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Writing as a Learning Activity: An Academic Study

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Abstract:

Research on writing as a learning activity has seen five major changes in recent years. In the last decade, meta-analyses have shown that writing's effects on learning are predictable and that a variety of variables mediate and modulate these effects. The second reason is that literature as a medium used to be assumed to be capable of generating thinking and education. A decade of study shows that writing to learn, according to the findings, is a self-regulated activity that depends on the writer's goals and approaches. A third movement, called Writing to Learn, emphasised the use of domain-general strategies to help students succeed in their studies (WTL). The WID movement, which emphasises the inclusion of genres that embody forms of reasoning particular to a certain subject, is reflected in a number of recent researches. To round things up, while WTL as a classroom activity was always at least somewhat social in nature, theoretical conceptions of it were largely solitary in focus. WTL has grown over the past two decades to embrace concepts and studies that involve social and psychological dynamics as well as individual distinctions. WTL research has traditionally focused on epistemic learning in schools, but it has lately widened its scope to include reflective learning in the workplace as well as other outputs and results from other domains, such as those from the workplace.

Keywords: Cognitive processes, research methods, writing, writing skills, writing to learn

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1 Introduction

The word "writing-to-learn" is not a phrase with a clear and unambiguous meaning despite its conciseness – or maybe because of it! Indeed, its two activities, each of which is conceptualised in a different way, are extremely far-reaching and difficult. Research into writing as a language production process and psychological activity, as well as an activity with a wide range of social and cultural functions and genres, has taken place during the past few decades. A wide range of psychological perspectives have examined learning on the other hand. A commonality between writing and learning is that they are both employed in academic and nonacademic settings: Outside of the classroom, students are writing and learning. In reality, the sentence "writing-to-learn" becomes even more difficult to interpret as a result of this dual "location" of writing. Even more so, this complexity increases enormously when the idea of "instrumentality" is expressly expressed, such as "writing as a tool for learning" (see Figure 1). These forms of writing can be used as "tools" for a variety of learning tasks.

Research into writing to learn shows that the two are intertwined, although the link is not symmetrical, as follows: In recent years, the value of writing has only expanded. To be sure, in recent decades, psychological research has heavily influenced how we view writing as a learning tool: as a mechanism and as a kind of active engagement in the learning process. Both cognitive and sociocultural approaches to writing may be found in these two important ideas, which are often at odds with one another (Boscolo, 2014). When it comes to influencing how people learn, writers have a remarkable capacity to do so, ranging from simple forms of learning (writing aids memory, for example) to their engagement with conceptual challenges in a wide range of academic disciplines. Throughout the course of this research, a major change has occurred from an individual process that is "useful" for any discipline to a fabric of processes that are tightly linked to certain disciplinary settings, as will be shown in the following pages. As far as writing is concerned, there isn't just one way to do it. Instead, it's a set of behaviours that, when encountered in a variety of contexts, might enhance one's ability to understand and reason.

In a way, writing has "integrated" learning into the writing process; hence, it has played a more prominent role. As a "means" or "tool" for learning, writing study in academic contexts

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tends to overlap with non-academic research on writing. All except the most specialised forms of writing have a connection to education. As a creative endeavour as well as a cognitively taxing activity, writing needs both mental work and reflection as part of the learning process. As far as I can tell, writing is a lot like thinking. It involves brainstorming, organising, checking, editing, and so on (Bereiter & Scardamalia, 1987). Students who want to pursue a career in academic writing need to master the skills of expressing themselves clearly, selecting appropriate vocabulary, and organising their work. Particularly if the audience is totally virtual, they can develop the ability to be aware of (Olson, 2001, 2014). In order to communicate successfully, a writer must understand how to determine which lexical choices, coherence tactics, rhetorical manoeuvres, and assumptions about a potential reader's comprehension to utilise. The distinction between information telling and knowledge changing (Bereiter & Scardamalia, 1987) has had a considerable influence on the discussion on writing training, in addition to the contrast between beginning and mature writing styles (Bereiter & Scardamalia, 1987). Static vs dynamic approaches to using and reusing knowledge are more true contrasts. In the dynamic method, the writer transforms what he or she has learned through the usage of material with purpose, or by adopting a specific writing style.

2. The following summarises the study's goals and objectives:

What are the most recent advancements in the study of writing as a learning activity during the last few decades? Although "writing as a learning activity" is considered a prototype in the field of inquiry, we believe it to be an idea that has no fixed boundaries. Example of prototype research would be one in which the comparison between writing and non-text activities, such as non-compositional transcribing, is explicitly marked as "writing to learn" (e.g., Gingerich, Bugg & Doe et al.; 2014; Klein, Piacente-Cimini & Williams, 2007; Rivard, 2004; Spirgel & Delaney, online). On the other hand, this article only scratches the surface of the WTL research. In the literature on reading comprehension from a variety of sources, for example, the activity used to aid understanding is often writing, thus it cannot be ignored (Britt & Rouet, 2012; Wiley & Voss, 1999). Cooperative learning, computer-supported collaborative learning, and learning from primary sources in history all have study literatures that explore the impact of writing on learning (for example Dillenbourg, Järvelä, and Fischer,

2009; Johnson & Johnson, 1985; Van Drie & Van Boxtel, 2008). "writing to learn" has therefore been defined in this work as a wide idea.

A dialectical contrast of theory and research findings largely guided our selection of material for this study. For theory, we relied on well-known works including Bereiter and Scardamalia (1987), Britton (1982a), and Galbraith (1986). (1979). (1999). Prior literature reviews and meta-analyses in terms of empirical evidence have given us a method of indirectly addressing a vast quantity of previous research (e.g., Applebee, 1984; Graham & Hebert, 2011). For this reason, we have focused on empirical studies published in peer-reviewed journals and book chapters within the previous five years (2011-2015) in order to give a fair sample of current advancements (e.g., Martnez, Mateos, Martn, and Rijlaarsdam, 2015; Spirgel and Delaney, 2014). Among other things, we've paid particular attention to critical and dissident views (e.g., Siebert & Draper, 2008). Many different terms have been used to index recent studies on writing to learn, including the general terms "writing" and 'learning strategies,' as well as more specific terms like "argumentation," "journal writing," and "analogical encoding," as used by Demirbag & Gunel (2014) and Petko, Egger, and Graber (2014) respectively (Mason & Tornatora, 2014).

In the last few years, WTL research has centred on five different categories of problems. This review is divided into sections based on a single, overarching question: In order to better understand WTL, what sorts of research methods have been used? (2) What psychological theories and evidence have impacted the course of this study? (3) Learning via writing is facilitated by a variety of forms of writing. What is the role of social theories in the understanding of writing as a learning activity? Are you seeking for typical WTL study conditions and results? Each of these inclinations has several elements that we attempt to explore, as follows: How each new trend demonstrates both continuity and change; how each new trend indicates larger advancements in the research of writing; and how much each new trend has resulted in empirically validated assertions

Do not misunderstand that the purpose of this study is not to do a meta-analysis of empirical research findings. This would be redundant in light of the plethora of excellent meta-analyses that have just been published (Bangert Drowns et al., 2004; Graham & Hebert, 2011; Hebert, Gillespie & Graham, 2013). Rather, we sought to identify current research trends, that is,

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theoretical and empirical approaches that are newer than those that have been studied before. It has become increasingly common for researchers to focus on topics that are not only based on the scientific method. In addition to fresh empirical findings, there have been considerably less research undertaken to be able to draw conclusions about the reliability of effects or the average magnitude of affects.

In a wide range of methods, techniques and outcomes are evolving in a number of ways. Changes in WTL literature methodological methods will be the primary focus of this section. Questions to be answered include these: What alterations have been made to the research methods? Are we any the more convinced that writing is a valuable tool for students?

3. Disputes in the Beginning

Speculative yet firmly held views characterised early studies on the impact of writing on learning. According to historians and cross-cultural comparative studies, humanities authors have long made assumptions about the influence of writing and written content on the individual mind as well as civilizations (Donald, 1991; Goody & Watt, 1963; Ong, 1982). In a fascinating chapter by Murray, a huge number of experienced writers have testified to the benefits of writing for thinking and comprehending (1980).

There are a large number of writing instructors that believe this to be true, basing their assertions on theory or anecdotes or extrapolation from writing-related studies undertaken other than the WTL (Britton, 1982a; Emig, 1977). In the early days of WTL, chapters written by writing educators or subject-area educators who adopted these views and quoted Britton or Emig frequently appeared. This group of educators drew on a variety of theoretical frameworks in addition to drawing on their own practical classroom experiences (e.g., edited volumes by Gere, 1985; Thaiss 1986; Young & Fulwiler, 1986). Ethnographic studies of WTL in schools were also included of other study (e.g., Rosaen, 1989, 1990).

In the 1970s and 1980s, a slew of research used experimental methods to examine the relationship between writing and learning. For the most part, these studies examined the efficacy of two different sorts of writing exercises, such as an essay vs a response to a short-answer question or another activity requiring students to write a longer text. According to Applebee (1984), who reviewed this early study and found that there was insufficient

evidence that writing is connected with learning because of the small number of prior studies and inconsistent findings,

Another review of the empirical literature was done by Ackerman (1993), this time focused on both quantitative and qualitative data. Although writing advocates commonly claimed that writing was a unique way of learning, the effects of writing had seldom been compared to those of other media. He recognised this. Contrary to Britton (1982a) and others' predictions, journal writing did not always result in significantly more learning than other activities during most study; essay writing resulted in significantly greater learning than other activities during just half of the trials studied. Writing as a learning tool is "at best an argument that has yet to be made" according to Ackerman, who also agreed with Applebee (p. 335). The empirical literature may be better understood if we abandoned the idea that writing is necessarily linked to the acquisition of information, as well, according to his findings. There were a number of studies published around the same time that showed how students' interpretations of activities, such as thinking-aloud studies, text analyses, and case studies, shaped their writing in ways that researchers and teachers hadn't intended (Durst, 1987; Greene, 1993; Newell & Winograd, 1995; Penrose, 1992).

After this development, most of the WTL literature changed from a declarative tone to one that was more ambiguous and analytical by the century. Writing as a Learning Tool by Tynjälä, Mason, and Lonka (2001) is an excellent illustration of this trend in educational publication. Many chapters in this book used statistical approaches or systematic qualitative methods to experimentally test hypotheses or study issues concerning the influence of certain features of writing on learning (Boscolo & Mason, 2001). The rest of the decade saw a lot of WTL research focused on hypotheses about specific practises, and it continues today (e.g., Cantrell, Fusaro & Dougherty, 2000; Hand, Wallace & Yang, 2004; Klein, 2000, 2004; Rivard, 2004).

4. Recent Advances in the Writing to Learn Methodology

Throughout the last decade, experimental research has been taking place in a wide variety of environments. Some studies have found that writing has little or a limited impact on learning (Drabick, Weisberg, Paul, and Bubier, 2007; Gingerich et al., 2014; Yildiz, 2012), however the majority of studies have found that writing has a significant impact on learning (e.g.,

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Linton et al., 2014; Spirgel & Delaney, online 2014; Yassin & Yong, 2013). Writers have researched the influence of writing on learning using various time scales, from the single writing activity to the full academic year (Correnti, Matsumura, Hamilton & Wang, 2012; Schumacher & Nash, 1991; Tomas & Richie, 2014).

As study methodologies have become more sophisticated, there is now more consensus on the benefits of writing for learning. It is notable that, although being a well-established technique, meta-analysis has only lately allowed for the systematic integration of numerous separate findings. Bangert-Drowns et al. (2004) did a review of previous trials and found that the majority of them compared writing-intensive study units to non-writing-intensive study units. According to the findings, writing had a small but noticeable impact on student achievement. As a result, the amount of these effects ranged from none to large, depending on the instructional context.

According to a recent meta-analysis by Graham and Hebert (2011) on the benefits of writing on reading, both average and poorer readers and writers benefit from writing when it comes to improving their reading comprehension. Prolonged writing (such as argumentative writing), summarising written work, collecting notes, and answering or creating inquiries are all examples of this style of writing. Reading comprehension in this cohort was improved by d =.37, which is in line with the efficacy of earlier treatments. More significant changes occurred in middle school compared to high school. Writing instruction (process writing, text structure, or paragraph/sentence construction) increased students' reading comprehension, although only half of the research met two-thirds of a quality criterion set. Writing more helped students' reading comprehension, although the quality of their work was uneven. Contrary to certain frequently held beliefs, further study found no evidence of variations in the effects of various types writing activities; see below for more information on this (Hebert, Gillespie & Graham, 2013). Each of these meta-analyses gave additional information, such as interaction effects, sampling and constraints.

Additional moderator factors discovered through meta-analysis have provided a more nuanced view of how writing affects learning and how it influences other variables. The magnitude of the effect on a dependent variable can be influenced by these variables (or vice versa). Students' educational level (Graham & Hebert, 2011); the frequency and duration of

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writing activities (Bangert-Drowns, et al., 2004); the type of discipline in which students write (Bangert-Drowns, et al., 2004); and methodological features such as the type of dependent measure (Bangert-Drowns, et al., 2004) have all been examined as moderator variables (Hebert et al., 2013).

Finding moderator factors can be aided by using analyses of variance and multivariate analysis of variance. Studies have shown that learning is affected by various types of interactions, such as the interaction between media (writing versus talk) and achievement level; the interaction between individual traits, such as level of self-monitoring, and the type of writing task; and the interaction between the writer's knowledge or achievement level, and the type of acti (Kieft, Rijlaarsdam, and van den Bergh, 2008).

Concerns have been raised concerning the procedure since moderator factors have been taken into consideration. There are studies in the WTL literature that utilise dependent measures similar to those used in writing therapy. Because writing interventions have a greater influence on treatment intrinsic measures than other measures (see Hebert et al., 2013 for additional information), they are a matter for concern (Hebert et al., 2013; Linton, Pangle, Wyatt, Powell & Sherwood, 2014).

This is the third big methodological development that has occurred in recent years. Mediating variables (in this case, writing) influence the dependent variable when they are influenced by an independent variable (in this case, writing) (here, learning). Mediating factors are depicted in WTL theories of "active substances" Textual analysis and verbal think-alouds are among the strategies used to acquire information on mediating factors. A number of researchers studied comparable factors in the 1980s and 1990s (Durst, 1987; McCrindle & Christensen, 1995; Newell & Winograd, 1995). These characteristics, however, were not tested statistically to see if they had a role in the association. As a result, route analysis has been used in recent years in order to achieve this aim (e.g. Glogger, Schwonke, Holzäpfel, Nückles & Renkl, 2012). This has been accomplished through methods such as route analysis (e.g. Petko, Egger, Graber, and Wäschle, 2014; Wäschle & Nückles 2015). These findings bolstered the hypothesis that WTL is mediated by elements such as cognitive processes. It will be discussed in further detail in the section on psychological processes in WTL later on in this chapter.

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Psychological processes are undergoing three major shifts: from writing as an agent to self-regulation and more. As opposed to the what, this part will focus on how WTL affects psychological processes. We'll begin by looking at three current study trends: What is WTL's psychological make-up like? Does learning new things benefit from the use of elaborative cognitive processes? Is there a function for spontaneous cognitive processes in the learning process?

5. Written text as a causal agent in social science research of the 1970s and 1980s is examined in this section

Students' learning was attributed to a variety of cognitive processes that were supposed to be facilitated by text in early writing across the curriculum. A substantial impression was made on both the United Kingdom and the United States by the work of James Britton (1972/1982a, 1982b). According to him, most of the writer's knowledge is initially implicit before it is explicitly stated in the text. There are times when a writer doesn't know how a sentence will end up. Because writing permits information to be shaped "at the point of utterance," the syntax and semantics of language may be used to great advantage. According to Britton, the Vygotskian idea of "inner speech," which is similar to expressive writing in that it is a discourse addressed at oneself, has a theoretical relationship to expressive writing.

In line with this strategy, Britton campaigned for a rise in the use of expressive writing in the schools. An extensive research done in British schools provided the basis for this guidance (Britton, Burgess, Martin, McLeod, & Rosen, 1975). However, the goal of this experiment was to show that transactional writing is more widespread in schools than expressive writing. We did not investigate whether or not spontaneous cognitive processes are induced by expressive writing, nor did we investigate whether or not they benefit learning in general. In the 1980s, Britton's advise on writing expressively was extensively used in curricular literature, despite lack of evidence to back his statements (e.g., see volumes by Fulwiler & Young, 1982; Gere, 1985; Thaiss, 1986;). Freewriting, inkshedding, and the writing of informal essays were all part of this tendency toward expressive drafting, as were other related practises (Elbow, 1973, 1981; Murray, 1980; Thompson, 1990). For the sake of this discussion, let's focus on how this idea predicted that the act of writing would automatically lead to increased knowledge, with the writer needing just to write.

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Emig's notion was yet another early one that linked writing to learning (1977). When she published "Writing as a Mode of Learning" a fundamental study that was extensively recognised, she defined the aspects of writing that, in her opinion, "uniquely" linked to learning processes. Writing, for example, "create generative conceptual groupings that are both synthetic and analytic," to generate "establishes clear and systematic conceptual groupings through the use of lexical, syntactic, and rhetorical devices" (p. 128). A more metaphorical interpretation may be to claim agency was given to the text rather than the author in this approach.

6. In the 1980s and 1990s, the writer acted as a strategic agent.

The early 1980s saw the emergence of the notion of writing as a methodical, problem-solving strategy popularised by the work of Hayes and Flower (1980). (Flower & Hayes, 1981a, 1981b; Hayes and Flower, 1980; for a review, see Alamargot & Chanquoy, 2001). Cognitive theories claim that the writer has a high degree of control over the writing process, and this control is based on the writer's intentions as well as their knowledge, techniques and judgements. Writing therefore has a direct impact on learning (Hayes, 2012; Kellogg, 2008; McCutchen et al., 2008). Written text as a medium does not have any intrinsic learning properties according to the cognitive perspective; rather, the precise methods employed by writers to perform tasks are vitally crucial to the learning process.. Since learning while writing demands complicated objectives, complex techniques, and knowledge about writing, all of which are often linked with more experienced and talented writers according to cognition, one topic in cognitive tradition has been (see Klein, 1999 for a review). Influential cognitive theories such as those proposed by Bereiter and Scardamalia (1987) argue that the fundamental difference between authors who create new knowledge via their writing and those who merely recount what they already know about a subject matter. When learning to write for the first time, most people engage in knowledge-telling tasks that need them to draw on a variety of sources, including current events and genre-specific material, in order to retrieve the next idea from long-term memory, which is then transformed into text. Writing experts participate in a process of knowledge transformation based on the dialectical interaction between the text's rhetorical message and its knowledge content, which leads in the text's knowledge content being restructured and re-elaborated.

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These new cognitive theories were established in opposition to Britton's idea that spontaneity in writing is a crucial prerequisite for learning. To put it another way, Applebee's (1984) evaluation of WTL was in line with the new cognitive theories. Using the Craik and Lockhart (1972; Craik & Tulving, 1975) depth of processing theory, Applebee argued that writing helps to learning to the degree that the writer elaborates links between concepts. Using these findings as evidence, Applebee came to the conclusion that various types of writing activities have different effects on learning; for example, summarising may cause the writer to recall a wide range of content, while analytical essay writing may cause the writer to gain a deeper understanding of the specific relationships that are the focus of the text. They show the connections between scholars' theories about the psychological processes they believe are responsible for learning and the genres they recommend reading.

7. Learning Environment Mediating Processes

"does writing induce learning?" is a better question, in Klein's (1999) view, rather than "by what cognitive processes does writing effect learning?" Applebee (1984) and Ackerman (1996) received mixed reviews (1993). To put it another way, what mental processes let us tell the difference between writing that helps us learn and writing that doesn't? According to his research, he found four distinct WTL ideas in the prior literature: These assumptions were based on processes that lay somewhere in between the two extremes of spontaneousness and greater planning and complexity. According to the theory of shaping at the time of speech, the spontaneous end of the spectrum, the hypothesis was situated (Britton, 1982b; cf., Elbow, 1981; Galbraith, 2009). Following this was the concept that writing is a way for people to externalise their thoughts so that they may analyse, evaluate, and alter them. Backward searching was the second-complicated hypothesis (Young & Sullivan, 1984). The third sort of theory, genre theory, posits that distinct text genres facilitate the formation of specific kinds of connections between concepts. – (Applebee, 1984). According to the idea of backward search, the transformation of information happens during the search process if objectives and subgoals are established (Bereiter & Scardamalia, 1987). It was Klein's opinion that each concept was supported by some research, but that none of them could be proven conclusively at the time.

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Recently, there has been a rise in the study of how writing and learning go hand-in-hand, particularly since the turn of the century. One of the most common assumptions in WTL research is that writing in different genres elicits different types of reasoning, which in turn leads to different levels of learning (Applebee, 1984; Wiley & Voss, 1996, 1999). In this study, two seemingly contradicting but logically consistent findings emerged.

However, assignments in a variety of genres don't always produce learning results that are appropriate for the subject matter. According to Britton, expressive writing does not have a larger effect on learning than other forms of writing (for reviews and meta-analyses, see Ackerman, 1993; Graham & Hebert, 2011; Stotsky, 1995). In recent years, the genre of argumentation has become increasingly popular as a means of promoting critical thinking and learning. When it comes to thinking or learning, research has shown that argumentation contributes more than other forms of writing do (e.g., Langer and Applebee, 1987, Chapter 6, 8; Wiley and Voss, 1999). This disparity in genre effects, on the other hand, has not been replicated by other studies (Langer & Applebee, 1987, Chapter 7). According to a recent meta-analysis, the majority of measures did not show any differences in reading comprehension between the following pairs of writing activities: extended writing (often argumentation) and answering questions; summary and answering questions; summary and taking notes; and extended writing (often argumentation) and taking notes (Hebert, Gillespie & Graham, 2013). However, only on measures that require prolonged writing did extended writing beat question answering; whereas summary outperformed question answering on those measures that require free recall.

On the other hand, path analysis and related approaches have demonstrated the relevance of genre-appropriate thinking in the learning process. Klein and Kirkpatrick (2010) found that students' genre expertise had an impact on the quality of their texts, which in turn predicted the quality of their learning results (cf., Klein & Samuels, 2010). Following the findings of Klein, Piacente-Cimini, and Williams (2012), it was discovered that students' learning was improved when they utilised more comparable writing movements (such as comparing and contrasting parts of the source and the target) (2007). Greater utilisation of cognitive processes in text has been linked to improved learning outcomes in learning protocols according to Glogger, Holzäpfel, Schwonke, Nückles and Renkl (2009) (similar to learning

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journals). Many other researchers (Glogger et al. 2012; Klein 2000, 2004; Wäschle, Gebhardt et al. 2015) have found that students learn more when texts involve cognitive operations more frequently.

It's not clear what may be done to reconcile these disparate findings on the influence of genre on learning. There are other explanations for the differences in the effects of genre writing, such as that they occur primarily inside the genre. Wiley and Voss (1999) and Gil et al. (2010) discovered that there is little diversity between genres in their effects on learning, as indicated by their findings. However, disparities between students who use genre-appropriate reasoning operations and those who don't seem to be as persistent within a specific genre as the differences between students who don't use genre-appropriate reasoning operations. An educational genre's influence on student learning will often be determined by the student's ability to grasp and apply concepts taught within that genre.

8. Writing to Learn: Self-Regulation in the Writing Process

Research on the function of self-regulation in writing processes during learning has made tremendous progress over the last decade. An individual is said to be engaged in "Self-regulation" when he or she is able to see and control his or her own psychological processes. We've seen that early theories of textual mediation gave the text medium the most of the agency, whereas cognitive theories of WTL give the writer the bulk of that agency. The empirical evidence substantially supports the latter viewpoint. This meta-analysis included metacognitive writing prompts, which ask students to reflect on their own learning, as a major mediating variable, as previously indicated by Bangert-Drown et al. (2004). The "metacognitive writing activities" (goal setting, organising, assessing, and changing) observed in another study by Klein, Boman, and Prince (2007) contributed a separate variance to learning, independent of more fundamental operations such as generating ideas and transcribing text. It was shown that metacognitive methods such as verifying understanding contributed much more to learning than cognitive activities such as extending information (see also Glogger et al., 2012; Nückles et al., 2009; Petko et al., 2014).

In order to increase the utility of writing as a learning tool, researchers have discovered that students may be taught metacognitive abilities. Teachers and students alike should take note. Research on the cognitive strategy teaching approach known as Self-Regulated Strategy

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Development has been the most in-depth (SRSD; Graham, McKeown, Kiuhara & Harris, 2012; Harris & Graham, 1996). Since its inception, SRSD's primary research focus has been on improving writing abilities. Both the teaching of writing skills and self-regulation methods, in which students set objectives and monitor their writing process, contribute to the quality of written work produced by students, according to evidence (Graham et al., 2012). Research has been moving away from utilising strategy education to learn to write and toward using writing strategy teaching to learn to write for over a decade (see MacArthur, 2014 for a review). When it comes to teaching writing strategies, Martnez, Mateos and Martn and Rijlaarsdam (2015) employed a range of methods, including SRSD (e.g. Martnez, Mateos, Martn, and Rijlaarsdam, 2015).

Literature, science, and the arts have all been studied in terms of the impact that writing strategy instruction has on learning, as has the impact of writing strategy instruction on the development of writing skills (Boscolo & Carotti; Kieft, Rijlaardam & van den Bergh; Lewis & Ferretti 2009, 2011; Wong, Kuperis, Jamieson, Keller, and Cull-Hewitt, 2002). (De La Paz & Felton, 2010; Martinez et al., 2015). With the use of strategy training, teachers have seen improvements in their students' writing and learning in tasks like discourse synthesis (Britt & Rouet 2012; Gelati, Galvan, and Boscolo 2014; Martnez et al. 2015; Martnez et al. 2016). Hübner, Nückles and Renkl (2010) found that teaching cognitive operations and teaching metacognitive (self-regulation) operations both contributed significantly to learning while writing (Berthold, Nückles and Renkl, 2007; Hübner, Nückles and Renkl, 2010). The same can be said for learning protocols (which are related to learning journals).

We'll return to strategy teaching in the following section, when we analyse the change from discipline-specific approaches to WTL. Meanwhile, research utilising strategy training has found it to have a significant and frequently considerable influence on the learning process when it comes to the writing process. According to recent studies, students who struggle academically or have learning disabilities benefit from self-regulation training (e.g., Ferretti, MacArthur, & Okolo, 2001; Taylor, Therrien, Kaldenberg, Watt, Chanlen, & Hand, 2012; Wong et al., 2002). At the same time, a study of secondary teachers in the United States indicated that most instructors do not employ strategy teaching to enhance writing for

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learning, indicating that this is an area of professional development that should be prioritised for teachers.

The study of psychological processes has also seen some recent advancements. There has been a substantial amount of study into the role of spontaneous processes in learning, as well as the necessity of self-regulatory behaviours. WTL theory pioneered by Galbraith (1992, 1999, 2009) links learning to spontaneous writing processes rather than structured teaching (Galbraith, 1992). (Elbow, 1973, 1981). Using the existing parallel distributed processing architecture, he has devised an efficient and effective model for knowledge building. Writing activities focused on rhetorical preparation are more beneficial for students who are high self-monitors, according to Galbraith's indirect study, whereas drafting activities, which encourage spontaneous writing, are more effective for students who are low self-monitors (Galbraith, 1998). For further information, see Ong (2013).

Finally, applying Cognitive Load Theory to WTL is a relatively new method. As of this writing, it's still in its infancy. Writing and learning via writing require a healthy supply of working memory (e.g., Galbraith, Ford, Walker & Ford, 2005). When it comes to designing instruction to reduce extraneous working memory load, cognitive load theory focuses on principles for reducing inefficient instructional methods and maintaining at an optimal level intrinsic working memory load, which directly concerns the relationships that are critical to schema formation (Sweller, Ayres, & Kalyuga, 2011). It was originally developed to help students understand math and other subjects characterised by algorithmic problem solving. According to a recent study, the notion of cognitive load has recently been expanded to domains that are less computational, such as written writing (Schworm & Renkl, 2007; Si & Kim, 2011; Zhu & Zhang, 2005). For this study, it will be interesting to discover if any of the impacts of writing on cognitive load are equally applicable to the influence of writing on learning. According to Klein and Ehrhardt (2013), April, Klein, Haug and Arcon (2015, August), and Nückles, Hübner, Dümer and Renkl (2010), low cognitive load conditions benefit writers with a low level of knowledge while those with a high level of knowledge are either less advantaged or even disadvantaged by low cognitive load conditions. Another discovery was the reversal of expertise.

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The genre of writing is always evolving, and students should be aware of current developments in the field. Writing for the Learning (WTL) focuses on a second major trend: what kinds of writing activities or genres of writing activities might contribute to learning? What is the connection between disciplines and genres in World of Tomorrow Literature?

9. Early Writing to Learn: Domain-Neutral Writing as a Step One

Britton, as previously mentioned, was a major writer who advocated for the use of journaling to express one's emotions through writing. Similar to this approach was one that had pupils begin with freewriting before moving on to draught and revise their work into a formal text (e.g., Britton, 1982b; Elbow, 1981). The argumentative (or "analytical") essay or subject was deemed to be the most appropriate at the time since it elicited the most in-depth consideration (Langer, & Applebee, 1987; Stotsky, 1995). These views all held that writing in a certain genre would lead to a greater understanding of a wide range of things. A "domain-general" or "discipline-neutral" point of view will be used in this study.

It's important to remember that genres like "journal" and "essay" have their roots in the humanities, and many of the early proponents of "writing across the curriculum" were humanities-trained instructors or professors. Writing to Learn (1988's) original title, "How to Write and Think Clearly About Any Subject at All," wonderfully captured the concept of Zinsser's famous book. "excellent writing" in this book is defined as a higher quality for humanities and popular nonfiction in science and social sciences. According to Zinsser in analysing the chapter "Crochets and Convictions," good written communication relies heavily on brevity, avoiding jargon, and proper organisation. "Reduce your discipline—whatever it may be—to a logical series of clearly considered statements," he writes in the book. As a result of this, you'll be able to explain it to others and to yourself. " Your topic matter knowledge will be tested to see whether you've been exaggerating (p. 198).

10. A Context for Change in Discipline-Based Writing

In the meantime, the "WID" (writing in the disciplines) movement was placing pressure on discipline-neutral writing approaches. A notable early publication on the issue was Bazerman's (1981) research, "What Written Knowledge Does: Three Examples of Academic Discourse," One from each of the domains of sociology, biology, and literary criticism were examined in the study. There were differences in subject matter and audience expectations

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across the three books, according to Bazerman's analysis. He also pointed out differences in style and authorship. The fact that he uncovered major discrepancies in the conceptions of evidence and arguments held by each academic profession is perhaps the most crucial finding for people who write to learn. In Hartman's (1978) review of Wordsworth's poem "Blessing the Torrent," for example, the reviewer used his own writing to create an aesthetic state of mind in the reader that would allow them to appreciate Wordsworth's poetry, "Blessing the Torrent." For example, Bazerman said that each text "[i]n mediating between reality, literature, the audience, and one's own self, each text appears to be making a new kind of play in each game." by mediating between reality, literature, the audience, and one's own self. (1981,(Also see Myers, 1985, p. 46.)) In contrast to social theories of writing, such as sociocultural theory, which proposed that each genre has historically evolved under the influence of specific institutional structures and disciplinary cultures, this belief was consistent with the belief that the nature of writing is specific to each discipline... (Bazerman, 1988; Olson, 1994; Russell, 1997). There is a comprehensive summary of writing and rhetoric in different academic fields provided by Bazerman and colleagues (Bazerman and colleagues, 2006). (2005).

11. Understanding and Using Writing Concepts Specific to Each Academic Field

For educational purposes, WID research has advocated for shifting from a domain-general view of writing that is applied across the curriculum to a more domain-specific view of writing as an educational activity (Bazerman et al., 2005; Russell, 1997). During the 1990s, many collegiate writing educators and academics began to clearly regard writing as a practise that is interwoven with disciplinary communication, inquiry, and argumentation. In addition, they viewed disciplinary instructors as collaborators in the development of pedagogy and research as well (e.g., Monroe, 2002; Walvoord, Hunt, Dowling, McMahon, Slacker & Udel, 1997). When Carter (2007) collected data on educational outcomes at a prominent public institution, for example, he published his findings in 2007. According to his research, the intended outcomes of writing may be divided into four "meta-genres," with a number of disciplines utilising more than one of these categories.

It was about a decade ago when WTL research in elementary and secondary schools began shifting toward more discipline-specific genres and practises. Several studies have looked

into the Science Writing Heuristic (SWH; Akkus, Gunel & Hand, 2007; Benus, Yarker, Hand, & Norton-Meier, 2013; Keys, Hand, Prain & Collins, 1999; Hand, Wallance & Yang, 2004). According to this theory, professional science is a group of researchers who share their findings primarily through the written word. Students in elementary and secondary courses alike are encouraged to form similar communities via the use of the SWH. Students participate in a variety of activities as part of an inquiry process, including small group discussion, hands-on inquiry, large group discussion, and reading. In this method, writing activities for individuals and groups are intertwined and help to link the many phases. Students follow a framework that resembles a scientific study report when they are writing, and this template emphasises argumentation concepts significantly. Small and large-scale group activities are used for peer collaboration and assessment as well as a specific emphasis on providing explanations and testing them using evidence. The approach is similar to that of traditional discipline research.

When it comes to writing as a learning tool, both Olson (2001) and Nelson (2001) explore it. Given the importance of disciplines and professions in shaping one's own literacy and learning, it is clear that this phenomena is domain-specific. In the early 2000s, the application of domain-specific approaches in elementary and secondary WTL was still unusual. In studies, the use of discipline-neutral practises such as note-taking and essay writing (Cantrell, Fusaro, and Dougherty, 2000; Klein, 2000), portfolio building and maintenance (Linnakylä, 2001), and the use of technology in writing (Hartley & Tynjälä, 2001) remained significant.

It has been a decade since the trend toward WTL specialisation began. Writing in elementary and secondary schools as well as research in psychology are now being affected by this trend. Prior to this, we examined how strategy training has played a big role in the previous decade, pointing out that the majority of this was discipline-specific. According to a recent study by MacArthur (2014), research has been undertaken in the fields of science, history, and literature on cognitive strategy training in writing at the elementary and secondary school levels. Since the early 2000s, research on WTL in history has grown more discipline-specific in its approach (De La Paz, 2005; De La Paz and Felton, 2010; Ferretti, MacArthur & Okolo, 2001; Wiley, Steffens, Britt, and Griffin, 2014; van Drie, van Boxtel & Braaksma, 2014). Researchers drew on studies in which experts in the field of history debated contentious

topics to develop this method (Seixas, 1993; Wineburg, 2001). Students may then utilise these resources to help them write on a disputed topic after researchers have completed their study and compiled a collection of primary source articles. During this course, students were taught how to critically analyse historical sources and utilise them as evidence in their arguments (De La Paz, 2005; De La Paz and Felton, 2010; Ferretti et al., 2001; Wiley et al., 2014; Van Drie et al., 2014). Using a Self-Regulated Technique Development method to teaching argument writing, De La Paz and Felton (2010) ran a research in which they taught students a multi-step strategy for critically examining historical sources (De La Paz & Graham, 1997). WTL cognitive strategy education has had favourable impacts in the past, but the number of research and methodologies utilised are limited, according to MacArthur (2014), who asks for additional replication of these findings.

In the 2000s, writing educators in the literary studies area developed long-term, discipline-specific, cognitive strategy approaches to writing (Boscolo & Carotti, 2003; Lewis & Ferretti, 2009, 2011). When Lewis and Ferretti (2009) looked at how literary critics utilise methods (topoi) to understand texts, they came up with one of the most discipline-specific approaches. (1991) (Fahnestock & Secor, Secondary school students' performance was significantly improved as a result of the researchers' use of these topoi into reading and writing approaches. The reader might study MacArthur's book to acquire a comprehensive review of strategy training in literature studies (2014).

During the same time period as WTL has developed more specialised methodologies, progress has also been made in the closely linked subdiscipline of topic area literacy instruction. Many scholars are now questioning the long-held belief that instruction in general reading comprehension techniques and non-field-specific journal writing are sufficient preparation for students to succeed in a given subject area's literacy requirements. A content analysis of significant content literacy tools in math teaching was undertaken by Siebert and Draper (2008) in their study. There is a lack of understanding of the specific character of arithmetic in terms of representations, reading methods and conceptual substance, as well as textual representations and texts in these sources even when they claim to be about math. According to the researchers, psychologists and academics in the field of literacy have affected subject area literacy tools more frequently than disciplinary educators. Text and

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literacy should be defined more broadly to encompass disciplines like mathematics, according to Siebert and Draper. In recent years, there have been a number of recommendations for teaching pupils to read, think, and write in certain secondary school fields like math and science (Moje, 2008; Shanahan & Shanahan, 2008).

12. The WAC vs. WID divide has significant drawbacks when it comes to writing for learning.

Here, we explain a shift in the WTL literature from the more domain-neutral Writing Across the Curriculum (WAC) approach to the more domain-specific Writing in the Disciplines (WID) approach. While McLeod and Maimon (2000) refuted the "myth" that writing throughout the curriculum is incompatible with writing inside disciplines, our interpretation of these patterns differs significantly. Writing and disciplinary educators collaborated from the inception of WAC, according to the authors. This collaboration facilitated the development of disciplinary learning and reasoning abilities, they said.

It's also worth noting that current WTL practises comprise both discipline-specific and discipline-neutral strategies, the usefulness of which has been amply demonstrated in recent years. Many fields can benefit from the use of a reflective diary entry (also known as the learning technique) as an example. According to several research papers (Bangert-Drowns et al., 2004, Hübner, Nückles and Renkl, 2010; Nückle-Hubles and Renkl 2009; Uzoglu 2014), writing in this genre is an effective way to improve one's writing skills. McNeill and Krajcik (2009) investigated the role of domain-specific and domain-general argumentation in science, concluding that each contributes to learning in a distinct manner (cf., Mason & Boscolo, 2001).

To make matters more complicated, WTL uses a WAC/WID distinction. In recent years, research in this field has become increasingly discipline specific, although there is a sense in which it has evolved not toward writing in the disciplines, but rather toward reading in the disciplines.. When researchers teach students how to read and interpret documents in a specific discipline, the student's critical interpretation is used as a basis for an essay that is written using a discipline-neutral argument strategy (such as persuasive writing) that is based on the student's critical interpretation (e.g., De La Paz & Felton, 2010). It is possible that educational and developmental considerations were taken into account due to the fact that

this form of writing is essentially discipline-neutral. Graduate and professional school students who are writing in their fields of specialisation have a reasonable objective of generating texts that are similar to those produced by experts. For students at the primary and secondary levels, the experience is less real because their primary goal is to gain a fundamental understanding of the discipline's knowledge and methodology. A "school genre," is a phrase used to describe a type of writing that has a primary aim and structure in mind when it comes to educational writing. Elementary and secondary students might benefit from writing in the school genre, even if the end output may differ from professional writing in the same discipline (Bazerman, 2009; Berkentotter & Huckin, 1993).

13. Discourse Synthesis is a technique for synthesising discourse.

A writer can develop a new piece of writing by integrating and synthesising information from several sources. Writing from sources, or discourse synthesis, is known as this (Mateos et al., 2014; Segev-Miller, 2007; Spivey, 1997). As students combine various sources to generate one piece of writing, different study literatures such as argumentation and reading comprehension from multiple texts are intertwined with discourse synthesis research (Britt & Rouet, 2012; Wiley & Voss, 1996). Spivey (1997) found that authors must select, link, and arrange content from a number of sources to create a new work. For the construction to work, authors must take apart and reassemble numerous source texts in order to produce a structure that is distinct from any of the source texts (Boscolo, 1996; Segev-Miller, 2007). Authors must create an intertext model consisting of intertext predicates that logically connect elements of two or more texts in order to achieve this goal (Britt & Rouet, 2012). An iterative process of analysing materials and developing a final draught of the essay is necessary for this to occur (Mateos et al., 2008). Self-control is required because this is a deliberate activity (Britt & Rouet, 2012; Mateos et al., 2008). (Segev-Miller, 2007; Smeets and Solé, 2008; Britt and Rouet, 2012) Writing from sources assignments require students to develop a conceptual model of the writing process that they will use to synthesise their sources.

Discourse synthesis appears at first glance to be both a teaching and a learning process.

Discourse synthesis leads to a unique integration of knowledge that may go beyond what is offered by the sources themselves as their final product (Segev-Miller, 2007; Martnez et al., under consideration). Mateos and colleagues discovered that teaching students how to apply a

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discourse synthesis technique may improve both their writing and their conceptual learning (Mateos et al. 2014; see also Britt and Rouet (2012), Gelati and colleagues (2014), Reynolds and Perin (2009); Mateos and colleagues (2014)). How to teach sixth-year students how to write from sources using the following steps: analyse each source, generate a concept map for each source, assemble a concept map that integrates the different sources and write a piece. Modeling, writing together, and then individual writing were all part of strategy development instruction. There were substantial differences between instructional and control groups when it came to complexity of writing processes, quality of text, content transformation and topic knowledge acquisition.

There is some evidence to suggest that genres such as argumentation and explanation, which necessitate an integrated product that is distinct from the source texts in terms of genre, are more effective at improving student learning than tasks in which the integrated product is the same genre as the source texts (Britt and Rouet, 2012; Cerdán and Vidal-Abarca, 2008; Wiley and Vos 1996, 1999). Previously, we stated that there is no clear scientific agreement on this topic, as we have shown. Researchers have found in the past that both summarization and discourse synthesis, which do not require that the sources be transformed into a new genre, require integrative work and lead to participants developing conceptual knowledge (Gelati et al. 2014; Martinez et al, 2015).

Many people, including those who work in argument writing, have debated the difference between persuasion and deliberation. As an alternative to persuasive argumentation (i.e. disputation), deliberative argumentation (conversation or exploration) has been suggested as a means for authors to study different statements and arrive at reasoned conclusions. Although there has been a lot of talk about this, there hasn't been any research done to see if written discussion and deliberation have different effects on learning. While there are significant distinctions between the effects of oral and written persuasion and deliberative goals on speech, they are also convoluted (e.g., Nussbaum & Kardash, 2005). While deliberative peer discourse had the greatest impact on later writing and learning, it was observed that disputatious peer talk had no influence on these outcomes. Felton et al. (2009) agreed. According to the results of another study, the form of reasoning and past writing success have more complicated relationships (Felton et al., 2009).

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14. Combining Text and Other Media

Recent approaches in the study of genre and WTL have focused on the diversity of literacies. Before, it was common to contrast the supposed powers of written language with other media's weakened or divergent capabilities, particularly visual ones (Emig, 1977; McLuhan, 1962; Ong, 1982). A consequence of this has been that until recently, "writing to learn" was conceived of primarily in terms of the creation of written material. A consideration of the value of discussion in connection to writing might occasionally moderate this approach, though (see Klein, 1999 for a review). It was during this time period, notably in the humanities and social sciences, that the primacy of text for thinking and learning was increasingly challenged. Studies of cross-cultural communication demonstrate that writing and speech have many of the same qualities as well as a wide range of functions that are heavily impacted by their respective cultural settings (Biber & Vasquez, 2008; Scribner & Cole, 1981; Street, 1984).

It was stated by semioticians that many aspects of culture may be viewed as sign systems that are similar to those used by people when communicating. Scholars in several domains have discussed the ramifications of adopting a semiotic perspective on thinking and learning (Smagorinsky, 1995; Suhor, 1984; Unsworth, 2011). For example, they found that a range of representational kinds are crucial to the acquisition of knowledge in numerous professions and school subjects such as the study of science (Kress, Jewitt, Ogborn & Tsatsarelis, 2001; Smagorinsky, 1995). This vast spectrum of media has been studied extensively under the banner of "New Literacies" or "Multiliteracies" (Baker, 2010; Leu, Kinzer, Coiro, & Cammack, 2004). It was found that fine arts departments were predominantly concerned with non-written outputs and performances when Carter (2007a) performed a study project on university departmental writing results. To keep up with the growing recognition in educational discourse of the wide range of sign systems in use throughout the world, writing to learn expanded into various media forms in the 2000s. Smagorinsky (1995) defines "composing throughout the curriculum" as a notion that includes "electronic writing across the curriculum," which is another way of saying "composing throughout the curriculum" (see volume by Reiss, Selfe & Young, 1998).

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According to a number of recent studies, children learn more from activities that require them to create multimodal representations than they do from activities in which they are just required to write (Demirbag & Gunel, 2014; Leopold & Leutner, 2012; Leopold, Sumfleth and Leutner, 2013). Developing multimodal representations is predicted to be a focus of future research. Experiments on the consequences of students developing products that combine text and nontextual media, such PowerPoint slides, equations and graphs, were conducted by Hand and his colleagues. Students' creations that combine text and nontext media, such as equations and graphs, have been empirically compared to the impact of various combinations and sequences of these representations on science learning (e.g., Gunel, Hand & Gunduz, 2006; Hand, Gunel & Ulu, 2009; McDermott & Hand, 2013).

15. As a result of this transformation, we're seeing an increase in the use of the social-cognitive system.

Earlier in this part, we reviewed how the idea of causal agency in writing has evolved from the textual medium to the individual writer. In the next section, we'll look at the writer in relation to a larger social and technical context, including current study trends.

As early as the 1970s and 1980s, social aspects of writing to learn were only sketchily discussed.

So far, what we've understood about learning via writing is that internal psychological processes, which were activated either by the text as a medium (Britton, 1982b; Emig, 1977), or the strategies that the writer deployed (Britton, 1982a), were assumed to be responsible (Bereiter & Scardamalia, 1987). Journal writing, a type of content that was mostly written by the individual writer for his or her own personal delight and growth, was paired with an emphasis on individual and internal attention (volumes edited by Gere, 1985; Thaiss, 1986; Young & Fulwiler, 1986). On the other side, WTL's success was supported by social activities like community gardening. There was a lot of interaction between the students and their teachers, as well as with their peers (Elbow, 1981; Langer & Applebee, 1987; Rosaen, 1989, 1990; Thompson, 1990). In contrast, little attention was paid to the social aspects of WTL in this early research.

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Moving toward social theories is a trend in the writing profession.

Since the 1980s, social theories have become increasingly prominent in academic writing, and this trend has maintained to this day (Nystrand, 2006; Prior, 2006; Russell, 2013a). In addition to Cultural and Historical Activity Theory (Engestrm, 2009), there are additional versions of historical activity theory (Russell, 1997). In addition to distributed cognition and situational cognition, two other theories have been offered in the past (Carter, 2007; Englert, Mariage & Dunsmore, 2006; Haas & Witte, 2001; Klein & Leacock, 2012). These theories, although being unique, share overlapping subsets of the following concepts: A variety of tools and techniques are employed in writing practises, which are taught and learned through experience. Each writing practise is specific to a particular social context and text genre. Many written texts are the result of multiple contributors, including authors, reviewers, and editors. Writing practises use a variety of tools and techniques. a. Greetings

Authors such as Prior, 2006; Starke-Meyering & Paré, 2011 have discussed the rise of social theories of writing and claimed or implied that cognitive theories were inadequate because they did not address social, historical and political aspects of writing, while acknowledging the contributions of cognitive theories. Social theories of writing have been offered as a replacement for cognitive theories of writing, with mixed results. The social theory of writing has advanced significantly during the 1980s and is expected to continue to do so in the future, according to most experts. It is our opinion that this new story is inaccurate in three important respects. Cognitive theories are backed by extensive empirical evidence; second, their influence on theoretical work and empirical study has been evident throughout the years; third, the "social" theories are each made of a combination of both social and cognitive components.

16. Studying to Become a Professional Writer: A Social Aspect

If you want to learn more about social theories of writing, Nardi (1996) has an excellent comparative examination of these ideas. As an alternative, we will focus on the recent connections between social theories of writing and research on WTL, which will be examined in great detail. " When it comes to sociocultural theory, it's perhaps the most frequently referred to in reference to WTL. For example, Nelson and Olson (2001), Tynjälä et al. (2001), and Tynjälä et al. (2001) have all mentioned Writing as a Tool for Learning as a key

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effect (2001). Individuals may access literate organisations and their personal awareness of linguistic and argumentative forms is affected by literacy, according to Olson (2001). "these individual processes always have a social and cultural background" they wrote in reference to Vygotsky's work in Tynjälä and colleagues' (2001) allusion to his work (p. 14). According to Bazerman's (2009) sociocultural theory, a learner can use a genre to rebuild information by employing it as a perspective on knowledge and as a vehicle for communication. This is based on Vygotskian sociocultural theory.

It is a sociocultural idea called activity theory that has informed contemporary thinking about WTL. Engestr•m and Russell (2009) describe this object-oriented theory as one in which writing is conceptualised as an interaction between tools, the subject (in the sense of an agent), rules or norms, objectives/reasons and division of labour and community. Russell (2009; 2013a; 2013b) is a disciple of Miller when it comes to viewing genre as a kind of social action (1984). Bakhtin, 1986 (cf. Thus, each genre is viewed as having a specific social function that can be described and routineized as a form of tool-mediated behaviour. An environment of trust may then be created to help students learn about their disciplines (Bazerman, 2009; Russell, 1997; 2013b).

The term "distributed cognition" (also known as "distributed cognition theory") has been used to characterise the social aspects of WTL (Klein & Leacock, 2012; Newell, 2006). Complex human behaviours, such as thinking, can theoretically be modelled as a system made up of several individuals and a variety of internal and external symbolic representations, all of which are dispersed throughout both time and space. Organization, dissemination of information, and transparency of decisions are examples of external representations (Hutchins, 1995; Zhang & Patel, 2006). The authorship of academic textbooks has been cited as an example of distributed cognition (Cronin, 2004; Zhang & Norman, 1994). In professional research, for example, writing is used to develop knowledge in a distributed network of writers, reviewers, and editors. Distributed cognition has been used to characterise writing and knowledge creation in academic and professional writing, as well as writing and knowledge construction in general (Freedman & Smart, 1997; Klein, 2014; Newell, 2006; Rivers, 2011). It has been shown that professional written communication is highly collaborative and is mediated by both older texts and technology advancements (Beaufort,

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2008; Haas & Witte, 2001). Research conducted by Hewitt and Scardamalia (1998) and Mason (1998) indicated that dispersed cognition influenced their understanding of computer-supported collaborative writing.

In accordance with the hypothesis of'situated cognition,' complex mental processes are learned by engagement in the environment in which they are practised (Brown, Collins & Duguid, 1989; Robbins & Aydede, 2009). Carter and colleagues (Carter Ferzli and Wiebe, 2004; 2007) investigated laboratory report writing as an interpretation of experiments. They tested LabWrite, a programme that helped scientists write lab reports and explain their findings. A wide range of internal cognitive processes and other behaviours that incorporated context into thinking and learning were affected by this intervention, the researchers found. Students' learning results improved when they went back to their readings and attended lectures.

17. Social practises in the writing process are discussed in section 5.4.

In WAC and WTL teaching practises, there has been a well-established scholarly and professional literature for a long time now (e.g., Nystrand et. al, 2001). Because of the vast number of people involved and the employment of cultural instruments to mediate these activities, we may classify them as social and cultural practises. First generation WAC programmes were oriented on individual students' cognitive growth; however, the second generation of WAC programmes progressively turned toward learning as a social process that involved cooperation, an audience, and a social environment (Childers, Gere, and Young, 1994). To further understand these processes, we'll look at some of the research currently being done in this area.

Instructing and facilitating are not the same thing; they are two separate activities. In the sections above, there are several allusions to the role of facilitation and teaching in the WTL process (e.g., De La Paz & Felton, 2010; Martinez et al., 2015). Social support has been shown to have an impact on cognition in several research (e.g. Carter et al. 2004; Roelle, Krüger & Jansen, 2012; Wong et al. 2002). (e.g., Carter et al., 2002).

Collaboration. Writing tasks like "academic controversy" were employed in the early research on cooperative and collaborative learning to test ideas (Johnson & Johnson, 1985). Review of research on cooperative learning (not specifically on writing) indicated that group

objectives and individual responsibility, where each student is held accountable for the collective goal, were both significant moderators of learning (see Johnson & Johnson, 2002 for a meta-analysis). Many forms of WTL activities have included cooperation, including considerable study into the Science Writing Heuristic during the last two decades (Hand, Wallace & Yang, 2004). The social support that comes from a readership is particularly crucial for new authors (Chen, Hand & McDowell, 2013; Gunel, Hand & McDermott, 2009).

Some recent qualitative study has examined the ways in which students might learn more successfully when they collaborate while writing (Klein 2014; Milian 2005; Nykopp, Marttunen and Laurinen, 2014). An ongoing theme has been that students commonly fill in gaps in one another's sentences, often by building on one another's ideas. However, the study by Felton et al. (2009) indicated that group thinking followed by writing resulted in learning that was significantly more successful than solo writing. Collaborative writing was proven to be far more successful than individual writing. In order to better understand the influence of collaborative writing on learning, further experimental studies are required.

Using a computer for collaborative learning is supported. When it comes to theories of how people learn, computer-supported collaborative learning has traditionally been excluded from consideration. However, writing has not always been the dominant manner of interaction on CSCL systems (Dillenbourg et al., 2009; Stahl, Koschmann & Suthers, 2006). As a result of their knowledge transforming model of writing, Bereiter and Scardamalia created Knowledge Forum (formerly known as Computer Supported Intentional Learning Environment), an innovative CSCL platform (Bereiter & Scardamalia, 1987; Chuy, Scardamalia & Bereiter, 2012). In CSCL platforms, argumentation is a frequent genre that allows students to engage in critical thinking, challenge one other's ideas, and re-construct their understanding (Chen & She, 2012; Yeh & She, 2010; Chen & She, 2012). For further information, see Choi, Hand and Norton-Meier (2014).

Many other elements of writing and learning have been affected by computers, including CSCL. Carlson and colleagues (2008) used a platform to measure the ability of engineering students to analyse peer assignments and found positive results. While the writer is working on a piece of writing, the computer can act as a teacher, providing scaffolding to aid learning (Schwonke et al., 2006). He describes this as yet another role for computing in the WTL that

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was developed with the help of the content management system MyCase (Fisher, 2007). An advisory board was formed by students in the field of telecommunication. The system used email and other business technology to encourage and promote writing. Video-recorded characters supported the writers by offering information and difficulties. As a result of this activity, students were able to respond and critique materials in a more realistic context.

It is common for CSCL platforms and techniques to include numerous features in a single package. When it comes to learning, hands-on investigation, argumentation training, small-group discussions, report writing and audience response are all incorporated into a single learning experience in an argument-driven inquiry (Sampson et al., 2013; cf., Chen & She, 2012; Syh-Jong, 2007). CSCL treatments that can be broken down into discrete variables for testing would be excellent. The effects of medium (for example, blogs versus paper and pencil) and prompting (for example, prompting against no prompting) may be separated using a 2 x 2 design in a recent research (cognitive and metacognitive prompts versus no prompts). Even more interesting, they found that students in the prompted condition learned more than students who were not prompted at all in both mediums; yet, students who were prompted at all learned more than students who were not prompted at all in both unprompted circumstances (Petko, Egger & Graber, 2014; cf., Braaksma, Rijlaarsdam & Janssen, 2007).

The phrase "critical pedagogy" refers to the practise of instructing students with a critical eye. As a kind of critical social activity, writing has inspired the work of certain authors (Kostouli, 2009; Luke 2012; Russell, 2013b). However, according to Russell (2013b), university-level WAC has created a platform for critiquing the very fields that have benefitted from this authority. Additionally, topic area teachers have used writing assignments at the elementary and secondary levels to encourage students to think critically about society and the world around them (Christensen, 1999; Comber, Thomson & Wells, 2001; Huang, 2011). Critical pedagogy and writing to learn have long been seen as distinct fields of study. On the other hand, writing assignments in this tradition may include important subject area reasoning as well as conceptual information. For instance, in one intriguing study, young children wrote letters as a kind of social action to raise awareness about social injustice (Vasquez, 2014). Students had to understand and think critically about a wide range of topics in order to complete the letter-writing assignments. Students' conceptual understanding should be tested

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in order to get more accurate results from previous critical literacy research. In the future, further research on WTL should be conducted using a critical pedagogy paradigm.

18. The terms "epistemic learning" and "reflective learning" are synonyms for "writing to learn."

As noted at the opening of this paper, the significance of writing in the acquisition and organisation of information has been emphasised in school settings, but the authors claim that the relationship between learning and writing has remained murky. It is true that WTL serves a purpose apart from its epistemic value. When it comes to studying and writing, it isn't just academics that are involved. There was a higher focus on the function of writing in the workplace by Leijten, Van Waes, Schriver, and Hayes (2014) than there was on writing in the classroom (Leijten et al., 2014; Schriver et al., 2012). Writing-to-learn may be viewed in a different light in professional contexts, when writing is used as a means of self-reflection and improvement.

When it comes to research on how people think and how they learn (e.g., Kolb 1984; Schön 1983), the term "reflection" is often used, but it has been largely overlooked in the field of psychology. A person's relationship with oneself or herself is characterised as a kind of implicit monologue in which a person might construct a tentative balance between his or her successes, failures, doubts, and concerns, as well as plan future activities, and this is what reflection is in actuality. Reflecting is a metacognitive practise that involves the activation of both ideas and emotions over the course of the reflection process. "Reflective writing" refers to writing that is meant to elicit reflection in students, as evidenced by several studies in vocational education (such as Ortoleva and Bétrancourt, 2015). Emotional responses can be channelled and dealt with more successfully via the act of writing about them (e.g., Hoover, 1994; Kember, 2001; Kember, McKay, Sinclair, & Wong, 2008; Wade & Yarbrough, 1996). Metacognitive functions, such as analytical thinking, problem solving, and decision-making, can all be aided by the act of writing. Higher-order thinking skills are used by professionals, for example, during critical reflection processes, to review and evaluate their experiences. Procedures like this connect theoretical notions to practical implementation. Writing activities in today's health-care systems are increasingly related with reflective processes (Breuer, Newman, & Newman, in press).

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Both epistemic and reflective writing have parallels and differences that may be explored. Digital writing tools like wikis, blogs, and electronic portfolios are examples of non-traditional forms of writing that are becoming increasingly prevalent. A wiki may be appropriate for instructors from the same subject to exchange and discuss their ideas on how to teach a certain topic or assess students' learning. An apprentice's specialisation may be used to teach them how to use a number of formats and media to help guide their reflection on their apprenticeship experience, assess proficiency, and select appropriate learning assignments (Cattaneo & Boldrini, in press).

A second component of the study focuses on the link between epistemic and reflective writing. Despite their differences, they are not incomparably separate from one another. As a student-writer, increasing one's proficiency in a discipline may increase one's awareness of writing as a learning tool and one's own role in learning itself. Reflective writing is an important part of developing professional competence, but understanding its relevance also enhances a person's self-image and sense of agency in the workplace (Kurunsaari et al., in press). As a researcher, writing is an essential part of your job, which means that it has a positive influence on your educational and professional development. In this case, writing is a tool for increasing self-awareness as a researcher. WTL for undergraduate students combines the two main meanings of writing as an educational tool: a student utilises WTL to study, and through writing, the student considers his or her identity as a future researcher

Phenomenographic research by Kurunsaari, Tynjälä, and Piirainen (Kurunsaari, Tynjälä, and Piirainen, in press) examined how students use reflective writing as a tool for learning throughout their undergraduate studies. After their first year of university, the students began filming themselves in classrooms and labs as well as at practical training places. In order to put their knowledge into practise, they chose settings where they could practise patient evaluation, training, and counselling. Students were encouraged to write in a reflective manner in order to increase their awareness of the many aspects of gaining certain talents. It wasn't necessary for students to write in a certain genre; rather, the goal encouraged them to think about their ideas, reflect on them, and then express them in writing. We polled the graduating class about their experiences with reflective writing, and the results were made public. In the interviews, writing emerged as a valuable tool in four descriptive categories: 1)

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writing as a meaningless pastime; 2) writing as a tool for deeper knowledge; 3) writing as a tool for self-reflection; and 4) writing as a tool for professional growth.. Individuals were divided into four distinct groups based on these criteria: how they intended to use their writing; what they were reflecting on; what they were feeling; and how important their writing was to their professional growth. The lower categories did not include any traits from the higher categories, and vice versa. Hierarchical relationships existed between the categories, with each higher category including elements from the lower ones.

The students who thought writing was pointless also realised that it didn't contribute to their professional growth. Students in the second category saw reflective writing as a tool for increasing their learning, despite the fact that they admitted that they didn't enjoy writing at first. That's why the third type of students thought that their writing job necessitated a comprehensive understanding of not just their own behaviours but also their interactions with others. As a result, pupils felt that writing helped them develop as persons in addition to honing their thinking abilities. In contrast to those in the preceding groups, people who completed the survey questions in this category had good sentiments regarding reflective writing right out of the gate. An effective approach for both self-reflection and the development of professional competence and identity, reflective writing was found in the fourth category, is described as a (as opposed to the first three). Reflection on students' encounters with patients and members of the professional community was more prevalent in the students' reflecting process. Students were able to better comprehend and work together with customers, colleges, and multi-professional workplaces because of this programme. Because of this, the importance of writing shifted from increasing one's personal growth to enhancing one's social development as a member of a community. Consequently Pupils shared their sentiments of inspiration and motivation with one another.

As a last point,

Five recent patterns in WTL research have caught our attention, and we feel they are significant. The first phase in this process has been the application of more sophisticated analytical tools to critically examine beliefs and practises. Initially, WTL research was based on theoretical statements and one-off experiments that produced a wide range of inconsistent and inconclusive results.. Researchers have been using meta-analyses for more than a decade

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to objectively combine the data of several studies. In addition, a meta-analysis has been conducted to identify the instructional elements and student characteristics that have a moderating influence on writing's learning effects. Route analysis has been used in conjunction with other research to explore the psychological processes and text elements that mediate the effects of writing on learning. Because of this, most researchers believe that writing has a major impact on learning, with effects ranging from moderate to large in size. However, the magnitude of these effects can be amplified depending on the amount to which moderator variables are utilised.

As an example, in the early days of cognitive psychology, some authors claimed that learning while writing was the result of spontaneous cognitive processes, which was at odds with current research on psychological processes. Cognitive theories that portray WTL as dependent on the intentions and methods of the writer, rather than other models, have been backed by research conducted in the last decade. Learning benefits from both task-focused cognitive processes and self-regulatory processes that focus on the writer's own perceptions. In recent years, students have been taught how to use writing as a learning tool through cognitive strategy training.

The third WTL research trend focuses on the types of writing activities students engage in. This view was commonly held by those who advocated Writing Across the Curriculum: that expressive (journal) writing and the argumentative essay were significant across disciplines. There has been an explosion of study in the last decade on the usefulness of teaching students cognitive reading and writing strategies that are specific to fields like science, history, and fiction. Metacognitive journal writing and discourse synthesis, two genres that are not directly tied to a certain field, have been shown to have a significant impact on student learning. Furthermore, a related trend has been the development of multimedia products that combine written texts with visual representations, such as animations, rather than relying exclusively on the written word.

Theorizing about WTL's social features has become the fourth trend to emerge. In the beginning, WTL was viewed primarily through the lens of psychology. There has been an explosion in the WTL literature in the last ten years of theories relating to social and activity contexts and situated and distributed cognitions. Writing teaching and facilitation; audience

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and audience response; cooperation; computer-supported collaborative writing; and other computer applications have all been studied empirically. Computer-supported collaborative writing, audience and audience response, and other computer applications are included in this category. Additional experimental research is needed to analyse the impacts of individual components in greater depth, as this study has mostly comprised of multi-faceted design trials or qualitative investigations.

The numerous sorts of learning that may be achieved via writing have been the focus of the sixth inclination. Research into WTL began with an emphasis on epistemic writing, which included familiarising oneself with the principles and reasoning of several academic topics, with the most common of these being physics, history, mathematics, and literature. However, writing in the workplace might serve as a learning opportunity. As a result of this, reflective writing has also come to the fore. It's not just about learning new facts; it's about developing a professional identity as well.

Writing-to-learn research has, without a doubt, focused primarily on the epistemic function of writing, while the reflective aspect has been examined qualitatively, in terms of personal experience, with results that are intriguing but difficult to generalise. With the trends described in this article, it's not hard to imagine how writing might develop into a more fruitful tool for learning and knowledge creation in the future. Read on to learn more about these trends. Educating people about their own personal capabilities, both inside and outside of the classroom, is another possible goal that is often overlooked when thinking about the second, lesser-known instrumentality of writing. Future academics may have a tough time analysing the roles of writing in the context of a specific concept of learning.

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