Curriculum integration

Learning in a changing world

Ross J. Todd

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Foreword

In an information-rich, technology-oriented world there is a real need to focus attention on the quality of the teaching and learning experience for young people. Quality teaching is the biggest influence on improving learning outcomes for students. A constructivist and inquiry-based approach emphasises the need to engage students in real-life learning experiences that challenge and stimulate the intellectual agility and social maturity of the learner, enabling them to develop knowledge and understanding of the world in which they live. The instructional model of Guided Inquiry, outlined in this book, focuses on the importance of designing programs that connect the learner with the curriculum through an inquiry-based approach to learning that is supported by an instructional team and a well-resourced school library.

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Contents

Introduction

This document outlines and presents a Curriculum Integration Matrix for 21st century learning in complex and diverse information environments. The matrix seeks to capitalise on and engage the richness and diversity of digital and print sources made available though schools' information networks and school libraries, meshed with the expertise of classroom teachers, teacher librarians, information technology leaders and key decision-makers to provide deep learning experiences for students. Central to this learning process is the development of knowledgeable and knowing students who are equipped with the essential skills of engaging with and transforming information across a range of formats, platforms, tools and media, and the development of young people who can succeed as citizens and workers in a globalised and interconnected world.

The Curriculum Integration Matrix presented in this document is based on the constructivist instructional framework of Guided Inquiry and underpinned by the research-based Information Search Process model, both developed by Kuhlthau (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari 2007). It outlines how Guided Inquiry as an instructional framework in 21st century schools can be developed and implemented to enable students to learn meaningfully from diverse and complex information sources; to develop essential information and communication capabilities; to enhance digital literacies, critical thinking and problem-solving, and to acquire deep knowledge and understanding of curriculum content.

The book articulates the philosophical and professional foundations and instructional standards for Guided Inquiry based on constructivist learning principles, as explicated by Kuhlthau (2004). It then presents a Curriculum Integration Matrix structured on the Information Search Process and establishes a set of potential strategies and approaches for designing quality teaching and learning through Guided Inquiry.

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Chapter 1

Learning in the changing Australian landscape

> The principal goal of education in the schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done; men and women who are creative, inventive and discoverers, who can be critical and verify, and not accept, everything they are offered.
>
> Jean Piaget (1896–1980) (Ginsberg & Opper 1969, p. 5)

An analysis of the Australian educational landscape—based on a plethora of state and national educational policy documents—and indeed the broader international educational landscape, shows increasing acknowledgement of:

- the complexity and diversity of student learning in an increasingly globalised and technological world and the importance of responding innovatively to the needs of learners
- intellectual quality as a key learning outcome, underpinned by authentic and powerful pedagogy, intellectual engagement and relevance, supportive learning environments, and a culture of high expectations for student learning outcomes
- the development and integration of disciplinary knowledge and skills that enable critical thinking, problem-solving, communication, collaboration, creativity and innovation, and which have salience and power in the world, and in the lives of young people
- the development of social, cultural and personal agency of our young people—young people who have respect for different values, a sense of global awareness, responsibility and leadership, self-confidence and self-direction,

risk-taking, independence and interdependence, flexibility and adaptability, initiative and productivity

- the importance of connected learning—learning from and working collaboratively with individuals representing diverse expertise, cultures, perspectives and outlooks in a spirit of mutual respect and open dialogue; learning in connected and shared information communication environments, both personal and virtual; and learning that engages self, community and information technology in creative and innovative ways
- the centrality of a dynamic technology and media-suffused environment which increasingly demands complex capabilities related to timely and expert use of information, technology and media for decision-making, workplace effectiveness and quality living
- the importance of digital agency—equipping students with the capabilities, insights and strategies necessary to engage with and utilise the changing information and communication technologies to develop deep knowledge and understanding
- quality teachers and quality teaching as the most important influence on student learning
- the valuing of a shared understanding of the theory, research and practice of curriculum, pedagogy and evidence-based education to inform and enable professional action through teaching and learning processes, and being able to develop processes and strategies to measure learning impacts, and state claims of learning outcomes based on evidence-based practices.

At the heart of current educational discussion and debate is the central question: What do we want to enable and achieve for all young people? This question challenges all educators to rethink and re-imagine teaching and learning to provide the best opportunities for students to learn in the complex, diverse and information-intense 21st century.

Inquiry and learning

The development of innovative and powerful pedagogy centring on inquiry is increasingly seen as a key to rethinking, re-imagining and transforming schooling, and a key to engaging learners to succeed as citizens and workers in a globalised and interconnected world. While there are many conceptions and variations of inquiry-based learning, central to these conceptions is the move away from the listen-to-learn paradigm of the classroom, to a

discover-to-know paradigm that immerses students in rich and authentic learning experiences to inquire, question, discover, build deep knowledge and understanding, and to be creative and innovative. According to Kathy Short (Siu-Runyan 1999), inquiry means 'immersing ourselves in life and living our lives as problem-posers and problem-solvers to its fullest' (p. 5). Savery (2006), in exploring the differences between inquiry-based learning and problem-based learning, posits that inquiry-based learning is 'a student-centered, active learning approach focused on questioning, critical thinking, and problem-solving … creating new knowledge as information is gathered and understood, discussing discoveries and experiences, and reflecting on new-found knowledge' (p. 16). Kuhlthau (2004) describes inquiry learning as 'an active personal process … fitting information in with what one already knows and extending this knowledge to create new perspectives' (p. 4). Kuhlthau, Maniotes and Caspari (2007) posit inquiry as an approach to learning that engages and challenges students to 'connect their world with the curriculum … to increase their understanding of a problem, topic or issue' (p. 2).

As an approach to teaching and learning, inquiry values students:

- making personal connections and finding relevance in the real world
- being challenged through instruction to make a serious cognitive and emotional investment in learning that focuses on individual and collective knowledge building
- being able to integrate both disciplinary knowledge (curriculum content) and a range of capabilities and dispositions—reading and literacy capabilities, resource-based capabilities (including information and communication technologies), thinking and knowledge creation capabilities, personal and interpersonal capabilities and learning management capabilities—to become quality creators, producers, users and sharers of knowledge
- being able to go beyond the boundaries of specific curriculums to apply their knowledge and skills to the world around them, and to be, do and become—to grow and thrive and flourish as productive citizens in a constantly changing intellectual, social, cultural and increasingly digital information environment
- knowing how to ask significant questions, pose real world problems, engage actively, seek answers and solutions, and reflect thoughtfully on the outcomes, applications and implications to the value of society
- making both emotional and cognitive investment in learning through expert guidance and intervention.

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Chapter 2

Constructivist learning and inquiry

> Education is not an affair of telling and being told but an active constructive process.
>
> John Dewey (1859–1952) (Dewey 1916, p. 46)

Constructivist learning and inquiry provide the philosophical foundation for the Curriculum Integration Matrix. Inquiry-based learning is founded on the belief that learning is a process of personal and social construction. This view of learning is deeply embedded in educational tradition, and has been developed by influential 20th century educational thinkers such as John Dewey, George Kelly, Jerome Brunner, Jean Piaget, Howard Gardner and Lev Vygotsky.

Constructivist learning gives emphasis to an active search for meaning and understanding by learners. Common dimensions of constructivist learning include:

- students being directly involved and engaged in the discovery of new knowledge
- students actively constructing deep knowledge and deep understanding rather than passively receiving it
- students encountering alternative perspectives and conflicting ideas so that they are able to transform prior knowledge and experience into deep understandings
- students developing and utilising a range of learning capabilities that enable them to transform information and ideas into deep knowledge and understanding
- students transferring new knowledge and skills to new circumstances

- students taking ownership and responsibility for their ongoing learning and mastery of curriculum content and skills
- students contributing to social wellbeing, the growth of democracy and the development of a knowledgeable, interconnected and globalised society.

Central to constructivist learning and inquiry is the engagement with information in all its forms to develop new knowledge. For several decades now, this engagement with information has been conceptualised as information literacy, and put forward as an essential component of learning and living in an information-rich environment. Positioned at the core of lifelong learning, the information literacy agenda has focused on enabling people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals (UNESCO, IFLA & NFIL 2005). It has spawned a plethora of information literacy models and frameworks to guide both its development and integration into curricula at all levels of education. In recent years, a range of information literacy models with explicit focus on digital information competences has been developed, such as Bloom's Digital Taxonomy (Churches 2009). These models and frameworks are grounded in diverse theoretical and conceptual traditions including behavioural, constructivist and relational approaches for explaining and understanding information literacy and the development of digital literacies. Such models and taxonomies provide rich and practical descriptions and examples of the range of information handling and using skills, as well as knowledge construction competencies to be developed through formal instruction. A number of these models have been developed as explicit instructional frameworks to facilitate the development of these skills.

Guided Inquiry

Against this backdrop, the Australian School Library Association (ASLA) and the Australian Library and Information Association (ALIA) have recently released a joint statement on 'Guided Inquiry and the Curriculum' (2009). This statement endorses the adoption of a Guided Inquiry approach (Kuhlthau, Maniotes & Caspari 2007) to teaching and learning through the school library to engage students in actively interacting with a variety of sources of information and ideas, and to use higher order thinking skills

to construct deep knowledge and understanding. In doing so, it positions the school library as the school's physical and virtual learning commons where inquiry, thinking, imagination, discovery and creativity are central to students' information-to-knowledge journey, and to their personal, social and cultural growth.

Within the context of engaging students in actively interacting with a variety of sources of information and ideas, and to use higher order thinking skills to construct deep knowledge and understanding, the primary work of the teacher librarian is that of an information learning specialist. Teacher librarians should lead instructional teams to develop, implement and assess authentic inquiry experiences that engage students meaningfully with the wealth of information resources both within and beyond the school (print and digital); help develop deep knowledge and understanding of curriculum topics; and foster independence in students' abilities to successfully and thoughtfully engage in their information worlds.

What is Guided Inquiry?

As elaborated further in this document, the Guided Inquiry approach is derived from a substantive body of empirical research which has generated and validated the Information Search Process model (Kuhlthau 2004).

Guided Inquiry is carefully planned, closely supervised, targeted intervention of an instructional team of teachers and teacher librarians to guide students through curriculum-based inquiry units that build deep knowledge and deep understanding of a curriculum topic, and gradually lead towards independent learning (Kuhlthau et al. 2007). Through Guided Inquiry, students develop not just deep knowledge and understanding of their curriculum topics, they also systematically and explicitly develop capabilities—the skills, abilities and habits of mind—that enable them to prepare for, plan and successfully undertake a curriculum-based inquiry unit. Through working with information resources and ideas, students question, discover, think, reflect on and build deep knowledge and understanding of their curriculum topics. At the same time, they build a foundation of life skills essential for living and working in a globalised, interconnected world. These capabilities build on and extend the information literacy framework that has become the hallmark of resource-based learning over the last

two decades, and include resource-based capabilities, thinking-based capabilities, knowledge-based capabilities, reading to learn capabilities, personal and interpersonal capabilities, and learning management capabilities. These are elaborated further on p. 20. In building on the information literacy framework, five kinds of learning are integrated into the inquiry process. These are:

- **Curriculum content:** mastery of key concepts and their interrelationships in deep ways
- **Information literacy:** locating, evaluating and using information, and through this, constructing deep knowledge and understanding
- **Learning how to learn:** initiating, selecting, exploring, focusing, collecting, presenting and reflecting
- **Literacy competence:** reading, writing, listening, speaking
- **Social skills:** interacting, cooperating, collaborating. (Kuhlthau et al. 2007, p. 3)

Guided Inquiry is based on the premise that learning is a constructive, connected and shared process. Kuhlthau et al. (2007, p. 25) elaborate on this premise, describing six principles of Guided Inquiry, which can be both a framework and useful checklist for instructional teams in establishing and guiding the planning process for Guided Inquiry units. The Six Principles are:

1. Children learn by being actively engaged in and reflecting on an experience.
2. Children learn by building on what they already know.
3. Children develop higher order thinking through guidance at critical points in the learning process.
4. Children have different ways and modes of learning.
5. Children learn through social interaction with others.
6. Children learn through instruction and experience in accord with their cognitive development.

Based on these principles, the following list should serve as criteria for appraising and evaluating Guided Inquiry planning and its impact on learning.

- Learning through Guided Inquiry is active. Students do not passively collect information from textbooks or classroom lectures. They conduct their own investigations, driven by curiosity and the deep questions they have generated through their investigations.

- Learning through Guided Inquiry is addressing real world problems and issues. Students are not doing superficial and repetitious exercises in order to learn isolated skills independent of curriculum content. They see that the competencies they learn while engaged in inquiry are helping them do quality work, and they recognise the depth and breadth of their own learning. They are learning skills, dispositions and habits of mind in context as they investigate legitimate questions and issues and construct their own knowledge.
- Learning through Guided Inquiry is open-ended. Students are not simply looking up answers or facts, stockpiling them and re-presenting these in some sterile format. They are exploring information to interact with it. They relate that information to what they already know, and they use the information to construct deep knowledge and understanding. They use their new knowledge to apply it to new situations, analyse and evaluate, and create new representations of their knowledge. And they use it as a basis for reflecting on their learning, and generating further questions which continue to drive their investigations, in and out of school.
- Learning through Guided Inquiry is collaborative and connected. Students are not working in isolation. They are getting guidance from educators working in teams, as well as working with peers. They actively engage with one another and with their instructional team, and with the diverse viewpoints of others. They see and experience teams of educators focusing on their learning needs, and providing them with targeted and meaningful learning opportunities at critical points to succeed and achieve.

Learning through Guided Inquiry is reflective. Students are not solely focused on the end product and its summative assessment. They are also thinking about and reflecting on how they learn and how they can improve their work. They engage actively with feedback from educators and peers at critical points in their inquiry process in order to continuously refine and improve their knowledge, and to refine their learning skills.

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Chapter 3

Implementing Guided Inquiry in the school

> Guided Inquiry is carefully planned, closely supervised targeted intervention of an instructional team of teachers and teacher librarians to guide students through curriculum based inquiry units that gradually lead towards independent learning. Students actively engage with diverse and often conflicting sources of information and ideas to discover new ones, to build new understandings, and to develop personal viewpoints and perspectives.
>
> (Kuhlthau, Maniotes & Caspari 2007)

The Information Search Process

The research of Kuhlthau (1985, 1986, 1987a, 1987b, 1989, 2004), extending over two decades, provides the instructional framework for implementing Guided Inquiry in classrooms and school libraries. This instructional framework, known as the 'Information Search Process', is a model that describes the thoughts, actions and feelings commonly experienced by students in each stage of the inquiry process as they search for and engage with information to build personal knowledge and understanding. This instructional framework also gives particular attention to the affective dimensions of learning. The feelings of students while they are engaged in an inquiry project reveal much about the learning process they are experiencing and the interventions they need.

The Information Search Process forms the basis for developing a program of inquiry-based learning and for guiding students in their

inquiry. As a staged framework for designing instruction, it is the backbone and primary organising structure of the Curriculum Integration Matrix presented at the end of this book. The Information Search Process provides a mechanism for instructional teams to recognise and determine those critical moments when intervention and instruction are needed during the inquiry process, and then to tailor interventions to enable students to achieve successful outcomes of their inquiry. As an instructional model for Guided Inquiry, the Information Search Process takes the randomness out of inquiry, yet retains the openness and flexibility of inquiry within the boundaries of curriculum objectives. It forms a framework that equips the instructional team to anticipate the cognitions, behaviours and feelings of students as they engage in their information-to-knowledge journey, and to anticipate potential zones of intervention that will enable students to progress in a timely, sustained and deep way.

The Information Search Process model

According to Kuhlthau's research, and as illustrated in the model, the Information Search Process occurs in seven stages: Initiation, Selection, Exploration, Formulation, Collection, Presentation and Assessment. These stages are named for the primary inquiry task to be accomplished at each point in the process. When the Information Search Process is used as an instructional framework for developing and guiding inquiry, students move away from simply collecting and transporting information and putting it together to please the teacher; rather, right from task initiation, they are engaged and guided in a thinking process that requires extensive exploration of ideas and formulation of thoughts before moving on to the later stages of collecting and preparing to present their new knowledge. They avoid missing the critical stages of learning by allowing time for reflecting and formulating while they are exploring and collecting information. As an instructional framework, it also provides a research-validated mechanism for diagnosing learning needs and tailoring instructional interventions to ensure that students have the necessary capabilities to progress in their information-to-knowledge journey.

Initiation

Typically, in this first stage of Guided Inquiry, the teacher challenges students to research an engaging topic or question. Students recognise

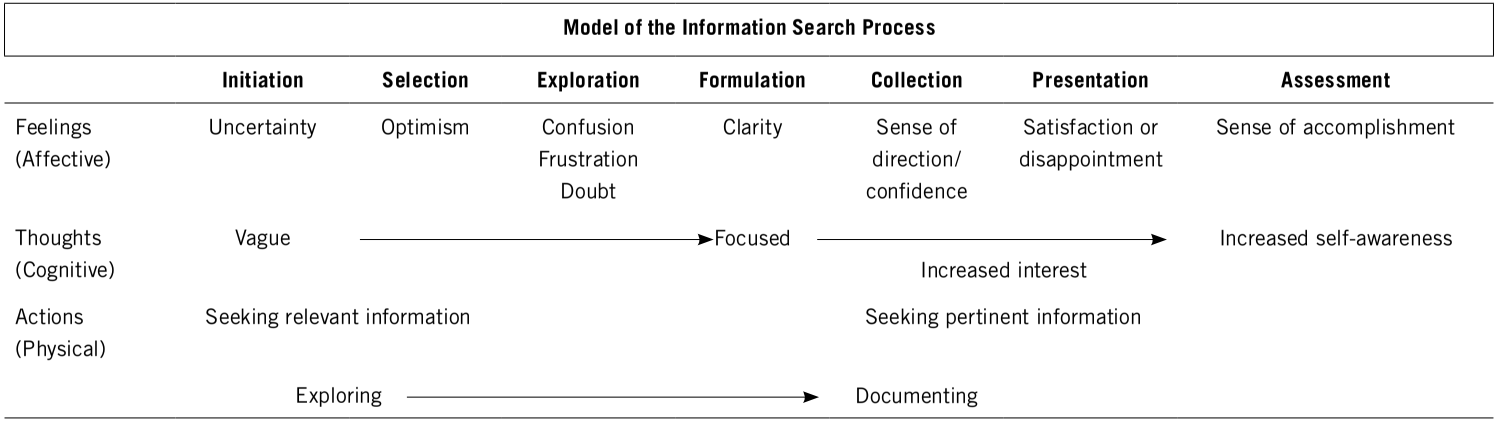

Figure 3.1: The Information Search Process model

Source: *Guided Inquiry: Learning in the 21st century*, Carol C.Kuhlthau, Leslie K. Maniotes, Ann K. Caspari. Copyright © 2007 by Libraries Unlimited. Reproduced with permission of ABC-CLIO, LLC.

that information is needed for the research task. When they first receive the assignment they experience uncertainty and apprehension about the work to be done. They think about the assignment to comprehend the task and to figure out why they should do the task, and they remember other assignments that required them to find information. Actions usually include talking about possible topics and ways to do the assignment, and browsing the school library collection or the Internet (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari, 2007).

Often students come into an inquiry process with little interest, motivation or ownership of the learning task. The key purpose of Initiation is to motivate and engage students. This begins with activating and assessing prior knowledge. This knowledge includes learners' experiences, the connections they make and the memories that they have on emotional as well as intellectual levels. This is particularly important for students who have not had a rich background in reading and exploring the world. Teachers need to know whether students lack the mental constructs that are critical to addressing the learning task. Weak prior knowledge and experience translates into lack of interest and commitment to the task. They also need to know whether learners are harbouring misconceptions and misinformation.

Selection

In the second stage of the Guided Inquiry process, students choose their general topic or aspect of the class theme they will be working on. They will tend to choose topics with which they have a personal connection. For example, a student may choose to research a disease that affects a member of her family. The topic selection should fall into a zone that is doable—not so large that it would be a life's work, and not so narrow or obscure that information is hard to find. As students engage in this stage, their thoughts tend to focus on weighing topics against criteria of personal interest, task requirements, information available and time allotted. They predict the outcome of possible choices, what aspects might be easy or difficult, and which topics have high potential for success. At this stage, they often experience uncertainty, confusion and anxiety as they endeavour to make topic choices. These feelings give way to optimism after the selection of a topic has been made, and they feel a readiness to search. During this stage, actions may include making a preliminary search for information,

skimming and scanning for an overview of alternative topics and talking to others about possibilities. If selection of a topic is delayed or postponed, anxiety intensifies until a choice is made (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari 2007).

Exploration

In the third stage of the Guided Inquiry process, students explore their broad topic and use this as a sound basis for deciding on the specific focus of the inquiry, developing questions of their own that arise as they begin to learn about the subject. Typically they make use of a variety of information sources that provide general information, and which help them understand the scope and depth of their topic. In doing so, they often encounter information that is inconsistent and incompatible with what they already know and what they expect to find. Sometimes they will be confused by the different viewpoints or conflicting ideas they encounter, and often their preconceived notions of the topic are challenged. Because of this confusion, some students may want to drop their topic and find another one. The goal of this exploration stage is to enable students to intentionally seek a possible focus for their inquiry, guided by personal interest and the requirements of the task (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari 2007).

Formulation

The formulation stage of the Guided Inquiry process is where students become aware of the various dimensions, issues and ramifications of their topic and begin to form their own focused perspective of it, and establish the focus of their research task—the specific questions or dimensions of the broad topic that they wish to investigate. Their involvement and interest in their topics lead them to be curious about certain things, to wonder, and to ask questions. This is the turning point of the Information Search Process, when uncertainty diminishes and confidence increases. The task is to form a focus from information encountered during the Exploration stage. The topic becomes more specific and personalised in this stage, and provides the essential focus and direction for knowledge construction to happen. Students work to craft a question, plan, abstract, statement of intention or thesis statement and engage in feedback and reflection (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari 2007).

Collection

The task of the collection stage is twofold. Firstly, students gather pertinent information that addresses the focused topic, and secondly, they interact with the found information to construct deep knowledge and understanding. During Collection, students' interest and confidence commonly increases as they gain a sense of ownership and expertise in the subject. Because students reach this stage with a rich background knowledge of their topics, the information sources they engage with are likely to be more complex, targeted to addressing the specific focus and complex questions that are directing their inquiry. At the Collection stage, students interrogate sources and collect ideas, and work to structure these ideas into a coherent whole that will represent their depth of knowledge and understanding about their specific inquiry. Students typically need guidance and instruction in structuring their ideas in meaningful ways to represent their new understandings, such as information analysis, synthesis, developing arguments, incorporating evidence and working with information in ethical and responsible ways (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari 2007).

Presentation

In the Presentation stage, students complete their searching, analysis and organisation of ideas, and prepare to present the results of their inquiry. The primary task at hand is to represent their new knowledge and understanding as a coherent and integrated body of knowledge, consistent with the task requirements. They work through some critical challenges, such as, 'What does "good" history/science/economics knowledge look like?', 'How is it typically presented in the real world?' and 'What are the appropriate and effective ways of combining textual, visual and graphical information to convey depth of understanding?' They typically need guidance and instruction in communicating their ideas clearly and effectively (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari 2007).

Assessment

In the Assessment stage, both students and teachers judge the topical knowledge that has been learned as well as the learning process/experience. Students reflect on what they have learned to discover what went well and what might be improved on, providing vital feedback

to enable the instructional team to document the learning outcomes, and inform the instructional process (Kuhlthau 2004; Kuhlthau, Maniotes & Caspari 2007). Each of the stages of the Guided Inquiry process provide opportunities for both students and the instructional team to reflect on the learning journey, and to diagnose interventions that might be needed to enable the information-to-knowledge journey to proceed in a timely way. The interventions at each stage provide mechanisms for ongoing formative assessment to be woven into the design of the inquiry study, providing timely and descriptive feedback to both students and the instructional team, and which further guides the dynamic instructional planning. This formative assessment, coupled with the summative assessment, enables the instructional team to gather evidence of learning process and learning outcomes (see p. 25 for clarification of these terms).

Information Search Process design principles

The Information Search Process, as the instructional framework for enacting Guided Inquiry, is underpinned by several key instructional design principles. These are embedded in the Curriculum Integration Matrix.

1. Effective inquiry is guided and structured utilising diverse and complex information sources (both digital and print).

Through engaging in Guided Inquiry, students move away from traditional library research approaches which emphasise finding the right answer, stockpiling and memorising a collection of facts, and transporting and repackaging information. They are guided through a staged process of intellectual construction and transformation to help them to build on what they already know and to come to a deeper understanding of the concepts and problems underlying their topics. The Information Search Process—as a research-developed and validated model—represents that staged process. It puts emphasis on the students and their knowledge journey and knowledge outcomes, rather than on the information foundation. It provides staged opportunities for students to master complex digital literacies, critical thinking and knowledge-building capabilities. It provides a staged structure so that students are not abandoned in the knowledge-building journey. In traditional library research, students are often supported in their information finding, yet left to their own devices

to independently do something with the found information. They are abandoned at the most complex and difficult time—that of constructing their own deep knowledge and understanding.

2. Guided Inquiry revolves around mediation and intervention at all stages of the process.

The pedagogical focus of Guided Inquiry is to build a community of learners, and mediation and intervention are key mechanisms in this process. Mediation is defined as the 'human intervention to assist information seeking and learning from information access and use … A mediator, however, implies a person who assists, guides, enables, and otherwise intervenes in another person's information search process' (Kuhlthau 2004, p. 107). A mediator is different to an intermediary, the latter being something that 'intercedes between the information and the user, but this interchange may not involve any human interaction' (p. 107). Intervention centres on the way in which 'mediators become involved in the constructive process of another person … in information seeking and use' (Kuhlthau 2004, p. 127). Kuhlthau's research shows that most library interventions tend to be based on sources, that is, matching a student's query with the organised collection, often with little attention given to the holistic experience of students in the process of constructing new understandings and meanings. Guided Inquiry calls for guiding students throughout the information seeking and using process, steering them in the process of building new understandings. Central to effective inquiry is the 'zone of intervention'. Borrowing from Vygotsky's (1978) concept of a zone of proximal development, guidance can be developed around a zone of intervention, in which a student can do with advice and assistance what he or she cannot do alone or can do only with great difficulty (Kuhlthau 2004). Accordingly, the Curriculum Integration Matrix has been developed to provide opportunities for mediation and intervention as determined by the instructional team.

3. The specific interventions are determined by the stage of the Information Search Process, the affective, cognitive and behavioural needs of the learners as diagnosed by the instructional team and the curriculum objectives/syllabus outcomes to be achieved.

The Curriculum Integration Matrix provides an overview of the range of interventions that might support students' engagement in the inquiry process. A constructivist approach does not prescribe the interventions; rather these are negotiated though careful consideration of a range of learning dimensions. The Curriculum Integration Matrix is not presented as a scope-and-sequence hierarchical approach, nor is it meant to be prescriptive. It functions as a framework for guiding the selection of interventions that might be needed to support students working as a class, in smaller groups and individually. Specific interventions are collaboratively negotiated and determined by the stage of the search process, the affective, cognitive and behavioural needs of the learners, and the curriculum standards and goals to be achieved. More specifically, the selection of interventions as articulated in the Curriculum Integration Matrix is determined by:

- the specific curriculum content and skills objectives that are to be developed though the inquiry experience
- the cognitive level of the inquiry task
- the year level
- the previous experience and learning outcomes of the students
- the particular learning needs and problems that learners face as observed and identified by members of the instructional team
- formative and summative assessments of previous learning
- student and team reflection on previous learning tasks
- other learning input available in the school
- ongoing diagnoses though feedback as students engage in the stages of inquiry.

Instructional teams are encouraged to document instructional interventions and chart learning outcomes, and to participate in whole-school curriculum mapping to ensure that all students have the opportunity to learn the skills, attitudes and habits of mind that underpin Guided Inquiry. In elaborating the range of competencies that provide opportunities for intervention, the Curriculum Integration Matrix goes beyond specifying lists of information literacy skills in some predetermined order or sequence. Information literacy competencies are vitally important; however, the Curriculum Integration Matrix looks more holistically at the inquiry process to identify a wider range of capabilities for deep inquiry. Accordingly, the following categories are used in the matrix:

- **Resource-based capabilities:** These are abilities and dispositions related to seeking, accessing and evaluating resources in a variety of formats, including people and cultural artefacts as sources. They also include using information technology tools to seek out, access and evaluate these sources, and the development of digital and print-based literacies.
- **Thinking-based capabilities:** These are abilities and dispositions that focus on substantive engagement with data and information, the processes of higher order thinking and critical analysis that lead to the creation of representations/products that demonstrate deep knowledge and deep understanding.
- **Knowledge-based capabilities:** These are the abilities and dispositions that focus on the creation, construction and sharing of the products of knowledge that demonstrate deep knowledge and understanding.
- **Reading to learn capabilities:** These are the abilities and dispositions related to the transformation, communication and dissemination of text in its multiple forms and modes to enable the development of meaning and understanding.
- **Personal and interpersonal capabilities:** These are the abilities and dispositions related to the social and personal aspects of learning about self as a learner, and the social and cultural participation in inquiry learning.
- **Learning management capabilities:** These are the abilities and dispositions that enable students to prepare for, plan and successfully undertake a curriculum-based inquiry unit.

As can be seen from the above range of capabilities and the desired kinds of learning, Guided Inquiry as an instructional framework takes a more holistic approach to identifying the abilities and dispositions that are needed to support effective inquiry. By focusing on the development of deep knowledge and understanding, Guided Inquiry encourages the instructional team to look more holistically at the information-to-knowledge journey of students, including behavioural, cognitive and affective dimensions. It goes beyond traditional approaches to implementing information literacy instruction in the following ways:

a. It is not based on a prescribed set of information handling skills that follow a scope-and-sequence approach where the mastery of these skills becomes the primary objective of the instruction; rather, the objective is to enable and support the development of deep knowledge and understanding.
b. It is not based on reductionist approaches to information literacy development, where knowledge construction in various disciplines is reduced to a generic

construct of locating, analysing and synthesising information. Such an approach does not take into account that the various disciplines of knowledge such as history, science, geography and economics exhibit distinctive structures or patterns of meaning, and have different (and complex) ways of 'coming to know'. These include how knowledge is gained in a discipline, how it is validated, how it employs different methods for creating new knowledge and how it validates claims to new knowledge. How experts go about making discoveries and building new knowledge in mathematics, sciences, social sciences or music for example, cannot be reduced to simplistic ideas of mastery of a generic listing of information skills (Phenix 1986).

c. It does not treat information and technical/digital literacies as separate disciplines, where the teacher librarian teaches information skills, and the disciplinary content is left to the classroom teacher. Rather, it focuses on the integration of content and process in very dynamic ways to ensure the depth of learning.

Instructional teams are encouraged to make use of a number of supporting elaborations of information literacy competencies available in the educational literature, and which include some year and school level specifications (Kuhlthau et al. 2007; AASL & AECT 1998). In addition, it is important to consult state standards documentation targeted at information and communications technology. These typically elaborate concepts, skills and expectations.

To guide in the selection of these skills as instructional interventions, here are some important questions for instructional teams to consider in the planning process for Guided Inquiry:

- What are the curriculum content standards/syllabus objectives that will be developed?
- What are the curriculum skills standards/syllabus objectives to be developed?
- What is the school level—primary, upper primary, middle or secondary?
- Who are the students—for example, mixed ability, at risk, special needs, gifted and talented?
- What do we already know about these students and their approaches to learning and inquiry, including strengths and weaknesses and feedback from key people in the school?
- What is the time frame, including number of proposed lessons and independent time?

- Who will comprise the instructional team—for example, teacher librarian, classroom teachers, special needs teachers, reading/literacy support, technology support, additional expertise from within and outside the school such as information agencies, museums, specialist experts?
- How will we guide students in their inquiry, and how will the responsibilities be shared?
- At what stages of the Information Search Process will we intervene? Why?
- Using the Curriculum Integration Matrix, what are the most needed interventions, given the time constraints and desired syllabus outcomes?
- How do we enable students to stay focused and not be detracted from the learning task at hand?
- How will we motivate and engage students who may perceive the task of searching as primarily one of gathering information and encourage them to instead form focused perspectives from the information encountered?
- How will we provide feedback during the inquiry process?
- How will we know what learning has taken place? How will we measure knowledge development?
- How will we share learning outcomes and use them to inform ongoing learning?

In designing the Guided Inquiry unit (see pages 48 and 49), instructional teams are also asked to consider the following aspects of constructivist learning (Callison, McGregor & Small 1998; Donham, Bishop, Kuhlthau & Oberg 2001; Gore, Griffiths & Ladwig 2002; Harada & Yoshina 2004; Kuhlthau 2004; McAfee Hopkins & Zweizig 1999):

- engaging students from the start through compelling situations and rich stimulus materials that connect their lives and worlds to the curriculum goals, and which inspire them to want to know
- activating and connecting with students' background knowledge
- developing instructional activities which put emphasis on meaningful, authentic tasks that help students develop understandings and skills relevant to problem-solving, and help them to see that these tasks are important for the knowledge outcome
- building and sustaining motivation and interest to engage in their inquiry through exercising some choice with selecting their broad topics (selection), their specific questions they want to answer (focus), and how to present their new knowledge and understandings (presentation)

- engaging students in instructional activities which explicitly encourage thinking, critical analysis, reflection, discovering and linking ideas, making connections and developing and transforming prior knowledge, rather than merely collecting facts
- modelling learning tasks and giving students opportunities to practise their new skills to sustain and support their learning
- providing students with opportunities to summarise, consolidate, reinforce and constantly extend their knowledge
- enabling sustained dialogue and feedback between students, and between the instructional team and students
- structuring learning activities so that they closely resemble the ways that students will be expected to use their knowledge and skills in the real world
- placing emphasis on knowledge developing competencies, rather than source finding and information gathering—moving beyond finding to constructing
- providing students with opportunities to communicate, share, critique, review and reflect on their new understandings
- establishing learning environments and relationships that convey to students that intellectual inquiry and hard work are valued and acknowledged, and ones where students feel connected, cared for and trusted
- working diagnostically so that instruction is responsive to students' personal, social and cultural worlds, valuing differences and cultivating an inclusive community.

Two useful sources for conceptualising and designing inquiry-based research tasks are those by Loertscher, Koechlin and Zwaan (2004 and 2007).

4. Guided Inquiry is an opportunity for instructional teams to provide comprehensive evidence of how resource-based inquiry learning improves student learning outcomes.

As documented above, Guided Inquiry derives its instructional mandate from a body of theoretical knowledge on constructivist learning and empirical research centring on the Information Search Process. As a blueprint for deep learning outcomes through resource-based inquiry, Guided Inquiry is an accountable practice, and measuring and documenting learning outcomes are part of that practice. It is a strategic approach to evidence-based education, and reflects the tri-dimensional model of evidence-based practice developed by Todd (2009) with particular emphasis on school libraries.

Table 3.1: Holistic model of evidence-based practice for guided inquiry

Evidence FOR Practice	FOUNDATION/INFORMATIONAL ◗ Existing formal research provides the essential building blocks for professional practice. ◗ Kuhlthau's Information Search Process, as a research-developed and validated model, provides the informational foundation.
Evidence IN Practice Applications and actions	PROCESS/TRANSFORMATIONAL ◗ Locally produced evidence. ◗ Data generated by practice is meshed with research-based evidence to provide a dynamic decision-making environment. ◗ The use of formative and diagnostic assessments at each stage of the inquiry process provides a basis for generating educational team-observed evidence.
Evidence OF Practice Results: impacts and outcomes; evidence of closing of gaps	OUTCOMES/FORMATIONAL ◗ User-reported evidence. ◗ Learner changes as result of inputs, interventions, activities, processes. ◗ Summative assessments that focus on charting and establishing the development of deep knowledge and learning capabilities

Implementing Guided Inquiry naturally embeds a range of opportunities for evidence-based practice into classroom practices and demonstrates the tangible impacts and outcomes of sound decision-making and implementation of organisational goals and objectives. Guided Inquiry provides instructional teams with a range of strategies that will enable them to chart and document learning outcomes of their teaching and learning activities. It enables them to build a portfolio of local school evidence that shows the importance and value of inquiry learning to their school communities.

Ongoing assessment is one of the primary goals and values of Guided Inquiry. Just to clarify the terminology:

- **assessment** is a gathering of information about what a student knows and can do by observing them at work, looking at a portfolio of their work, or testing their skills and knowledge.

- **formative assessment** is diagnostic feedback for student learning and to inform instruction. This is the same as ongoing assessment.
- **summative assessment** documents what the student has learned at the end of a unit.
- **evaluation** is interpreting and making judgments about the assessment information.

An inquiry-centred research study involving teams of classroom teachers and school librarians (Todd 2006; Todd & Heinstrom 2006; Kuhlthau, Heinstrom & Todd 2008) found that students:

- learned topical content in varying ways, including rich descriptions of topics, as well as showing understanding of complex concepts and explanatory and predictive relationships of topical content
- became more skilful and confident as information seekers
- became increasingly engaged, interested and reflective during their learning process, and saw information seeking as a constructive process of building both deep knowledge and deep understanding
- became more critically aware of the broad variety of sources and their different purposes
- gained practical skills in independent information seeking.

As part of the research study process, the Student Learning through Inquiry Measure (SLIM) Toolkit was developed, tested and refined. The SLIM toolkit is freely available at the Center for International Scholarship in School Libraries (CISSL 2005) website as an evidence-based approach to measuring and charting the outcomes and impacts of Guided Inquiry initiatives, particularly for students from Year 8 and above. It provides instruments for instructional teams to gather data at the Initiation, Focus and Presentation stages, as well as a handbook, coding and analysis guidelines, and a spreadsheet structure for data analysis. It takes instructional teams through writing summaries of the findings and generating claims of learning outcomes based on the findings. The SLIM toolkit moves beyond just product assessments, informal observations, personal experiences, advocacy, testimonials, intuitions and anecdotal evidence as basis of claims of learning outcomes by providing an approach to assessment that seeks to document evidence of deep learning.

Additional evidence-based practice approaches can be used during the Guided Inquiry, depending on the instructional interventions.

Instructional teams are encouraged to use multiple sources and types of evidence and multiple ways of systematically gathering this evidence. The use of multiple sources facilitates triangulation, which is an approach to data analysis that synthesises data from multiple sources. It enables you to analyse, compare and interpret diverse data sets to develop strong claims about impacts and outcomes. Different sources and types of evidence might include:

- student interviews
- student portfolios
- reflection and process journals or search logs
- formative and summative assessment tasks
- process rubrics and product rubrics
- surveys—both student and teacher
- pre-test and post-test measures
- peer review
- student-generated products as representations of new knowledge
- state-wide assessments
- skills measurements
- ongoing performance-based assessments
- general student data
- systematically recorded observations.

It is recommended that a portfolio structure be used by instructional teams to build a strong evidence-based practice approach to their work, and particularly to document their learning interventions and evidence-based claims of learning impacts. This portfolio can include outcomes of the SLIM toolkit; syntheses of pre- and post-survey material on existing and developed knowledge and skills; summaries of student and teacher reflections; summaries of assessment rubrics that chart learning outcomes and documentary evidence of best practices.

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Chapter 4

Quality school libraries: The foundation for Guided Inquiry

> To understand is to discover, to reconstruct by rediscovery, and such conditions must be complied with if in the future individuals are to be formed who are capable of production and creativity and not simple repetition.
>
> Jean Piaget (1896–1980) (Piaget 1972, p. 20)

Guided Inquiry is grounded in a constructivist approach to learning, based on the Information Search Process developed by Kuhlthau (2004) for developing students' competence with learning from a variety of sources while enhancing their understanding of the content areas of the curriculum. The Information Search Process, as a research-tested and research-validated model of the information-to-knowledge journey of students, provides the instructional framework for Guided Inquiry, and is the backbone of the Curriculum Integration Matrix.

A central assumption of Guided Inquiry is that it is grounded in and enabled by the provision of quality school libraries, and the information learning expertise of teacher librarians. Considerable research evidence exists which clearly shows that school libraries are vital to students' education (Hay 2005, 2006; Lonsdale 2003; Scholastic 2008). This research shows that many factors contribute to the establishment and operation of effective school libraries to enable them to contribute substantially to student learning and achievement though Guided Inquiry.

Effective school libraries in 21st century schools provide students with up-to-date and diverse resource collections in a variety of information

formats and readability levels that are aligned with local curriculum requirements, and support state academic content standards and desired syllabus outcomes. Access to and engagement with high quality resources provides the rich information and ideas necessary for students to discover and build new knowledge for themselves.

State-of-the-art information technology

Guided Inquiry in 21st century schools needs and utilises a rich information technology environment. Current developments in information technology and access to web-based environments provide unprecedented opportunities for inquiry learning. Such digital tools and environments seek to facilitate community, communication, collaboration and creativity between users through a variety of interactive functional spaces, and provide a dynamic learning architecture for the creation, production and sharing of knowledge rather than the transmission of and passive interaction with streams of information. Such technologies and tools contribute to a learning environment that is complex and fluid, connective and interactive, diverse and unpredictable. As such, they invite inquiry, engagement, experimentation and interaction. An extensive body of research (as documented in O'Connell & Groom 2010) stresses the importance of 21st century school libraries providing a state-of-the art information technology environment to develop and support inquiry learning throughout the school.

Learning spaces

Effective school libraries provide multi-dimensional learning spaces to meet diverse information needs, learning tasks and instructional approaches. These spaces are structured to:

- accommodate multiple learning styles and teaching styles
- facilitate multiple pathways to information and constructing and representing new knowledge
- provide access to information technology and tools to enable information to be transformed into deep knowledge and deep understanding by students working individually and collectively

- provide dynamic instructional spaces for intellectually challenging lessons, and for students to engage collaboratively and individually in knowledge building and experimenting with ideas in safety and with expert guidance
- provide individual spaces and group spaces, both physical and digital, for construction, co-construction and dissemination of knowledge.

Essential learning foundations for Guided Inquiry

Reading and literacy development

Guided Inquiry has its foundation in students who are able to read, and who are motivated to read, write and listen in order to learn. Reading and literacy research (Krashen 1988, 1989, 1993, 1997) tells us that:

- access to reading materials in school libraries predicts motivation to read and reading achievement
- long-term development of reading interest and grade-level achievement has a stronger base in print-rich environments
- a rich supply of high-interest diverse sources provides sources of ideas for the knowledge construction process and a basis for students becoming independent, efficient readers and learners
- more flexible access to the school library and free voluntary reading results in increased interest in books, more enjoyment of reading and improved learning outcomes through expert engagement with text.

Effective school library initiatives further promote and encourage reading for academic achievement and lifelong learning through:

- reading enrichment programs
- participation in national and state reading celebrations and initiatives
- collaboratively planning reading and writing enhancement activities with classroom teachers and literacy specialists
- providing the skills to enable students to interrogate diverse information sources and build their own understandings and viewpoints.

Expert instructional leadership in the school library

Research tells us that effective school libraries are an integral part of teaching and learning (Hay 2005, 2006; Lonsdale 2003; Scholastic 2008). This does not

happen by chance, or through the mere existence of a physical library facility. A formally trained teacher librarian working as an information learning specialist, together with classroom teachers, plays a key role in implementing Guided Inquiry (Todd & Kuhlthau 2005a, 2005b). The teacher librarian has:

- expertise in how students build knowledge and learn deeply though engaging with information
- an understanding of the complex array of competencies required to enable engagement and knowledge-based outcomes
- expertise in establishing and collaborating with instructional teams and planning and implementing instruction (tied to specific curriculum content) that guides and enables students to learn through diverse, complex and multi-format resources, and become quality researchers, information seekers and knowledge creators
- expertise as partner–leader in the provision of learning-oriented professional development for Guided Inquiry targeted to whole-school success with learning outcomes
- expertise as a school library administrator who mutually negotiates, plans and implements (with school leaders, teachers, students and the parent community) a whole-school Guided Inquiry which focuses on achieving curriculum outcomes.

These essential learning foundations and instructional partnerships and teams are the building blocks for Guided Inquiry, and are represented in the following model, developed by Todd and Kuhlthau (2005a, 2005b).

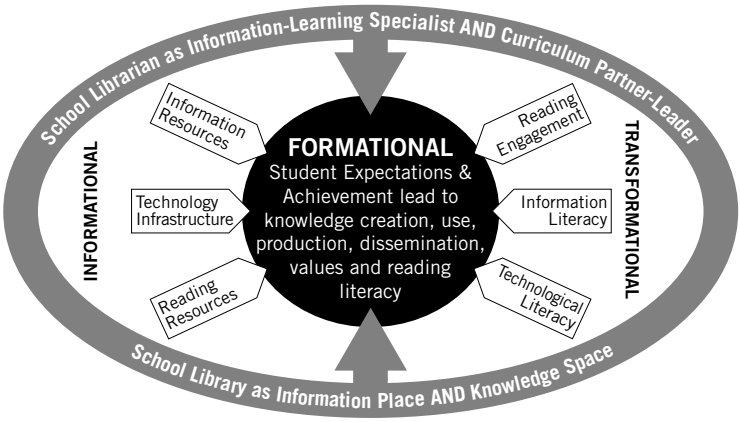

Figure 4.1: Model of the school library as a dynamic agent of learning

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Curriculum Integration Matrix

The Curriculum Integration Matrix is designed to illustrate the range of competences that might need to be developed through intervention, rather than a complete listing. It is not presented as a scope-and-sequence hierarchical approach, nor is it meant to be prescriptive. It functions as a framework for guiding the selection of interventions that might be needed to support students, working as a class, in smaller groups and individually as they progress through their inquiry units. The selection of interventions are negotiated by the instructional team and determined by a range of contextual factors, such as:

- the specific curriculum content and skills objectives that are to be developed though the inquiry experience
- the cognitive level of the inquiry task
- the year level
- the previous experience and learning outcomes of the students
- the particular learning needs and problems that learners face as observed and identified by members of the instructional team
- formative and summative assessments of previous learning
- student and team reflection on previous learning tasks
- other learning input available in the school
- ongoing diagnoses through feedback as students engage in the stages of inquiry.

COMPETENCY: Skills, abilities and habits of mind (e.g. discovery, inquiry, creativity) that underpin working with information to build deep knowledge and understanding.	**INITIATION:** Students commence a curriculum-based inquiry unit that requires extensive research from multiple sources.	**TOPIC SELECTION:** Students choose general topics that emerge out of curriculum themes/ standards/syllabus goals being addressed.	**EXPLORATION:** Students explore information with the intent of finding a focus that will direct their inquiry.
LEARNING MANAGEMENT COMPETENCIES: These refer to competencies that enable students to prepare for, plan and successfully undertake a curriculum-based inquiry unit.	Recognise that an inquiry-based process has steps and stages for success; know that good research takes time and effort; recognise the need for planning, time management, task organisation and inquiry process management; understand and follow steps involved in an inquiry-based process; develop and follow simple to complex inquiry plans, depending on task, time and year level; set up and apply structures, strategies and files to maintain and manage the inquiry process; set up approaches to information and document management; carry out journalling process as required by the inquiry task.	Monitor the inquiry process; set up systems to track information seeking; document topic choices and rationale for choices (linked to interests, inquiry requirements); understand strengths and weaknesses of undertaking topic choices; be able to refine topic choices based on feedback.	Continue to monitor research process and information seeking process in relation to time and task goals; be open and responsive to new and diverse perspectives; incorporate group and instructional team feedback into the inquiry; be able to prioritise, plan and manage work to achieve the intended goal of establishing inquiry focus.

FORMULATION: Students negotiate and formulate a focus for their investigation, based on background knowledge already developed.	**COLLECTION:** Students select, evaluate and interact with complex sources, data and ideas, and create and build deep knowledge and understanding of their inquiry.	**PRESENTATION:** Students share their deep knowledge and understanding with others.	**ASSESSMENT:** Students reflect on and judge what was learned about curriculum content through the inquiry process.
Recognise need for planning and focusing task; plan and develop directions for specific inquiry which outline essential questions, pertinent resources, timeline; use feedback loops (e.g., create an abstract, proposal or research plan; develop plan and justification for representing and presenting new knowledge; seek feedback on scope, depth, and structure of proposed inquiry).	Plan complex search strategies for collecting pertinent sources, ideas and data; create and maintain structure(s) for managing the collection process (including text, images and multimedia); create and maintain structure(s) for recording and managing found information, collected data and analysis; select appropriate and relevant strategies for minimising time taken to process information and data; plan structure(s) for documenting and citing sources.	Select appropriate and relevant strategies for managing time and processes involved in creating representation of new knowledge; identify and plan for developing required production skills and technologies to create the knowledge product; set up processes to manage and track edits and versions of representations of new knowledge.	Reflect on adequacy and efficiency of planning process to complete the inquiry task; reflect critically on learning experiences in order to inform future planning of inquiry tasks; reflect on meeting learning goals in relation to planning processes; identify strengths and weaknesses of planning process; reflect on how obstacles and competing pressures were dealt with; reflect on the adequacy of and ability to prioritise, plan and manage work to achieve the intended result; reflect on quality of technology skills mastered during inquiry unit.

COMPETENCY	INITIATION	TOPIC SELECTION	EXPLORATION
RESOURCE BASED COMPETENCIES: These are competencies related to seeking, accessing and evaluating resources in a variety of formats, including people and cultural artefacts as sources. They include using information technology tools to seek, access and evaluate these resources.	Engage with and share resources that bring the inquiry unit alive and which help show the real world importance of undertaking the inquiry; actively engage with resources that build interest, connections and increase motivation to explore; actively engage with resources and ideas that foster listening and thinking about possible topics; be able to see and make connections to task requirements.	Find, evaluate and select sources that facilitate topic selection; use technology tools to facilitate topic selection (e.g., wordle, wordsift, google wonderwheel, google squared); know how to construct effective search terms/ strings to identify and select topics; develop search terms and strategies to identify and select topics; know and be able to apply a range of search strategies such as key words, broadening and narrowing topics, and identifying related topics; select sources of relevant information using library organisational systems and knowledge of search engines; work with a continuum of simple to complex searches of library catalogue, databases and web depending on information task using author, title, natural language, controlled language; use appropriate access skills to locate and retrieve relevant information from a variety of sources.	Find, evaluate and select sources that enable building background knowledge; understand criteria for selecting sources to ensure quality information; evaluate information based on dimensions such as accuracy, relevance, purpose and context; continuously question and reflect on quality of sources selected; select sources that convey different viewpoints/ perspectives; utilise different media/formats to build background knowledge of topic, recognise the scope and complexity of background knowledge; demonstrate mastery of technology tools for accessing sources/ formats/viewpoints; use a range of information-seeking strategies to seek divergent perspectives; recognise structures and qualities of different types of content such as newspaper, web entry, encyclopaedia, media report, blog; use technical tools like wordle and wordsift to test readability, vocabulary, relevance of found information; effectively employ skimming and scanning techniques; develop structures to record development of background knowledge; use appropriate citation standards and processes.

FORMULATION	COLLECTION	PRESENTATION	ASSESSMENT
Select sources with different perspectives and viewpoints to frame focus questions; develop search strategies for questions to be linked to pertinent sources; make independent choices in resource selection based on emerging focus questions; assess gaps and weaknesses in resource needs; negotiate additional resource access, e.g. inter-library loans	Plan complex search strategies for collecting targeted sources, ideas and data; evaluate sources and found information based on dimensions such as accuracy, relevance, purpose and context; continuously question and reflect on quality of sources selected and relationship to focus questions; select different media/ formats targeted to focus; understand strengths, weaknesses and uses of different formats in relation to focus; use appropriate citation standards and processes.	Respect copyright/ intellectual property rights of authors; understand and apply creative commons for online publishing; identify, select and discriminate between technology tools and techniques appropriate for knowledge representation; identify resources and strategies to help develop skills in using chosen tools for knowledge representation.	Reflect on adequacy, quality and use of resources, and how these enabled or hindered the learning process and the depth of knowledge and understanding presented; reflect on appropriateness and adequacy of search strategies used; reflect on use of technology tools to access and retrieve sources; reflect on understanding of resource selection criteria and how this shaped the inquiry process and final product.

COMPETENCY	INITIATION	TOPIC SELECTION	EXPLORATION
THINKING BASED COMPETENCIES: These are competencies that focus on substantive cognitive engagement with data and information, the processes of higher order thinking and critical analysis that lead to the creation of representations/ products that demonstrate deep knowledge and deep understanding.	Understand and value the importance and worth of doing an inquiry task; explain the real world relevance of undertaking the inquiry; find personal connections to the world, and to self; identify and understand outcomes of the inquiry learning; understand how inquiry unit can contribute to school achievement and personal success.	Identify and state set of possible topics; think flexibly and openly about choice of topic; identify why student is interested in topic; connect potential topics to students' interests, prior knowledge and experience; cluster topics; identify strengths and weaknesses of each possible topic; provide rationale for topic choices; finalise own area of interest and establish rationale for topic selection.	Maintain openness to new ideas; show willingness and ability to consider divergent opinions and perspectives; cluster and categorise facts/ viewpoints/perspectives into thematic groups to give structure to background knowledge; understand both how and why ideas and messages are constructed, and for what purposes; examine how people interpret ideas and messages differently; recognise how and why values and points of view are included or excluded, recognise how messages and ideas can influence thoughts, feelings and behaviours; understand how to work with conflicting ideas and perspectives; know how to deal with factual errors; apply strategies for dealing with different perspectives; think through and determine how to act on information (accept, reject, modify); recognise need to read more widely when background knowledge is incomplete or insufficient.

FORMULATION	COLLECTION	PRESENTATION	ASSESSMENT
Raise and formulate a range of questions (from simple to complex); develop and refine the deep questions/focus statements that direct and shape the personal inquiry; demonstrate thought and creativity in establishing questions/ focus statements; craft meaningful questions/ focus statements that show depth to proposed inquiry; assess gaps/weaknesses in questions/focus statements.	Apply critical and reflective thinking skills to analyse, synthesise and evaluate ideas; utilise a variety of tools, scaffolds and processes to collect, analyse and organise selected information; demonstrate use of a range of analytical processes to find patterns; identify relationships between central ideas; establish bias; develop arguments; draw conclusions; establish positions; demonstrate originality and inventiveness in thinking and problem-solving; use technology tools to list ideas and structure them into appropriate sequences; show adaptability in thinking and problem-solving; use divergent and convergent thinking to formulate and test conclusions; use technology tools such as databases and spreadsheets to think through and explore relationships and to help with problem-solving and making decisions; use a range of technology-based visual thinking tools to support structuring of ideas; demonstrate creativity in engaging with and exploring ideas.	Understand how knowledge can be represented most effectively based on content and audience; show how to select and apply appropriate disciplinary conventions for representing knowledge; think through a variety of ways for manipulating text, images and data to create meaningful knowledge representations for specific audiences; justify approaches to presentation in terms of audience; explain use of particular technology tools and techniques to represent new knowledge; evaluate strengths and weaknesses of students' decisions and actions for knowledge representation; think through and act on feedback and creative ideas to make a worthwhile product.	Reflect critically on learning experiences and thinking processes used throughout the inquiry; reflect on effectiveness of information analysis and synthesis; identify strengths and gaps in thinking processes and how these might be further developed and improved.

COMPETENCY	INITIATION	TOPIC SELECTION	EXPLORATION
KNOWLEDGE BASED COMPETENCIES: These focus on knowledge creation, including co-creation and sharing the processes of creating the representation/ products of knowledge.	Show motivation, interest and determination in creating a worthwhile outcome; understand that creating an inquiry product is about demonstrating own knowledge, not replicating the knowledge of others; identify existing/ prior knowledge; make connections to prior knowledge and experiences.	Show understanding of how a discipline is organised around topics/themes/ central ideas; show understanding of the scope and depth of a broad topic; show understanding of how experts in topic area work to build deeper knowledge of the topic; identify central concepts and relationships of topic.	Show knowledge of and ability to apply citation and documentation processes to track emerging knowledge and understanding; use a variety of technology tools to document background knowledge; select and record main ideas in a variety of ways to construct picture of background knowledge of chosen topic (e.g., concept map, mind map, wiki, timeline, grid and other initial note taking strategies); use tables, templates and graphical structures to represent background knowledge; use technology tools and techniques to organise concepts and their relationships; map divergent issues and ideas that allow relationships to be identified.

FORMULATION	COLLECTION	PRESENTATION	ASSESSMENT
Show an understanding of the essential questions of a discipline; engage in a range of question-formulation strategies; test the worth/merit of focus questions; establish appropriateness of questions/focus in relation to task requirements.	Construct sequence of ideas to form coherent, clear and meaningful representation of knowledge; show understanding of the vocabulary of focused topic; use appropriate language systems for constructing knowledge; construct drafts of new knowledge and solicit and seek feedback; refine process of constructing knowledge using appropriate language conventions and technology tools.	Communicate ideas clearly and effectively through constructed products; manipulate text, images and numeric data to create simple to complex products representing deep knowledge and understanding for specific audiences; produce accurate and suitably formatted products to suit stated purposes and audiences; translate thinking into actual knowledge representation; demonstrate understanding of copyright and creative commons guidelines in publishing creative outputs.	Reflect on mastery of tools, techniques and processes to construct and present deep knowledge; reflect on capacity to incorporate feedback effectively throughout the process to improve the outcome; deal positively with praise, setbacks and criticism.

COMPETENCY	INITIATION	TOPIC SELECTION	EXPLORATION
PERSONAL AND INTERPERSONAL COMPETENCIES: These are related to the social and personal aspects of learning about self as a learner, and the social and cultural participation of inquiry.	Develop and display interest, initiative, interest, motivation; be willing to work effectively in diverse teams; respect cultural differences; work effectively with people from a range of social and cultural backgrounds; use accepted protocols to communicate regularly online and in class with peers, experts, and others; express communication messages in language appropriate to selected form of communication.	Display curiosity to pursue multiple interests and engage with ideas of others; collaborate with others to share and discuss topic selection; exchange ideas and considered opinions about potential with others through online and class mechanisms; demonstrate ability to effectively listen and critique topic ideas of others; demonstrate ability to work effectively and respectfully with diverse teams in topic selection; assume shared responsibility for collaborative work; value individual contributions about topics made by each team member.	Participate effectively in collaborative approaches to building background knowledge (e.g., wiki); respect how others interpret information and ideas differently; contribute positively to resolving differences in knowledge; ask questions; listen effectively to decipher meaning, including knowledge, values, attitudes and intentions.

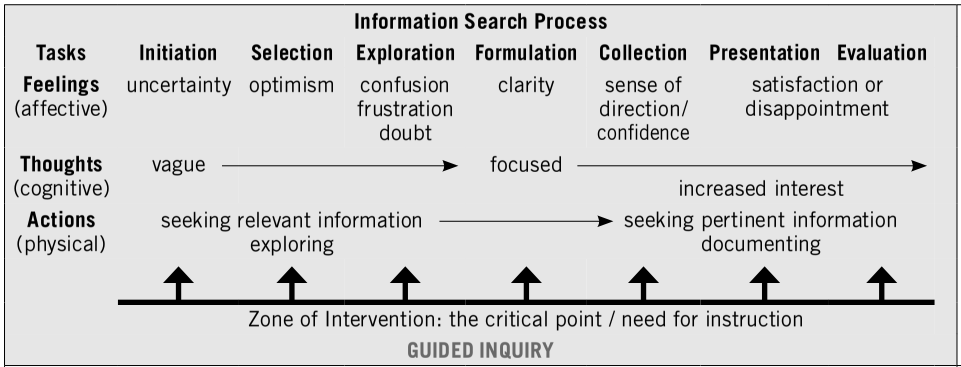
FORMULATION	COLLECTION	PRESENTATION	ASSESSMENT
Demonstrate confidence and self-direction in question formulation; seek feedback from instructional team and peers; participate actively with others by contributing questions, ideas (collaborative learning); show active and sustained team work as required; demonstrate motivation to formulate and answer personal questions; display willingness to go beyond academic requirements; exchange ideas and considered opinions with others through online forums and websites.	Follow ethical guidelines in recording ideas; develop and demonstrate personal productivity by creating representations of personal learning; collaborate with others to exchange ideas, critique, peer review; solicit feedback on draft process; understand and apply procedures for academic integrity; document ideas and sources ethically and correctly.	Communicate clearly; articulate thoughts and ideas effectively using oral, written and nonverbal communication skills/ tools in a variety of forms and contexts appropriate to task; demonstrate ability to engage in public conversation about personal knowledge; contribute to the exchange of ideas; demonstrate ability to use collaborative/ networking technology tools to share and exchange ideas; demonstrate respect for principles of intellectual freedom; demonstrate appropriate writing, speaking and technical skills to communicate understandings; demonstrate leadership, team work and responsibility.	Assess strengths and weaknesses of personal learning through the inquiry process; identify transferable skills, techniques and processes; establish personal improvement goals; reflect on how skills and insights gained in inquiry process might be used in other situations.

COMPETENCY	INITIATION	TOPIC SELECTION	EXPLORATION
READING TO LEARN: These competencies are broadly related to reading and literacy: the transformation, communication and dissemination of text in its multiple forms and modes and the development of meaning and understanding.	Understand the importance of having and utilising reading strategies for engaging with potentially large volumes of information that provides the foundation for the inquiry; know and develop strategies for person-to-text; text-to-world and text-to-text connections; use a range of reading strategies to activate prior knowledge; engage with visual information to activate prior knowledge and make real world connections to learning task; activate background knowledge when reading through text structure and signal words.	Engage in reading strategies to identify and select topics of interest; select sources related to reading ability; use technology tools to foster visualisation and make textual connections to topics; select resources at appropriate reading and difficulty levels.	Monitor comprehension of background knowledge of topic; read analytically to reinforce information already known, gain additional information and contradict previous knowledge; determine insufficient information and make appropriate reading choices; unravel confusion about the topic; create sensory mental images from written or oral text, including pictures, smells, tastes, sounds, feelings that are connected to the reader's life experiences and memories; use a range of reading comprehension strategies to ensure depth of interaction with sources and ideas; recognise when comprehension breaks down and seek assistance.

FORMULATION	COLLECTION	PRESENTATION	ASSESSMENT
Use reading strategies that help determine the importance and relevance of ideas; use text organisers (e.g., contents, headings) to frame questions; develop and document significant questions related to the text; frame questions to support internal dialogue between the reader, author, illustrator or text; develop questions based on skimming and scanning title, heading, subheadings, pictures, captions; use texts to generate literal questions and inferential questions that may form focus of inquiry.	Prioritise information and merge thinking with information; understand and use a variety of text organisers for building comprehension; merge background knowledge with clues in text to come up with ideas not explicitly stated by the author; read to confirm or contradict predictions by end of text.	Effectively use and engage with blogs and other online tools to reflect on progress and difficulties during inquiry units.	Reflect on appropriateness and efficacy of reading comprehension strategies employed to undertake inquiry unit; identify reading comprehension barriers and approaches to dealing with them.

Guided Inquiry at work

Template for Planning the Guided Inquiry Unit



Student-related aspects

- Learning dilemmas
- Challenges
- Observations

Learning task: Process and product

Standards/syllabus outcomes/years or phases of learning

Information Search Process model adapted from Kuhlthau, Maniotes & Caspari 2007, *Guided Inquiry: Learning in the 21st century*, Libraries Unlimited, Westport, CT, p. 19.

Guided Inquiry stage	Potential instructional interventions	Evidence strategies/assessment/feedback (formative/summative; informal/formal)
INITIATION		
SELECTION		
EXPLORATION		
FORMULATION		
COLLECTION		
PRESENTATION		

Further reading

American Association of School Librarians (AASL) 2007, *Standards for the 21st-century learner*, American Library Association, Chicago, <http://www.ala.org/ala/mgrps/divs/aasl/guidelinesandstandards/learningstandards/standards.cfm>.

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Curriculum integration

Learning in a changing world

Curriculum integration outlines and presents a curriculum integration matrix for 21st century learning in complex and diverse information environments. The curriculum integration matrix is based on the constructivist instructional framework of Guided Inquiry and underpinned by the Information Search Process, both developed by Carol Kuhlthau, Professor Emerita, Rutgers University. It outlines how Guided Inquiry as an instructional framework in 21st century schools can be developed and implemented to enable students to learn meaningfully from diverse and complex information sources. It presents and elaborates a Curriculum Integration Matrix structured on the research-based model of the Information Search Process, and establishes a set of potential strategies and approaches for designing quality teaching and learning through Guided Inquiry.

The *Learning in a Changing World* series addresses how the process of learning is evolving – including the array of resources available in the digital age, changing curriculum, and the different teaching strategies needed in order to use new media and technologies. The series presents the core areas for teacher librarians and school leaders to consider for 21st century learning: the digital world, virtual worlds, curriculum integration, resourcing, and the physical environment. All are essential elements to enable and empower our students to be lifelong learners and active participants in our society.

Dr Ross J. Todd is Associate Professor in the School of Communication and Information at Rutgers, the State University of New Jersey. He is also Director of the Center for International Scholarship in School Libraries (CISSL) at Rutgers University. His primary teaching and research interests focus on adolescent information seeking and use. The research includes: understanding how children learn and build new knowledge from information; how teacher librarians and classroom teachers can more effectively empower student learning; and how the development of information and critical literacies through guided inquiry and constructivist learning approaches lead to deep knowledge and deep understanding.

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