts. In doing so it supplies a nuanced approach to information literacy research, and reveals the potential for re-constituting

IL (both at the learner and theoretical level) as an approach to critiquing academic discourse which enables students to become participants in its discursive practice rather than simply conforming to it.

In the example of online discourse (Walton & Cleland, 2017), the text-based discussion found within online peer assessment appears to be a useful way for evidencing IL capabilities. The online contributions made by students as commentators are contextually appropriate, embodying attributes of IL capability such as high levels of information discernment (as defined by Walton, 2013), and demonstrating discursive competence which has the potential to be used in summative assessment.

However, though in this study these students are engaged in becoming good scholars by using appropriate texts to create valid evidenced arguments through assessing other's work, what they are not engaged in is questioning received meanings (from academics) regarding the quality of information they are using as evidence. In other words, they are operating within a well-defined discourse which reproduce existing structures and their *cognitive questioning* is bounded and finite. Hence, the evidence indicates that IL appears to reproduce existing social power relations rather than empowering the individual because it fits seamlessly into existing Western academic discourse.

IL also reproduces the 'strong discourse' (Foucault, 1972) that peer-reviewed journals and their publishers are the primary source of legitimate knowledge. Other sources of potentially authentic knowledge are ignored because of the highly instrumental rather than critical engagement that IL facilitates. In other words, IL contributes towards the process of getting good grades which may eventually lead to a professional post – but not towards a critique of the production, communication and exchange of information. In essence, the outcome of IL is already decided for the student, and s/he merely follows the rules of the game and is subservient to more powerful discourses working through higher education institutions and its academics. Critical thinking is embodied in the narrowest possible range.

In summary, what is not explored by students, academics, teachers and librarians is the actual production of knowledge, where it comes from, what interests are involved in producing this knowledge, how authority is defined and the notion that all knowledge is provisional; it is under a continual process of change and development. It is not a fixed set of facts to be learnt for all time from a specific set of sources such as peer reviewed journal articles, monographs or textbooks.

6.2 Worldview and misinformation

Lewandowsky, Ecker, Seifert, Schwarz & Cook argue that a person's worldview is deep seated and has a very strong pull on people's ability to make judgements about information:

Given that people more readily accept statements that are consistent with their beliefs, it is not surprising that people's worldview, or personal ideology, plays a key role in the persistence of misinformation (2012, p.118)

Misinformation is defined by Lewandowsky et al. as 'any piece of information that is initially processed as valid but that is subsequently retracted or corrected' (2012, pp.124-125). Worldview and confirmation bias are strongly linked. He argues that our default position is one of trust: we receive all of our information from our parents when we were young, and this instils in us this default position. For Lewandowsky the default assumption when people receive information is to accept that the material at face value and assume that it is true. You, dear reader, have quite naturally just taken all that has been said in the previous paragraphs at face value; you haven't taken time to verify quotes references or any other statements – that would

take time and some cognitive effort. (In reassurance, however, it is safe to say that, most, if not all of what I have written so far is quite robust and accurate.)

This may explain why students so often present at school or university with very low levels of information discernment. Our project with sixth formers supported this argument. We found that students saw their parents as their most trusted source of information with teachers second, peers third and the media last. This confirms the view that our default trust position is based on our relationship with our parents – especially when we are younger. This finding surprised us, as we expected that trust in peers (and the media) would be much stronger at this age (16-17 years old).

Lewandowsky also maintains that, since recipients of information are inclined to believe the material presented to them, they must make a special effort to tag the information as false if it becomes obvious that it is inaccurate (this is why misinformation is so easily spread and very difficult to retract). This greater cognitive effort is a challenge, especially as information behaviour research has frequently confirmed that people act in line with the 'principle of least effort' (Case 2012) and will do just enough to find and comprehend the information they want or need.

Misinformation is easy to circulate and difficult to dispel – and it appears that standard IL approaches are not going to address this issue.

6.3 Confirmation bias

Research showing that people prefer to consume news and information they agree with is well established (Campbell, Converse, Miller & Stokes, 1960). This phenomenon is called confirmation bias, and appears to link worldview and motivated reasoning. We not only seek out newspapers that confirm our viewpoint but also like-minded individuals.

In 2017 I carried out a very unscientific experiment with my postgraduate students and asked them to find news about current events. By and large, they chose to search the BBC and the more left-leaning quality papers. When I questioned them on their choice it was quite clear that their choices matched their broad liberal views. When I asked why they hadn't looked at news channels that might contradict their views, they met my question with some amusement and said, 'even if we did look at those alternatives we wouldn't admit it'.

This demonstrates the almost self-evident occurrence of confirmation bias. Whitworth (2011) states of cognitive bias that, 'we may not even notice information that challenges our existing beliefs – at best we can be easily persuaded to ignore or misinterpret the information'. Although cognitive biases help us create social networks, they also prevent us from learning – and it is this cognitive state that contributes to the echo-chamber of the close social media community which leads to the fuelling of ever more extremist beliefs.

6.4 Motivated reasoning

In contrast to liberals, conservatives are least likely to accept climate change. Kahan et al. argue that polarisation over climate change is not due to a lack of capacity in understanding the issues: it is those who have the highest degrees of science literacy that are the most polarised (Kahan et al., 2012). Those who are able to handle scientific and numerical information are more successful at confirming their own biases and ignoring inconvenient evidence (Jones, 2017).

This result suggests that public divisions over climate change are not due to lack of understanding of the issues – quite the contrary: they are due, as Kahan et al. (2012) argue, to a conflict between personal interests where beliefs are matched with those held by others with

whom they have close ties, against a collective interest in line with making use of the best available science to promote common welfare. Personal interests or allegiance win out every time (Kahan et al., 2012).

Jones (2017) reports that both 'Brexiters' and 'Remainers' in the UK Referendum campaign could accurately interpret statistical data regarding scientific data on skin rashes but abandoned these skills when looking at statistics that undermined their rationale for their views on immigration. In other words, the facts did not cause them to change their beliefs. Social media simply amplify this deep-seated problem.

It is very clear that standard forms of IL, especially those practices in academia, are not going to help with this psychological issue. Jones (2017) recommends two solutions: presenting information graphically can help people to form a more accurate opinion about an issue; and bolstering self-esteem so that new ideas become less of a threat to a person's deeply held worldview.

6.5 Epistemic beliefs

Trevors, Muis, Pekrun, Sinatra & Muijselaar (2017) examined how reading conflicting information can have an emotional effect, and can lead people either towards resisting new ideas or a chance to learn. In a large study in a number of Canadian and American universities, students read a series of texts with conflicting evidence on climate change. Some of the texts presented an anthropogenic viewpoint, claiming that climate change is due to human activity, while others argued that is caused by astronomical effects.

Readers' different knowledge and beliefs engendered very different emotional reactions, and led to different ways of handling the text. Participants who believed that knowledge requires individuals to compare and contrast across a range of many sources demonstrated greater feelings of surprise and curiosity when reading the conflicting texts. This affective state appeared to motivate them to comprehend this new information and acknowledge multiple viewpoints. However, participants who endorsed the idea that information is fact-based, derives from authoritative sources and should be digested like food, noted feelings of confusion when dealing with a range of authorities. Interestingly, this confusion caused them to remember less of the information and ignore the controversial information. In believing that knowledge is certain, participants appeared to feel less surprise, not more, when dealing with these contradictions.

Clearly our aim is to encourage learners to acknowledge credibly sourced, evidence-based arguments, including those that dissent from the dominant narrative. This research demonstrates that our feelings could interrupt this process. It implies that educators should perhaps anticipate possible reactions to a specific argument, especially when it may conflict with deeply held views; or perhaps more usefully, educators could attempt to modify how individuals think about information and knowledge. This could be achieved by always providing good quality evidence and the counter arguments so that sources are weighed up against each other.

Kahan et al. (2012) discovered that people who seek out scientific information for personal pleasure exhibit *scientific curiosity*. He found that scientific curiosity is linked to greater acceptance of climate change, regardless of political orientation. This phenomenon of scientific curiosity leads to both liberals and conservatives matching their views closer to the evidence. They also found that scientifically curious individuals will seek out views that clash with their political tribe. Kahan et al. (2012) recommends a different answer to this issue: the promotion of scientific curiosity and the scientifically curious.

A possible solution is perhaps to employ all of these approaches. For our purposes the first step is to recognise that individuals will have different emotional reactions to information depending on their epistemic beliefs. An interesting, and long-standing, example of this comes from the work of Kuhn (1970). In his seminal work on beliefs in science he showed that physicists remained wedded to the principles of Newtonian physics long after Einstein's theory was emerging as a more accurate description of the world and evidence was mounting to demonstrate that this was the case. This ties in neatly with evidence for motivated reasoning as discussed above: Newtonian physicists' misplaced and erroneous loyalty to their own community outweighed the compelling evidence for change to a new physics.

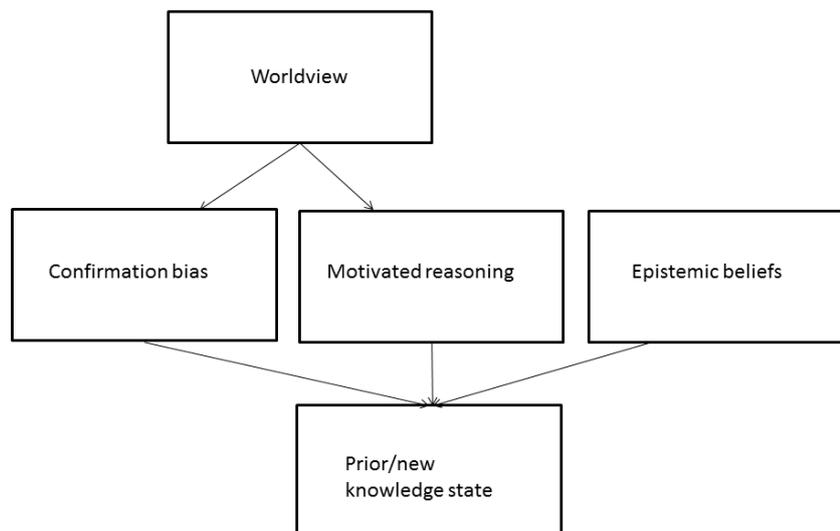
7. An emergent new theory of information discernment?

What has become apparent to me during this voyage of discovery is that the original definition of information discernment and the model of information behaviour which underpins it are now no longer satisfactory. What is needed is a more articulated explanation of the knowledge state within the psychological component of the information behaviour process.

What occurs to me is that the knowledge state should be separated into prior and new knowledge in this process. Four new factors not considered previously – those of worldview, confirmation bias, motivated reasoning and epistemic beliefs – appear to underpin the knowledge state. Worldview (as depicted in Figure 3) appears to shape both confirmation bias and motivated reasoning, but not necessarily epistemic beliefs. Epistemic beliefs, as shown above, are manifest in two forms: as scientific curiosity, open to questioning, and as the perception of knowledge as unchanging facts.

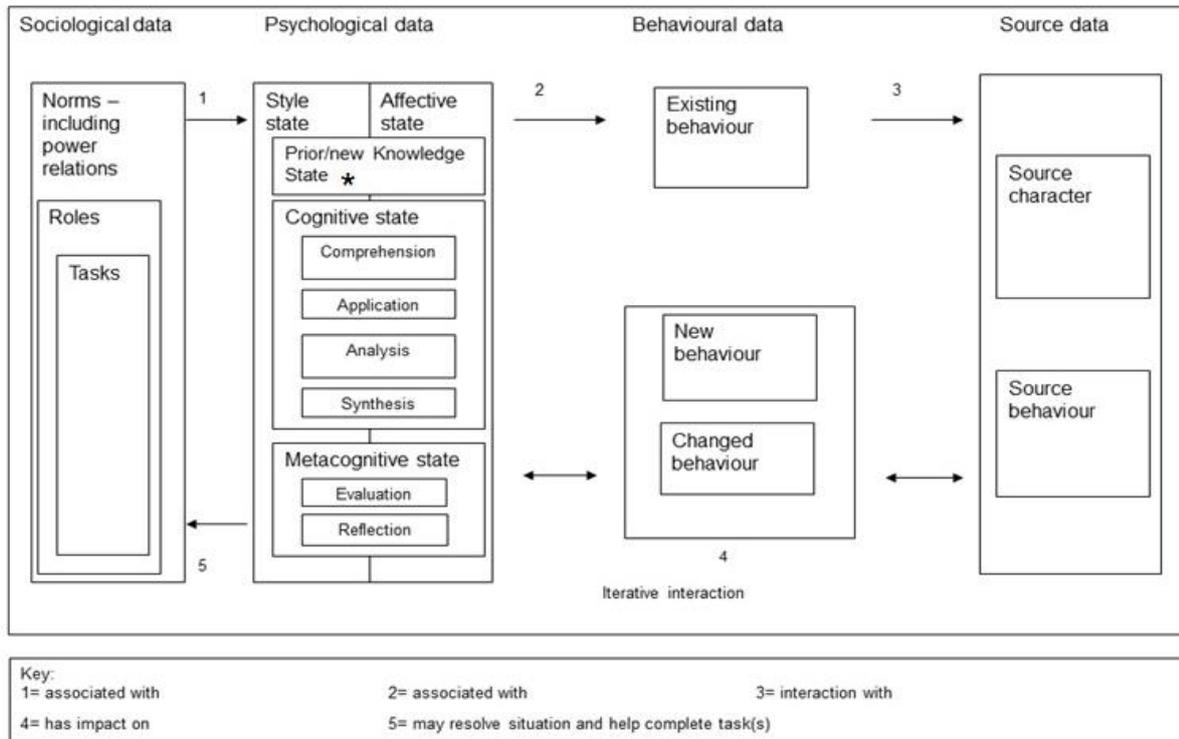
Are the learners who present as scientifically curious our new mentors and advocates? We need to be able to identify who these learners are and perhaps employ them to mentor the less scientifically curious. Using the work of Trevors et al. (2017) enables us to pinpoint these learners. It may be impossible to change the epistemic beliefs of the non-curious but it is something to which we should aspire. By fostering scientifically curious learners we can ensure that the effects of worldview are minimised and that individuals judge information on the evidence alone.

Figure 3: Revised model of the knowledge state



We also need to acknowledge, as discussed above, that power relations impinge on the information behaviour process at the sociological level. Figure 4 demonstrates how all of these components fit together to articulate the process of information discernment.

Figure 4: New model of information behaviour which underpins the information discernment process



* See Figure 3 above

Although the model is complex a new definition of information discernment itself can be put relatively simply and without specifying type of information or normative value:

The ways in which social, psychological, behavioural and information source factors influence peoples' judgements about information

This model might enable us to shape activities which could help to address the issues of fake news and post-truth. By elevating people's information discernment, it should be possible to foster a cognitive questioning state where people recognise that all information is provisional and contested. This, in turn, may enable them to challenge information they are given from powerful and vested interests, whether they be large companies, political parties, local or national government. By engendering a sense of curiosity in all things, people may increase their sense of engaged citizenship and rejuvenate a sense of engagement in the political process.

8. Concluding remarks

All that we are achieving so far as teachers of IL, in my view, is upholding the Western academic discourse and failing to challenge confirmation bias, which prevents individuals from making balanced judgements through cognitive questioning. If we can address the very real

problem of motivated reasoning by fostering the ability to act from a position of curiosity, where people can recognise that information is multi-faceted and that science generates multiple and often contradictory viewpoints, then and only then might we shift their epistemic beliefs to enable them to reach this cognitive questioning state – which sits outside the bounds of their deeply engrained worldviews.

In this way we can enable individuals to avoid, or at least minimise their tendency towards, confirmation bias and motivated reasoning so that they can reach the highest order of information discernment. The act of making judgements based on the evidence arrived at through cognitive questioning is the means by which individuals can successfully detect the ‘crap’ so succinctly put by Postman & Weingartner in 1969. By fulfilling all of these conditions we can begin to promote effective curiosity and questioning, not only critiquing scientific knowledge but also the received wisdom from divisive politicians and the misinformation from the tabloids and the unregulated media of the gutter.

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