# Inquiry Based Learning Models, Information Literacy, and Student Engagement: A literature review

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*This paper explores the research literature relevant to the increasingly popular field of Inquiry Based Learning (IBL) practices in K-12 academic environments. IBL is constructivist and student-centered (Barron & Darling-Hammond, 2008; Condliffe, Visher, Bangser, Drohojowska & Saco 2016; Duffy & Raymer, 2010; Kuhlthau, Maniotes, & Caspari, 2015), leveraging student motivation and engagement through its grounding in authentic, relevant study (Deci & Ryan, 2016; Saunders-Stewart, Gyles, Shore & Bracewell, 2015). Recent research shows positive academic and achievement gains for students engaged in IBL work and the practice is growing. Some educators are experimenting with variations of increasingly student-driven models that privilege student choice and autonomy, such as 20% time or genius hour (Krebs & Zvi, 2015), passion-based learning (Maiers & Sandvold, 2010), and personalized learning (Bray & McClaskey, 2016). We name these more student-autonomous frameworks Student Driven Inquiry (SDI) models. The argument here is for qualitative research on the learner experience of these more recent SDI models in order to glean a more holistic understanding of the outcomes beyond grades and test scores. An examination of the recent literature on inquiry based learning, information literacy and student motivation demonstrates the need for qualitative work focused on the efficacy of a growing highly student-centered learning model.*

# Introduction

Despite growing recognition that creativity and innovation are necessary aptitudes for successful and satisfied adult citizens (AASL, 2007; Henderson, 2008; Partnership for the 21st Century, 2013; Zhao, 2012), research shows these skills diminish for American students with each year spent in school (Zhao, 2012). While IQ and SAT scores have increased, creativity scores have dropped significantly since 1990 (Kim, 2011). According to Land and Jarman, "…. non-creative behavior is learned." (1992). In fact, after showing genius levels of creativity at ages four and five, U.S. students begin to show dwindling interest in school in the second grade (Zhao, 2012). Declaring a "creativity crisis," Kyung Hee Kim's research (2011) shows that while creativity in Americans of all ages suffers over time, the greatest loss happens for children in grades Kindergarten to third grade (ages 5 – 8). Kim argues that the academic focus on high stakes testing consumes class time better spent on more holistic, immersive learning pursuits, ones designed to spark imagination and engage the critical thinking required for growing creative, innovative minds. These findings suggest educators are not using instructional models that maximize creativity and deeper student engagement.

The current educational model is not working for many American students; school is not serving broader societal goals for a thriving citizenry of active, interested and self-possessed individuals. The Partnership for the 21st Century Learning (2013) states that, "There remains, however, a profound gap between the knowledge and skills most students learn in school and the knowledge and skills they need in typical 21st century communities and workplaces". The current traditional educational paradigm remains rooted in the industrial revolution and the factory production model where one size fits all and turns out "standardized" individuals. It has yet to move toward development of creative and innovative learners and thinkers able to successfully engage in diverse and complex environments (Robinson & Arnica, 2016; Wagner & Dintersmith; Zhao, 2012).

Forward-thinking educational scholars and practitioners, school librarians among them, are working towards a shift from outdated lock-step teaching modes of instruction to ones that actively engage students in authentic, relevant work. Such student-centered instruction is considered supportive of skills development necessary for effective and satisfying participation in an increasingly complicated, global society. Growing scholarly understanding reports that students experience academic engagement through feelings of relevance and choice, the knowledge that their work and learning matters and is valued by themselves and by others (Deci & Ryan, 2008, 2016; Guay, Ratelle, & Chanal, 2008; Núñez & León, 2015). New student-centered methods feature opportunities for students to research and explore, experiment, collaborate, make choices, and use their imaginations.

Currently, Inquiry Based Learning (IBL) is offered as an effective framework for catalyzing positive shifts in learning processes and strategies (Barron & Darling-Hammond, 2008; Bell, 2010; Buck Institute of Education, 2014; Duffy & Raymer, 2010; Friesen & Scott, 2013; Krajcik & Blumenfeld, 2006; Small, 2009; Thomas, 2000; Wolk, 2008). To date this framework is implemented in pockets around the country only. Where it is implemented, IBL allows students to make determinations about the problems, challenges and issues they investigate, helping move students toward meaningful engagement and deeper learning. It has been found that greater autonomy through IBL helps students develop knowledge and process skills as well as self-confidence, as they work and learn through questioning and problem-solving (Nunex & Leon, 2015; Small, 2009; Thomas, 2000). Included in this learning challenge is opportunity for students to experiment, fail, return to researching, revise thinking, and try again -- engage in creative and innovative practices. Such a learning framework encompasses a broader view of what education should accomplish: to

support the growth of healthy, engaged individuals able to contribute to their communities as satisfied, productive students, citizens and lifelong learners (Barron & Darling-Hammond, 2008; Noddings, 2005).

Today, variations of the IBL framework are springing up among like-minded educators, for example: Project Based Learning (Buck Institute of Education, 2014), Problem-Based Learning (Savery, 2015), Genius Hour or 20% Time (Eckert, 2016; Juliani, 2014; Krebs & Zvi, 2015), Passion-based Learning (Maiers & Sandvold, 2010) and Personalized Learning (Bray & McClaskey, 2016; Zmuda, Curtis & Ullman, 2015) and Open Inquiry (Knodt, 2008).  The designers and teachers implementing such variations share the common belief that students should have some choice, time and measure of autonomy to support deeper, meaningful learning that leads to skills and knowledge critical for the modern student and world citizen.  Those frameworks that favor more student autonomy we will refer here and moving forward as Student Driven Inquiry (SDI), as this term better captures the power and heart of such student-centered frameworks.  These freer frameworks favor student autonomy and place the student in the driver's seat to navigate the learning experience that research shows leads to deeper learning and the propensity and skills for independent lifelong learning (Barron & Darling-Hammond, 2008; Mandelsberg, Pressman, Fitch, Brod & Nelson, 2011; Saltman, 2012; Selwyn, 2010; Robinson & Aronica, 2016; Wagner & Dintersmith, 2015).

Despite developing understanding of desirable modern student skills and sensibilities the majority of scholarly research available on general IBL practices remains focused on student academics and achievement through examination of grades, test scores and educator perspectives.  Those findings are predominantly positive.  There is, however, a notable dearth of scholarly exploration of the student perspective of experience in IBL and apparently no research at all on emerging forms of SDI, a framework of growing interest to many including the researchers here in this work.  Examining the student experience of SDI will be helpful for understanding the more holistic outcomes of this kind of IBL learning experience, possibly those outcomes connected attitudes, perceptions, and engagements.  Do students enjoy doing SDI?  Do they believe SDI is worthy work?  Do students struggle in SDI?  If so, how do students cope with the struggles they encounter?  Where do they feel successful in SDI, if at all?  Do students think SDI is an effective learning framework?  These are the kinds of important questions that an experiential exploration of SDI may answer.  The student perspective of experience will populate the blank spaces grades and test scores cannot fill, and quite likely animate research fields related to intra- and interpersonal skills considered by many educators and scholars to be required skills for the successful modern citizen (Partnership for 21st Century Schools, 2013).  Nuanced personal insights gained through qualitative methods will be informative for scholars, educators and psychologists interested in holistic student learning, curriculum design and instructional practice.   Such a contribution will support scholars and practitioners as we rethink how we do school today.

## Method

Over a period of three years, starting in August 2013, I have aggregated research on IBL, IL and Student Motivation and Engagement relevant to my dissertation research question: what is the lived experience of middle school students engaged in Student Driven Inquiry?  To that end I have regularly searched Education Full Text, Education Research Complete, ERIC via EBSCO, Google Scholar, and INFOPsych using the following key words and phrases:  "inquiry based learning", "inquiry-based learning", "inquiry learning", "inquiry research", "project based learning", "project-based learning", "information literacy", "information literacy standards", "student

motivation", "student engagement", "student agency", "student interest", "student choice". I systematically linked each these terms with the others and the terms "in education" and "in schools" using the Boolean operator AND. I set up alerts using these terms in order to receive any new additions to the databases. I gathered additional sources by perusing "related articles" tagged in Google Scholar and by closely examining the cited sources in the reference section of key research papers. This review includes the important related research beginning in 1989 through 2016.

Following is a review of the literature on Inquiry Based Learning, Student Motivation, and Information Literacy. When viewed together these fields create the fertile ground and the clear call for research on the student experience of SDI models.

# Review of the Literature

Student Driven Inquiry (SDI) comprises the general IBL framework to be discussed in a subsequent section with a notable higher degree of student autonomy, including topic choice, research design, artifact creation, and presentation mode. When considering SDI we identify three research areas of interest because of the foci on Student Motivation, skills and knowledge building, and instructional design for effective learning. The first is the literature on Inquiry Based Learning (IBL). As SDI is a form of IBL, understanding IBL will help us situate SDI in its fields of practice and research. The second research area is Student Motivation with an emphasis on its relation to IBL. Analyzing the connections between Student Motivation and the SDI experience will shape our thoughts on its effectiveness as an educational practice. The third is Information Literacy (IL) in education. Examining how scholars and practitioners understand IL in academic environments will inform the evaluation of student personal experience and perceived outcomes of SDI, an information-focused learning experience. The following examination of the IBL framework and its learning outcomes, the conceptual understanding of Information Literacy, and how and why students are motivated to learn will be valuable for researchers studying IBL and related topics, such as SDI, as well as for professionals implementing IBL in their classrooms and school libraries.

### *Inquiry Based Learning*

Inquiry Based Learning (IBL), a learning model that has gained considerable momentum in recent decades and includes a variety of instructional models, is grounded in constructivist learning theory which centers around learning through the inquiry process, or learning by doing (American Association of School Librarians, n.d.; Duffy & Raymer, 2010; Grant, 2002; Kirschner, Sweller & Clark, 2006; Krajcik & Blumenfeld, 2006; Kuhlthau, 2010; Mayer, 2004; Saunders-Stewart, 2008; Saunders-Stewart et al., 2015). Though there is some debate about the effectiveness of IBL among scholars, especially with regard to the degree of teacher guidance necessary, strategies for the implementation of IBL are deemed by many to lead to deeper, transferable learning (AASL, n.d; Barron & Hammond, 2008; Bell, 2010; Cervantes, Hemmer, & Kouzekanani, 2015; Duffy & Raymer, 2010; Heinstrom, 2006; Hmelo-Silver, Duncan & Chinn, 2006; Krajcik & Blumenfeld, 2006; Saunders-Stewart, 2011; Saunders-Stewart, Gyles & Shore, 2012; Saunders-Stewart et al., 2015; Thomas, 2000). In fact, a working draft literature review from the George Lucas Education Foundation on Project Based Learning (PBL) (Condliffe et al., 2016), perhaps the most popularly used IBL framework (Buck Institute of Education, 2014; Project Based Learning, n.d.), concludes that despite the recent national interest in intra- and interpersonal competencies research continues to focus on cognitive outcomes alone.

Today, IBL is a cornerstone of curriculum reform throughout North America. In fact, the National Governors Association Center for Best Practices, Council of Chief State School Officers

decreed inquiry-based education the national pedagogy (2010).  For some time IBL has been coming into focus for educators and researchers across the content areas.  Now even more educators are turning to inquiry learning methods to meet the Common Core State Standards adopted by 43 of the 50 United States ("Standards in Your State," 2015), as IBL is proffered as one teaching technique likely to effectively actualize the implementation of the CCSS (AASL, n.d.; Dana, Burns & Wolkenhauer, 2013; Kuhlthau, Maniotes & Caspari, 2015).

Among the many questions of concern about the IBL approach today are: Is IBL a worthy teaching and learning model?  What are the benefits of IBL, as evidenced by teachers, as experienced by students?  How do the benefits of IBL compare with those of traditional models?  Do students enjoy IBL?  Does that matter?  And, how much guidance is needed?  Much of the IBL research conducted thus far shows consistently positive findings regarding academic achievement in the form of grades and test scores.  Other kinds of outcomes are less clearly understood.  Qualitative research focused on student perspectives into the IBL experience, specifically the autonomy-supportive Student Driven Inquiry (SDI), will sharpen the picture of how and why this learning model is experienced by students.

### Definition of Inquiry Based Learning.

Despite the fact that IBL has been in the school library world for more than (Addison & Meyers, 2013; Callison, 2015), IBL is most commonly implemented in science and math classrooms (Duffy & Raymer, 2010; Krajcik & Blumenfeld, 2006; Saunders-Stewart, et al. 2012; Saunders-Stewart et al., 2015), with the inquiry problem usually defined by the teacher.   IBL is characterized by some or all of the following key components: 1) a driving question 2) authentic, situated inquiry 3) learner ownership of the problem 4) teacher-support, not teacher-direction and 5) artifact creation (Barron & Hammond, 2008; Callison, 2015; Duffy & Raymer, 2010; Grant, 2002; Krajcik & Blumenfeld, 2006; Saunders-Stewart, 2008).   These characteristics support the constructivist framework for how people learn, undergirding the idea that learning is sense making on the part of the learner (Dewey, 1938).   Learners attend to and sort through complex issues and problems from multiple perspectives, and draw conclusions in order to construct knowledge for themselves and others, all processes highlighted by the American Association of School Librarians (AASL, 2007, 2009), the Partnership for 21st Century Skills (P21, 2013) and the George Lucas Education Foundation (G.L.E.F., 2001) as necessary higher order thinking skills and practices for learners and citizens of today and tomorrow.

### Academic and Achievement Outcomes of Inquiry Based Learning.

A number of recent studies focused on examining academic achievement and test scores show positive findings for students involved in IBL.  In a literature review including a 23-item, criterion referenced inventory of theoretically and empirically based student outcomes of IBL experiences, Saunders-Stewart et al. (2012) found the range of benefits to include: knowledge and skills development; increased intrinsic motivation; development of expertise; notable self-efficacy; task commitment; positive attitudes about learning; perceived competence or expertise; and greater creativity. Zafra-Gomez, Roman-Martinez & Gomez-Miranda (2014) found a positive relationship between academic achievement and IBL and concluded that IBL heightens student engagement leading to deeper learning and increased knowledge.   Corroborating these finding Cervantes, Hemmer, & Kouzekanani, (2015) found seventh and eight grade PBL students to make gains in both reading and math when compared to the non-PBL students.   And, in reviewing the literature Krajcik & Blumenfeld (2006), Barron & Darling-Hammond (2008), Bell (2010) and Condliffe et al. (2016) found higher academic achievement overall, in terms of both grades and test scores, among those students who engaged in IBL experiences.

Research studies have also indicated improved academic achievement. In their study of primary school students, Filippatou & Kaldi (2010) found similar positive achievement data regarding students with learning disabilities.  Additionally, Chu (2009) found that students who experienced collaboratively taught IBL units, regardless of academic abilities, received higher grades when compared with the control group working under a traditional learning model.  The school librarian and classroom teacher provision of student peer engagement opportunities coupled with autonomy supportive practices supported student academic success in the IBL work. Thus far, recent studies show enhanced learning opportunities and achievement outcomes for students working in IBL.  A qualitative exploration of student perceived academic achievement outcomes will enrich and perhaps broaden these existing findings when coupled with the additional currently desirable holistic outcomes of learning experiences deemed critical for effective participation in the global world of today.

### Personal Outcomes of Inquiry Based Learning.

Beyond examining grades and exam scores, scientists have found students of IBL enjoy positive outcomes in the development of personally, socially and professionally valuable skills.  IBL affords students choice and autonomy, precipitating increased academic motivation to be discussed in an upcoming section, and, not surprisingly, academic achievement (Barron & Darling-Hammond, 2008; Noguera, Darling-Hammond & Friedlaender, 2015; Saltman, 2012).   It supports the development of self-directed learning skills, problem-solving skills and reasoning skills, all beneficial to future learning (Hmelo-Silver, Duncan & Chin, 2006; Noguera, Darling-Hammond & Friedlaender, 2015). Using a design-based research study Stefanou, Stolk, Prince, Chen & Lord (2013) found that students who engaged in Project Based Learning (PBL), in this case an IBL model focused on the successful completion of a student-selected group project or one commissioned by a client, experienced higher levels of creativity, critical thinking and metacognition when compared to students using a Problem-based Learning (PbBL) framework.  The PBL students also reported greater autonomy support, which allowed opportunities for independent thinking and working compared to the PbBL students who worked on a problem defined by the instructor.  Similarly, the autonomy support provided in the PBL study examined by Motsching, Pitrik & Holzinger (2002) confirmed that students felt motivated to work harder and experienced increased opportunities for independent thinking.  The element of autonomy is singled out as one of interest.  SDI, as an IBL framework understood to elevate student autonomy in particular, is therefore of particular research interest for understanding how it influences the student inquiry learning experience.

### Inquiry Based Learning Conclusion.

Research shows positive academic and achievement outcomes of IBL, as well as outcomes related to the skills and proclivities leading to deeper learning.  There is noted interest in further research on the IBL influence on the habits of mind considered important for students and citizens of our technologically and globally connected work as well as concerted interest in looking at student perspective in particular (Condliffe et al., 2016; Duffy & Raymer, 2010; Kulthau, 2008; Saunders-Stewart et al., 2012).  Using qualitative research methods focused on the learner perspective of experience in the more highly student-centered, autonomy-supportive inquiry based SDI model will further develop these important actionable understandings.

### Student Motivation

Professional IBL models are designed and used by educators interested in constructivist practices for student learning.  Many educators are also interested in the student development of the sensibilities and habits of mind considered important for success in the world today, such as flexibility, initiative, persistence, problem-solving, and collaboration (AASL, 2007, 2009; Addison & Meyers, 2013; Duffy & Raymer, 2010; P21, 2013).  It stands to reason that these qualities are more

likely to be cultivated when a student is motivated, and so definitions of and studies on Student Motivation merit consideration and examination.    Research on academic motivation is transdisciplinary and comes from the worlds of education, library science and psychology.   A student must access motivation in order to conduct research and learn, and each student does so based upon their developed habits of mind, or available skills, attitudes, and proclivities for behavior (Addison & Meyers; Costa & Kallick, 2000).   Following is a discussion of some of the literature exploring issues of motivation as it relates to learning at school.

### Student Interest.

Student Motivation is linked to the student perceived value or meaning in the academic work at hand.   It is connected to student interest specifically, where interest carries both affective and cognitive components.   Tapping into student interest can increase academic achievement, study skills, and engagement, as it is seen to inspire reengagement with content (Hidi & Ainley, 2008; Linnenbrink and Pintrich, 2002). Students experience a positive connection between choice and task success when they have an initial interest in the topic or activity (Patall, 2013), but can also develop interest once engaged.   School does not often support studies of specific interest to the learner (Fredericks, Alfeld & Eccles, 2010) but could do so by providing opportunities for student choice (Evans & Boucher, 2015; Williams, Wallace & Sung, 2015).   In fact, a cornerstone of more autonomous SDI models is the element of student choice: choice in topic, research process, and presentation of findings and knowledge.   Additional research on the influence of perceived student relevance is needed (Seifert, 2004), as is research using classroom observations (Linnenbrink & Pintrich, 2002), wherein researchers work together with teachers and other educators to provide academic opportunities to leverage student interest thought to provide deeper, more meaningful learning (Barron & Darling-Hammond, 2008).   More information on how student interest is affected in SDI and other IBL models will grow the understanding of student needs for effective learning experiences.   Learning directly from students through qualitative research methods will support the knowledge development required for improving educational practices.

### Emotion, Motivation & Self-regulated Learning.

Emotion, motivation, and self-regulated learning (SRL), where SRL is defined as "student control of the learning process," have been found to have a marked impact on academic achievement (Mega, Ronconi & De Beni, 2013).   Mega et al. found that student emotions influence SRL and motivation, which in turn influence academic achievement.    These three component parts positively impact students' organization of study time, evaluation of learning, preparation for exams, metacognition and reflection awareness, as well as student belief in the incremental theory of intelligence (Dweck, 2006), that is, the idea that academic pursuits can improve overall intelligence.   However, to effectively engage in IBL, and especially in SDI, students must access initiative and actively take responsibility for their study, work, and learning (English & Kitsantas, 2013; Mergendoller, Markham, Ravitz, & Larmer, 2006).   It follows that students unaccustomed to the autonomous work of IBL may be challenged by this required volition.   How then to students develop SRL?  Where do they access motivation?  How are emotions connected?  Acknowledging the ambiguity in the existing relationships between the three phenomena, Mega et al. argue for more research untangling the apparent connection.   The element of student choice woven throughout the more autonomous IBL models, such as SDI, and firmly established in the Student Motivation literature as noted above, is a compelling piece to examine in relation to motivation and the development of SRL (English & Kitsantas, 2013).   Through researching with students directly using qualitative methods scholars can build on the existing Student Motivation literature and makes evidence-based suggestions for instructional design and practice.

### *Autonomy Supportive Instruction.*

Autonomy supportive instruction is student-centered. Autonomy supportive instructors privilege student choice, decision-making, self-reflection and assessment, and multiple perspectives and solutions. These instructional guides talk less and listen more. They encourage experimentation; deliver non-judgmental feedback and encouragement when appropriate (Stefanou, Perencevich, DiCintio, & Turner, 2004). Autonomy supportive teaching encourages Student Motivation, and gives rise to positive emotions in students, manifesting as enjoyment, satisfaction, perseverance, higher grades, deeper learning and increased retention of knowledge and understanding (Guay, Ratelle & Channel, 2008). Additionally, content skills development and knowledge is built when students are interested and willing to engage in and employ deeper level learning strategies (Blumenfeld, Kempler and Krajcik, 2006). Blumenfeld et al. advocate research on learning models in which students craft driving questions, design independent inquiry projects, and create artifacts to demonstrate learning and understanding. They recommend inquiry learning as an instructional model for its motivation-enhancing, autonomy supportive framework, and argue that educators and researchers would profit by making Student Motivation an explicit concern in particular. Guay, Ratelle & Channel (2008) voice the scholarly research gap in studies where autonomy supportive instruction and guidance is the framework for learning. Here we see reference to the kind of work available for students in SDI, and a call for such study.

Multiple studies show a positive association between intrinsic motivation and student academic achievement (Guay & Ratelle, 2008; Ryan & Deci, 2016). For instance, autonomy supportive experiences provided in the school library have been found to influence student perceived competence and intrinsic motivation (Arnone, Reynolds & Marshall, 2009). Additionally, school librarians provide information skills support, as well as relatedness (i.e. students making connections with peers in their work) and these elements contribute to academic motivation and engagement (Chu, 2009). Moreover, these studies on autonomy supportive practices agree that students perform at higher levels when they experience self-regulated learning (SRL). IBL models favoring greater student autonomy, such as SDI, may be found to afford students the benefit of SRL, increased engagement and learning. This timely research call is clear.

### *Intrinsic Motivation.*

Self-determination Theory (SDT) is a meta-theory for the study of human motivation and personality, and focuses on the manner in which social and cultural conditions influence peoples' sense of initiative and purpose, their well-being, and the quality of their work or performance (Deci & Ryan, 1985, 2016; Ryan & Deci, 2000, 2016). When applying the theory to educational environments, studies show (Jang et al., 2010; Patall, Cooper & Robinson, 2008; Niemiec & Ryan, 2009; Reeves, 2012; Roth et al., 2007; Ryan & Deci, 2009; Ryan & Weinstein, 2009; Vansteenkiste et al., 2004), that students who experience high quality motivation – that is the quality of motivation, drive, and satisfaction resulting in accomplishing one's scholastic goals – experience it intrinsically, due to autonomy supportive practices (i.e. student choice and control) and those who experience poor quality do so because of external regulations (i.e. teacher directedness and control). Research shows that students who experience feelings of competence and autonomy are more successful and satisfied with their school life (Jang, et al, 2010; Roth et al., 2007; Ryan & Deci, 2009; Vansteenkiste et al., 2004). Furthermore, these feelings are positively associated with academic achievement (Guay, Ratelle & Channel, 2008; Hidi & Ainley, 2008).

Relatedly, in investigating the life experiences that foster an intrinsic motivation to seek information Crow (2011) found that students with a heightened interest in seeking information share perceived competence, a "point of passion" (wherein a topic of personal interest or relevance

drives the research), a notable sense of play, feelings of autonomy support, an "anchor" adult relationship, and non-competitive attitudes. Crow notes that students reported their favorite information seeking experiences were non-assigned tasks, but rather self-selected, one of the key components of the authentic inquiry experience offered in ultra student-centered SDI models.

Looking at the underlying factors behind information habits, Heinstrom (2006) found similar to Crow (2011) that the level of engagement influences information seeking behaviors. Here studies revealed that intrinsically motivated students, but also strategic students (i.e. those with an academic end game or goal in mind) implemented a deeper approach to information seeking and study, searching longer and delving deeper into select sources. Crow concludes that a constructivist approach to learning will foster intrinsic motivation for information seeking or inquiry and the development of lifelong learning strategies.   Further, she asserts that inquiry strategies can maximize individual need for autonomy and relatedness and can provide for differentiation on various levels.  Heinstrom agrees it is vital to teach students in engaging contexts, but not necessarily entirely student-selected pursuits.  Heinstrom is interested in further research combing out the differences between the deep study students and the strategic study students.  In any case, both Crow and Heinstrom underscore the importance of student interest as a necessary ingredient in Student Motivation, for both intrinsically and strategically motivated students.

### Student Motivation Conclusion.

The literature on Student Motivation demonstrates a strong connection between student interest, engagement, academic motivation and achievement.  Studies show increased Student Motivation where student autonomy and self-regulated learning are in play.  Likewise positive academic and achievement outcomes are revealed in the research focused on students working with higher levels of autonomy and self-regulated learning, and intrinsic motivation.  These kinds of experiences also manifest positive emotions, dynamic school relationships, satisfaction, and deeper learning. Applying Student Motivation understandings to the qualitative research focused on the student perspective of IBL and SDI experiences will illuminate its influence on student engagement and learning.


### Information Literacy in Education

In the years since it was coined a concept in Paul Zurkowski (1974) Information Literacy (IL) has grown in complexity, both in how it is understood and how and where it is applied.  Once considered simply the ability to access and use print based information, today IL boasts many modes and many masters from such fields as business, education, health care, and more. Depending upon the scholar or practitioner one consults, IL can involve multiple literacies in multiple formats.  Modern technologies have rendered a kaleidoscope of literacies for consumers, educators and scholars to manage (Kellner, 2006) and scholars are highlighting the complex ways in which these literacies are experienced (Bruce, 2015).  As IBL and SDI are information-focused learning models, where students are challenged to effectively use information for learning and content creation, for purposes of this review focused on the school experience, we will consider IL as it relates to more formal academic studies (Callison, 2002; Bruce, 2004, 2008; Elmborg 2006; Kuhlthau, 1994).

### Looking at IL from the Student Experience.

Early research on IL focused nearly exclusively on content and technology, a bibliographic paradigm focused on the ways information is organized and accessed.  In the 1980s select researchers shifted their focus to human interactions with information due to perceived constraints

of the system viewpoint (Kuhlthau, 1991). Kuhlthau's work turned attention to the high school student user and how the individual experiences information seeking, highlighting the holistic examination of the user experience; information seeking involves the whole person, one with a particular life history, background knowledge, unique attitudes, and abilities. Understanding the student user experience is critical for scholars and educators in designing and implementing effective learning supports for students in their research and inquiry endeavors.

From a focus on the student user experience, Kuhlthau developed the information search process (ISP) (Kuhlthau, 1989), a model that includes the physical (user actions), the affective (user feelings) and the cognitive (user thoughts on content and process). Kulhthau's ISP and later developed Guided Inquiry (GI) (Kuhlthau, 2010; Kuhlthau, Maniotes & Caspari, 2015) both aimed at addressing the needs of the student information user, together have served for nearly two decades as models for designing and implementing student-centered IL instructional models in schools in the United States, Canada, Sweden, and elsewhere (Kuhlthau, 1994; Kuhlthau et al, 2007).

Similar to Kuhlthau, Bruce focuses her earlier Information Literacy (IL) research on the learner experience (1997) and advances the need for educators to prioritize student IL engagement in formal educational spaces (2004). Bruce outlines the characteristics associated with IL: the recognition of the need for accurate information; the ability to ask salient questions as the basis for information searching; the skills to search for and access quality information; the strategies for evaluating, organizing and integrating information; the ability to critically use information and problem solve. These characteristics are similar to those Kuhlthau found in her study of student information users (1989, 1991).

More recently Bruce explores the relationship between information use and learning experience in the development of Informed Learning (2008). Here Bruce details her path to understanding that the heart of Information Literacy resides within the experience of using information to learn. Informed Learning is based upon the holistic understanding and practices that pay special attention the information user and learner. Bruce believes in no uncertain terms that Information Literacy and learning through Informed Learning holds capacity for human transformation and empowerment (2013, 2015). Recognizing current institutional foci on a different paradigm, Bruce's direct call for research attention to the user experiences of Information Literacy in order better serve the needs of the individuals systems are developed to support (2013, 2015). As the use of information and learning are cornerstones for both IBL and SDI models, a consideration for the user experience with information to learn will be fruitful for further understanding how these models are working for students, which in turn will support the development of educational practices.

### Supporting the Information Literacy Learner.

The learner experience of information use indicates a need for supporting students in developing Information Literacy skills. Bruce acknowledges the connections scholars have made between IL and perceived academic achievement (2004). While this understanding is an overwhelmingly popular focus in many public schools around the world (Zhao, 2012), attention should go to the capacity for IL competencies to promote deeper learning, the propensity for the development of a lifelong learning mindset, and the necessary skills for continued learning and the holistic development of the individual. Bruce (2004) and Kuhlthau, Maniotes and Caspari (2007) advocate for retooling educational practices to include active, student-centered learning experiences with focused attention to IL skills and strategies acquisition. When armed with such IL capabilities and understandings, information users can drive their own learning and problem solving.

Responding to both the on-going information explosion, as well as an increasing concern that students master collaboration skills (AASL, 2007; P21, 2011), Kuhlthau's subsequent Guided

Inquiry (GI) model (Kuhlthau, 2010; Kuhlthau, Maniotes & Caspari, 2015) details a research-based strategy for educator teams to support students in tackling standards related research projects and problems, sometimes including student roles and jobs. Kuhthau's GI model is consistent with the more teacher-directed IBL models, such as the PBL reported on above.

Questions about parity in IBL work and equity in learning opportunity go unanswered however.   Kuhlthau states there are five kinds of learning that happen through inquiry: information literacy, learning how to learn, curriculum content, literacy competence, and social skills (2010). Assuming students take specific roles and duties as a member of the inquiry team, will each student, relegated to their particular assigned tasks, have maximum opportunity to engage in each of the five kinds of learning as outlined?  This is a critical question that merits consideration and investigation.  Exploring student experience of SDI may reveal qualities gained or lost by students working independently through the inquiry process.

Another concern with the Guided Inquiry model is the issue of student choice and interest that may be compromised to some extent considering the teamwork paradigm within the model. Substantive literature in the fields of Student Motivation and engagement highlight the importance of student choice and relevance for deeper learning and personal satisfaction (Blumenfeld, Kempler & Krajcik, 2006; Deci & Ryan, 2008; Ely, Ainley & Pearce, 2013; Hidi & Ainley, 2008; Linnebrink & Pintrich, 2002; Walkington & Bernacki, 2014).  How do students engaged in more autonomous SDI work experience choice and relevance?  And what is the value of that experience for students?   SDI models implemented in the school classroom may include fewer support structures than recommended by Kuhlthau in GI.  Data from the student perspective may illuminate other yet unexamined nuances of the affective student experience of information.  It may reveal the kinds of supports students want and need in SDI, as consistent with or differing from GI.

 In concert with these ideas, Elmborg sees the reference desk as an ideal place for teaching IL; he thinks of this work as engaged literacy narrative (2011), where open, imaginative and meaningful spaces for inquiry and dialogue are created and maintained. Taking a critical stance for librarian work today, Elmborg sees promise and power in re-envisioning the role as one where librarians engage students in constructivist learning methods in order to meet student information needs and interests (2002), a place that plays to imaginations, hope and creativity.
Like the facilitator-guide role of the teacher in the SDI model, Elmborg sees the reference librarian as one who supports students' IL needs through dialogue and questioning, not simply through resources and directives, instead moving towards a more student-centered pedagogy (2008; 2011). Rejecting the traditional paradigmatic model of reference support, here the tables are turned. Students are prompted, perhaps directly and/or indirectly, to share more completely their purpose, questions, ideas, presumptions, and concerns.  As with the SDI educator, the librarian responds as a guide or facilitator by questioning the student's position, their expertise and expectations, challenging and supporting the learner.  Elmborg directly references Vygotsky's zone of proximal development; the place and space when the educator meets the student at their point of need, where and when the student is ready to grapple with next steps in their learning.

In his advocacy for an educator-learner collaboration, Elmborg argues for hooks' engaged pedagogy (1994). It calls for teachers to more fully engage in the learning process *with* students, taking risks themselves and opening up to intellectual vulnerability.  For such a model to work, according to Elmborg, the conversation between librarian and student must be open, equal, and honest, as "horizontal" as possible.  This requires an atmosphere of freedom to inquire, to play, and to learn together, where educators work as co-conspirators with students in their quest to

know, learn and create new work.  Those implementing the SDI model value just such a dynamic relationship.  The question is, do the students?  Research privileging student perspective will move towards answering this question.

***Information Literacy Conclusion.***

The research and ideas developed by Kulhthau, Bruce, and Elmborg all position the learner at the center of the Information Literacy experience. By focusing on the information user, their work highlights the importance of understanding individual student learning needs and in many cases how those needs might best be met.  As an individual, a student approaches their information experiences, as only they will, with particular background knowledge, attitudes, proclivities, abilities, and interests.  These variable qualities must be considered, accessed and supported to meet student needs.  Using qualitative methods such as grounded theory, ethnography and phenomenology will support the development of understanding the learner perspective of Information Literacy practices.  Therefore, examining current IL research literature is essential to the interpretation of the learner experience in IBL and SDI, models holding IL at their foundation.

# Conclusions

When examined together the scholarly research on Inquiry Based Learning, Information Literacy, and Student Motivation point to the need for more in-depth research on the student learning experience from the student perspective in particular.  The overwhelmingly positive findings on student engagement and academic achievement in the implementation of IBL models demonstrate its worth as an effective modern day learning model.  However, the research on IBL is limited to mostly high school and college level science and math content areas.  Scant studies focus on other content areas or interdisciplinary studies, work with younger students, or the more student-centered SDI models.  Scant studies focus on the student perspective of the IBL or SDI experience; therefore less is currently understood about the skills and habits of mind that lead to deeper learning practices considered critical for today's students.  As seen in the literature previously discussed, underpinning the effectiveness of IBL is Student Motivation for its critical components of interest, choice, and autonomy. Student Motivation coupled with the growing focus on the information user and relationship between the user and the instructor or guide in the Information Literacy field, points directly to the need for understanding the student experience of IBL. Explorations of proliferating SDI models that privilege student autonomy in particular will help tease out the effectiveness of varying levels of teacher guidance and support, and provide much needed knowledge for scholars, educators and educational reformers concerned about effective teaching and learning practices for our current times.

Qualitative research methods able to access holistic student experience in SDI are highly recommended for this demonstrated need.  The phenomenological method will support the development of understanding the common experiences among students engaged inquiry learning. Attention to illuminating the student lived experience of IBL and SDI will have implications for meeting student academic and personal learning needs.  An ethnographic research approach will highlight student behaviors in SDI by affording researcher embedded observations. Gathering and using qualitative data for grounded theory research will manifest a theory of the ways students manage and work through IBL and SDI and thus provide valuable information for educators working with and/or designing curriculum for instruction.  There is much to be learned and understood about the student experience of IBL and SDI in a wide range of environments, school levels and content areas, so other qualitative methods should be considered as well.

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