Third Space as an Information System and Services Intervention Methodology for Engaging the User’s Deepest Levels of Information Need

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ABSTRACT
The paper discusses overview principles of information system and services intervention strategies for students researching a school assignment, then tests these principles in a field study. The principles are based on Kuhlthau’s ISP Model, Cole’s theory of information need and Maniotes’ concept of Third Space. The six-stage ISP Model describes information barriers that arise for students researching a school assignment while they are exploring information in Stage 3; they must transition to a focus formulation in Stage 4, but information overload and other barriers frequently block their thinking. The theory of information need seeks to explain successful Stage 3-to-Stage 4 transition as the student engaging his or her ways of knowing, which will enable focus formulation. Third Space is an intersection zone between the school curriculum and the student’s knowledge and ways of knowing, creating a dynamic conception of the learning space that involves the student’s outside-the-classroom knowledge. A content analysis study illustrates a methodology for operationalizing and testing these concepts and principles in a naturalistic setting.

Keywords
Information behavior, ISP Model, Information Need

INTRODUCTION
In our “information age” students in middle school are expected to locate, evaluate and use the found information to generate new knowledge. This has been embedded in the school curriculum under the rubrics “critical thinking” and “inquiry learning”. In a broader perspective, the overall theory of learning has been frequently defined as constructivism or the constructivist approach (including: Dewey, Bruner, Kelly, Vygotsky and Piaget). For our purposes, we define the objective of learning for the student as the student constructing a personal perspective on the selected topic. However, only some students know how to do this resulting in many students being left behind. These left-behind students hit an informational barrier which blocks their thinking and learning.

Kuhlthau, Maniotes and Caspari (2007) pinpoint this informational barrier as occurring in Stage 3 of Kuhlthau’s (1991; 2004) 6 stage Information Search Process (ISP) Model. The ISP Model, one of the most cited models in information science, charts the information seeking behavior of middle and high school students as they seek, find and use information to construct a school assignment. In Stage 1, the initiation stage, the student receives the parameters of the assignment from the school instructor. The student selects a topic for the assignment in Stage 2. In Stage 3, the student explores information on the selected topic. In Stage 4, the student formulates a focus for the assignment, which is akin to a theme, argument, thesis statement or essential question. The student collects supporting information for the theme, argument, thesis or question in Stage 5. In Stage 6, the student completes the assignment or presents their findings in some other manner.

Stage 3, the exploration stage is the danger zone where many students tune out. It is here that the student feels...
overloaded by too much conflicting information on the selected topic. They realize they can’t simply collect information on the topic; and that the interaction with information must somehow produce ideas and thinking. Ideas include organization-structural ideas like: cause and effect or compare and contrast organization structures. Such ideas will organize the assignment or project, giving it a cohesive structure that can communicate their message. But for so many students this does not happen. Instead barriers-to-thinking set in. The student may stop seeking information or may do the opposite, becoming overwhelmed by information overload.

Uncertainty goes up in Stage 3, with either a positive or negative effect. Uncertainty is necessary for the production of new ideas. For some students, an idea occurs to them, or questions about the material come to mind, from which they can formulate a Stage 4 focus, theme, argument or thesis on the topic. Their uncertainty then goes down and continues to decline in Stage 5 and Stage 6.

For many students, however, far from helping the student achieve a focus, their Stage 3 exploration of information on their topic produces such anxiety that it pushes the student out of the learning loop. They never achieve a Stage 4 focus. Stage 5’s collection of evidence in support of the focus is ineffective. In Stage 6, this student hands in a list of informational bits and pieces on the topic, with no theme, argument or thesis. There is no synthesis, no perspective, no point of view. They have generated no new learning or knowledge and receive a low mark from their instructor despite all their efforts.

In this paper, we would like to examine more closely the information barrier that occurs in many students when they are in Stage 3 of their ISP. In Part I we describe the thinking blocks that occur in this crucial stage, and the role of information in producing these barriers. In Part II we examine solutions or strategies that can overcome these thinking blocks and barriers by referring to Cole’s (2011, 2012) theory of information need, and Kuhlthau, Maniotes and Caspari’s (2007) teacher-librarian intervention strategies, strategies which are specifically designed to provide gateways to students in Stage 3 which facilitate their passage to focus formulation in Stage 4. In Part III we report a content analysis study that identifies an intervention strategy for facilitating aiding middle school students to cross over the Stage 4 barrier.

**Part I: Description of Stage 3 Thinking Blocks**

Figure 1 illustrates the thinking blocks created when a student is exploring information in Stage 3 of their ISP hits informational barriers. We define “informational barrier” as high uncertainty, which has both cognitive and affective elements. The affective element is high anxiety, which can lead to thinking shutdown. The cognitive element of this high uncertainty has something to do with conflicting and inconsistent information attacking prior thinking and beliefs, which can lead to information overload. Paradoxically, information overload can manifest itself to the student as: There is no information on my topic in the information sources or this topic isn’t worth pursuing. This is because none of the information resonates as relevant.

Cole (2011, 2012) describes this informational barrier in terms of Taylor’s (1968) levels of information need. There is the real Q1 or deepest level of the person’s information need, but the person seeking information does not and cannot formulate or put into words his or her information need but rather a compromised form of it, one that this user thinks the information system requires in order to function. The Q4 level is this codified or compromised form of the information need--the keywords the user utilizes to query an information system. But there are worse barriers than this to getting the information from the system the user really needs. As indicated in Figure 1, in Stage 3 the user approaches an information system with only a nebulous idea of his or her real information need, Taylor calls the Q1 level. The Q1 level is the unconscious, visceral form of the user’s information need. The Q1 real information need is “unspecifiable” even by the user him/herself to his or herself. This is the person’s belief system, what he or she believes to be true about the world. The person’s knowledge system. The person’s real, Q1 level information need is embedded in the person’s prior knowledge.
According to Cole’s recent theory of information need, the person must somehow touch this deepest Q1 level of information need via knowledge formation, but knowledge formation occurs only in Stage 4 of Kuhlthau’s ISP Model, when the person formulates a focus for the school assignment, a critical or personal perspective on his or her topic. This disconnect is the underlying barrier to effective information seeking when the person is exploring information on the topic in Stage 3.

The trick is to get middle school students who are confronted by this informational barrier while they are exploring information in Stage 3 to relate their micro information interaction for the school assignment to their knowledge/belief systems.

**Part II: Solution to Informational Barrier**

It is hypothesized that if an information system is designed to continually refer the middle school student user to this deepest level of his or her knowledge/belief system, that the middle school student then becomes “engaged” with the information he/she is seeking, thus facilitating the student’s formulation of their focus or critical perspective on their topic.

In Figure 2, Cole’s (2011, 2012) theory of information need postulates the person’s Stage 3 disconnect with their real, Q1 level information need (Figure 2(a)), and the responsibility of the information system to engage the middle school student’s general or macro knowledge-belief system while the student is, at a micro-level, interacting with information for a school project. Engaging the student’s deeper, question levels (Q1, Q2 & Q3) of their information need, causes (b in Figure 2) a focusing process leading, it is hypothesized by Cole, to the student breaking through the informational barrier to Stage 4 and successful focus formulation (c in Figure 2). As indicated in Figure 1, the user has now broken through the informational barrier.

**Figure 2:** (a) Pre-focus, (b) focusing, and (c) post-focus stages of the information seeking perspective on information search.

Figure 1 indicates that this conceptualization of information need and how it can be linked to knowledge formulation via the user’s process of interacting with information is a “route” through informational barriers the user encounters in Stage 3 of their ISP. Information processes occur (AKS). The user’s ideas focus in Stage 4 on the other side of this informational barrier, leading to a simpler, efficient form of command-type information seeking.

**Maniotes’ Third Space in Guided Inquiry: Constructing a “Route” through Informational Barrier to Overcome Thinking Blocks**

Once the problem of the Stage 3 user whose thinking is blocked by informational barriers is conceptualized in this way, the solution to the Stage 3 informational barrier is creating a route through the informational barrier via engaging the student’s knowledge-belief system—the deepest Q1, Q2 & Q3 levels of his/her information need. The problem remains how library and information science and information accessing system design can create this route.

Maniotes (from Kuhlthau, Maniotes & Caspari, 2007) proposes such a route in the “Third Space in Guided Inquiry,” illustrated in Figure 3. Figure 3 is divided into three spaces which overlap. First Space is the personal knowledge system of the particular student, which includes his or her personal ways of knowing. Second Space is the school curriculum presented by the teacher via teaching and approved textbooks, which includes the school’s ways of...
knowing. Third Space is the merger space linking the first two spaces. Within Third Space, “students can construct new worldviews rather than having to take on the teacher’s perspective or those mandated by the curriculum or textbooks” (Kuhlthau, Maniotes & Caspari, 2007, p. 32).

![Diagram of 1st, 2nd, and 3rd Space]

**Figure 3:** Maniotes’ Third Space in Guided Inquiry (from Kuhlthau, Maniotes and Caspari, 2007, p. 32).

The essence of the attitude library and information science must have towards this Third Space is articulated in Kuhlthau, Maniotes and Caspari (2007, p. 32) when describing the function of Third Space:

> Here students are flexibly and fluently using their outside knowledge to interpret, understand, and make sense of in-school curriculum, ideas, and ways of knowing.

The outside knowledge of the students of the First Space includes the students’ existential quest for making meaning of their world (Bhabha, 1994). This outside-of-school knowledge utilized to make sense of school curriculum, which is an essential feature of the dynamic, occurs within the in-between Third Space as the student’s First Space and the school’s Second Space confront each other. Third Space is a particular type of learning space but one that is especially adapted to learning in our information age (Maniotes, 2005).

In the next section, we describe a study that illustrates aspects of Third Space.

**Part III: A Study**

We report a study that seeks to define or operationalize Third Space via the concept of implicit knowledge. Implicit knowledge is the prior knowledge a person uses while interacting with new information, without consciousness of using it. Examples of implicit knowledge (and its associated concepts of implicit memory, encoding, cognition and learning) are procedural knowledge, knowledge of how to categorize environmental stimuli and analogy making (Dienes & Altmann, 1997). For domain novices exploring information in a new domain, which is the case for students in Stage 3 of their ISP, implicit knowledge may direct information seeking, the processing of new information, and the generation of new knowledge. In the case of the middle school students studied, we define new knowledge as developing through information seeking a critical perspective or thesis on their topic.

In the naturalistic study we report here, content analysis was performed on 16 grade-eight history project group proposals which the students submitted to their course instructors three weeks before the presentation of their findings to their fellow students, teachers and parents. The proposal required the students to indicate their topic and their thesis question/statement and the evidence they had found in support of their thesis, including citations, references and Web sites/pages the students intended to utilize in their history project. The proposals also included a project management aspect (timetable, division of work amongst the group members). The proposals constituted 20% of the students’ total history project mark. We did not utilize these real-life instructors’ marks in our study but rather asked the instructors to re-mark the proposals especially for the study. We did not control the criteria the instructors utilized in this re-marking exercise but we assume they referred to the proposals outline they had sent to all students as the instruction sheet for doing the proposal.

The content analysis produced a coding scheme, called the Initial Coding Scheme, the four broad categories of which we give in Table 1 (for a further description of the study, see Cole, Behesthi, Large, Lamoureux, Abuhimed, & AlGhamdi, submitted for publication). The Initial Coding Scheme included the elements required of the instructors in their proposal outline-instruction sheet to the students, specifically categories I. Management and II. Information Search + Use. As the history project and the proposal had an explicit topic and thesis objective, coding categories III. Proposal Structure and IV. Student Cognition were derived from this objective and the concept of implicit knowledge. The concept of implicit knowledge has a “prior knowledge” aspect and a new knowledge generation aspect.

<table>
<thead>
<tr>
<th>Student Group No.</th>
<th>I. Management</th>
<th>II. Information Search + Use</th>
<th>III. Proposal Structure</th>
<th>IV. Student Cognition</th>
<th>V. Total Score</th>
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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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**Table 1:** Complete four categories of coding for Initial Coding Scheme.
On the right-hand side of Figure 4, we illustrate the objective of an implicit knowledge-designed information system or information service compared to systems and services that require only students’ explicit expression of their information need on the left-hand side of the figure. Implicit knowledge elements, once built into the system or service, are a gateway to the deeper Q1-3 levels of the student’s information need. Since Taylor’s (1968) four-level model of information need, this has long been one of the important goals of information seeking and information behavior research.

Table 2 illustrates Part IV. only of Table 2. Part IV. indicates coding for the students generating new knowledge about their topic, and doing this via a critical perspective on their topic (i.e., by considering both positive and negative aspects of their topic). The definitions of the Part IV. elements and their weightings are the following:

IV. Student Cognition
Positive/Negative
1. Level 1: Positive spin (so shows excitement about topic): yes/no. If yes, then x 2.
2. Level 2: both negative and positive looked at indicating critical perspective. y/n. If y, then x 4.
Explicit/Implicit
3. Explicit evidence (explicitly stated) y/n. If y, then x 2.
4. Implicit evidence: Level 1 (prior interest in topic, related to student’s life): y/n. If y, then x 3.
5. Implicit evidence: Level 2 (evidence of generative-new knowledge and/or critical perspective): y/n. If y, then x 8.

<table>
<thead>
<tr>
<th>Student Group No.</th>
<th>McGill Initial Coding Score for IV. (out of 19)</th>
<th>McGill Initial Coding Score for IV. (out of 100%)</th>
<th>Instructor Marks (%)</th>
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<td>37%</td>
<td>70%</td>
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</tbody>
</table>

Table 2: Part IV. only from Table 1: Student Implicit Cognition, in the 16 History Project student proposals.

In Table 2, we also give the scoring for the 16 student group proposals (out of 19 points and as a percent), along with the instructors’ marks. The instructors’ marks for the 16 student proposals provide a standard to indicate the validity of the study’s Initial Coding Scheme. However, correlation tests between the McGill scoring and the private school instructors’ marks indicate weak and non-significant association. The school instructors’ marks, because they are so divergent from the researchers’ scoring of the 16 proposals, may indicate they are rewarding other things besides evidence of generative knowledge, or that the two research coders coded for different aspects of critical perspective and generative knowledge production than the instructors (the inter-coder agreement between the research coders was 82% for the Initial Coding Scheme).

In Cole, Behesthi, Large, Lamoureux, Abuhimed, and AlGhamdi (submitted for publication), we report other aspects of this content analysis study, which involved other iterations of the coding of the same 16 proposals for evidence of the students’ implicit knowledge in the development of a critical perspective, through their thesis, on their selected topic. An iteration that was successful was a re-coding scheme that began with the second author analyzing the proposals which received high instructors’ marks, and inductively creating a list of implicit knowledge elements (see Cole et al. (submitted for publication) for reporting of this re-coding scheme part of the study).

The study shown here is a first attempt to operationalize implicit knowledge by defining, labeling and then testing it against the real-world performance standard of the marks awarded to the grade eight students’ proposals by their course instructors. It will take many such studies to correctly identify, define and label implicit knowledge elements so that the results can be replicated by other researchers. Once these studies are completed, our objective is to produce a typology of implicit knowledge elements that can be built into the design of information systems and information services for middle and high school students researching a thesis or critical perspective-objective school assignment.

On the right-hand side of Figure 4, we illustrate the objective of an implicit knowledge-designed information system or information service compared to systems and services that require only students’ explicit expression of their information need on the left-hand side of the figure. Implicit knowledge elements, once built into the system or service, are a gateway to the deeper Q1-3 levels of the student’s information need. Since Taylor’s (1968) four-level model of information need, this has long been one of the important goals of information seeking and information behavior research.
Conclusion
The objective of this paper was to advocate designing effective strategies and systems for facilitating interaction between humans and information, particularly when a student is in Kuhlthau’s Stage 3 of their ISP. To achieve this objective, we linked Maniotes’ concept of Third Space, with Cole’s theory of information need. Third Space zeros in on the linking-space between students’ prior knowledge and their experiences with the new information they seek and find during a school project; while Cole’s information need theory links information seeking, finding and use to a system user’s knowledge formation. We believe we have illustrated how humans naturally interact with information to form new knowledge, and that if learning environments and information systems are designed based on these principles that such systems can facilitate students’ interactions with information to generate new knowledge for task production.

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References


