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Good IDEA: Instructional Design Model for Integrating Information Literacy

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Abstract

The demand for instructional design librarianship is increasing. The trend is due to higher education's focus on integrating information literacy content in academic disciplines. The generic ADDIE (analysis, design, development, implementation, and evaluation) design model is traditionally used to develop information literacy instruction and content. The IDEA (interview, design, embed, assess) Model is a library-specific systematic approach to integrating information literacy instruction and resources within academic courses. The process is based upon instructional design best practice and cognitive and behavioral learning theories. Close collaboration between library and academic faculty is evident throughout. Flowcharts, forms, and rubrics guide librarians not formally trained in instructional design through the process.

Background

Information literacy is an intellectual framework for identifying, finding, understanding, evaluating and using information (Middle States Commission on Higher Education, 2002). Teaching information literacy skills and knowledge is a critical aspect of academic librarianship. Effective library instructional programs reflect the current demands for flexible learning environments, technological advances, and the dynamic nature of information. Traditionally, librarians collaborated with instructional designers and other support resources to develop effective instruction. Due to recent declines in academic budgets, access to instructional design resources has decreased. In response to this trend, there has been an increase of library positions that integrate instructional design within the role of academic librarianship. These positions are most commonly referred to as embedded librarians or instructional design librarians (Shank, 2006).

Prior to 2012, the position of instructional design librarian did not exist at the author's University. The Library Dean and University administration recognized the importance of integrating pedagogically sound information literacy instruction and resources within academic courses. In response, the library's 2012-2016 strategic plan included instructional and outreach goals focused on increasing library-faculty collaboration and information literacy integration. The goals reflected the ideology that "information competencies cannot be learned in a vacuum; they must be used often and within a variety of curricular contexts." (Wendell, Gavin, & Canfield, 2004). In response to the library's five-year plan, the author was hired as an instructional design librarian.

To further define and clarify the library strategic plan and goals the author performed an informal needs assessment. Interviews were conducted with faculty from various disciplines in order to identify student information literacy needs from an academic instructor's perspective. Faculty commented on the significant amount of time dedicated to clarifying the research process both during and outside of class. Faculty also noted the labor-intensive task of grading research assignments due to the amount of instructor feedback on the proper use of resources, style, and citations. Based on these experiences, many faculty expressed the desire to focus more time and effort on course content. In addition, there were numerous suggestions for ongoing library support throughout the duration of a course beyond the "one shot instruction" session. Finally, faculty emphasized that although information literacy and research support was critical throughout all academic years, significant support was also needed in graduate years as research requirements grew more complex.

While the expectation and apparent need for information literacy integration was increasing, there was a decline in library staff due to financial constraints. As a result, the

remaining staff struggled to meet the increasing demand. It was evident that a library-specific instructional design model would be more efficient in streamlining the process and increase the pool of librarians not formally trained in instructional design. The author also recognized that an instructional systems design approach that specifically addressed the skills, criteria, and design issues of library instruction within content disciplines would improve students' ability to recall the information in academic, work, and personal environments and contribute to lifelong learning (Anderson & May, 2010). After a review of the literature found no evidence of an existing framework, the author developed the IDEA (interview, design, embed, and assess) Model in response.

Literature Review

Instructional Design

The concept of a systematic approach to designing instruction began in the 1950s. During this era, the field of educational psychology recognized that the instructional systems design (ISD) approach to curriculum development was pedagogically logical and cost effective (Gagne, Briggs, & Wagner, 1992). The ADDIE (analysis, design, development, and implementation) approach was the first formal model to be widely adopted for on-the-job-training. Although numerous derivatives of the ADDIE model evolved, most followed the criterion referenced instruction (CRI) framework introduced by Mager (1975). CRI focuses on first creating explicit performance objectives with a matched set of assessment tools after which course instruction and content is then created. The widespread adoption of Dick and Carey's The Systematic Design of Instruction (1978) promoted instructional design as an area of study and a formal profession. The

delayed global adoption of ISD into academia occurred in the 21st century with Wiggins and McTighe's (1998) comparable "backward design approach" which first identifies the instructional outcomes before developing curriculum and assessments.

A review of the literature indicates the increasing contemporary use of the ADDIE model in higher education. Reinbold (2013) reported success using the ADDIE model to redesign programmatic information literacy instruction for first year medical students. Also in 2013, Davis discussed the systematic approach to develop one-shot library sessions for journalism students. In addition to face-to-face instruction, as reported by Sumney & Valenti (2013), the model is also being successfully applied in distance learning environments. While Booth (2011) introduced a formal instructional design model for developing programmatic or "one-shot" information literacy instruction, a review of the literature found no evidence of a library-specific instructional design model for integrating information literacy. Although the literature references the empirical effectiveness of the generic ADDIE model in information literacy design, the author believes that a high fidelity model that accurately represents the process for embedding information literacy instructional within academic is more valuable.

Learning Theory

The IDEA Model has foundations in both behavioral and cognitive learning theories. Similar to traditional ISD approaches, the Model incorporates behavioral theory through its use of observable performance objectives and assessments as evidence of learning (Booth, 2011). The Model also assumes mental processes referenced in cognitive psychology, specifically Sweller's (1988) Cognitive Load Theory (CLT). CLT is an information processing theory that focuses on the relationship between the working and long-term memory in meaningful learning. The working memory is a mental construct that temporarily manages limited amounts of raw

information. Long-term memory contains cognitive structures, referred to as schemas, that permanently store unlimited amounts of meaningful information. According to CLT, an overload of information in the working memory, through complexity or amount, negatively impacts learning. Empirical studies indicate that effective instructional design improves the efficiency of the working memory particularly when learning complex tasks (Paas, Renkl, & Sweller, 2003). In addition, instructional design that considers students' prerequisite abilities and backgrounds improve long-term, meaningful learning. It is important to note that instructional strategies that support novice learners may have minimal or possibly negative effects on advanced learners, referred to as the expertise reversal effect (Kalyuga, Ayres, Chandler, & Sweller, 2003). Effective strategies include presenting clear and concise content, "chunking" information into appropriate amounts, logically sequencing information, limiting redundancy, and focusing students on critical learn tasks.

The IDEA Model

The IDEA Model is a systematic approach to integrating information literacy instruction in academic courses. While the process appears to be sequential in nature it encompasses an iterative approach to instructional design. The output of each phase is used to re-evaluate and confirm the activities and information collected from the previous step. As a result, the process remains cohesive, focused, and aligned while moving forward from phase to phase. Figure 1 displays the Model's overall framework and the purpose of each phase.

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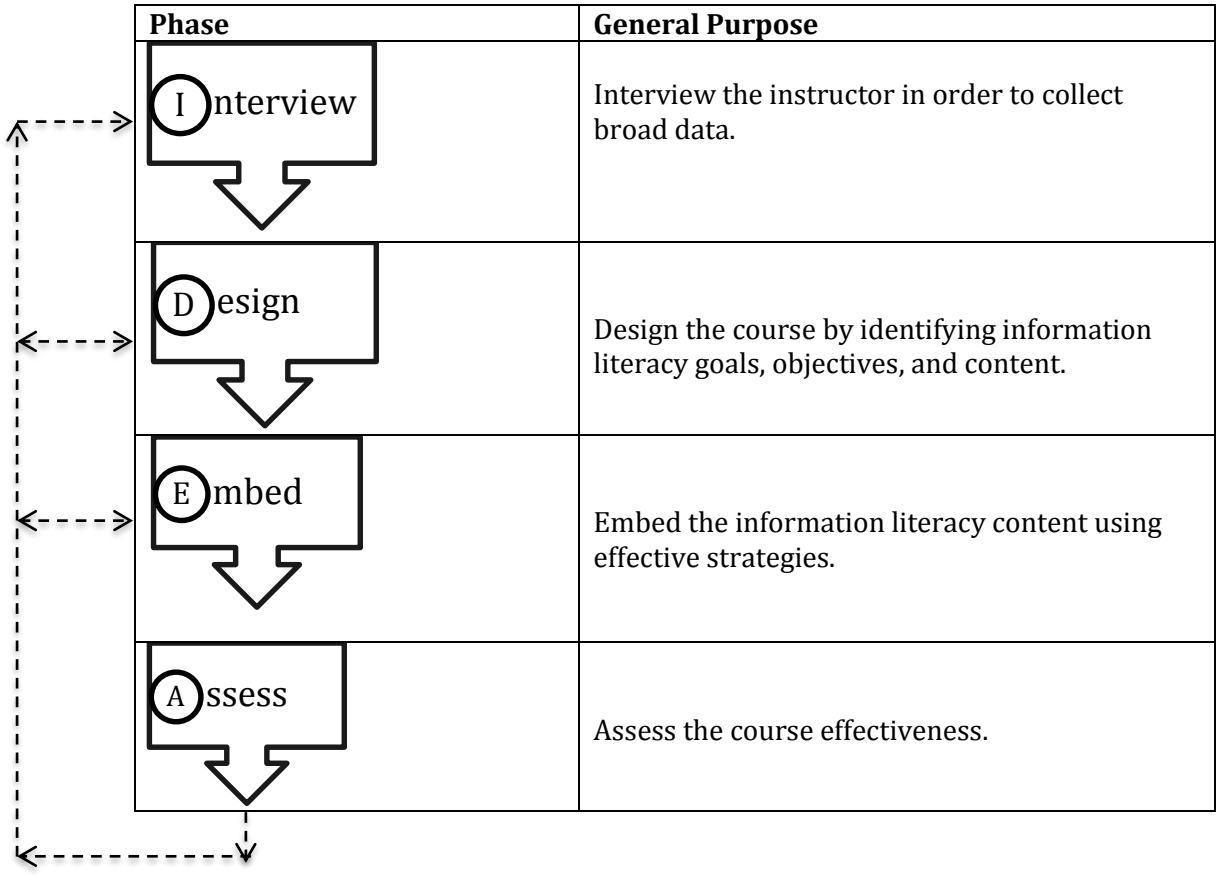

Figure 1. IDEA model

Interview Phase

The purpose of the interview phase is to collect broad data about the students, course, and information literacy requirements. Figure 2 displays the steps associated with the interview phase. The Interview Form (see Appendix A) is used to record the results of the phase and is illustrated in the discussion below.

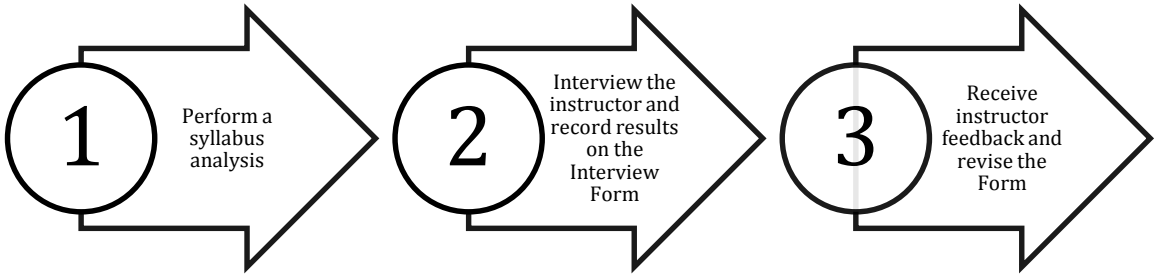

Figure 2. Interview phase.

Step 1: Perform a syllabus analysis

To begin the process, the instructional design librarian analyzes the syllabus and other course materials for potential information literacy opportunities. Smith, Doversberger, Jones, Ladwig, Parker & Pietraszewski (2012) attest to the effectiveness of "examining course syllabus as a method for uncovering opportunities for instruction and outreach". Some instructors explicitly define information literacy and research activities and list them separately from other course content. When this is not the case, the instructional design librarian must make inferences about information literacy needs from implicit information embedded within the content. The course description, objectives, assignment schedules, and grading policies are syllabus components that often reference research and information literacy requirements. Highlighting library and information literacy related terms and annotating the syllabus with notes, comments, and additional questions are useful techniques for recording potential information literacy opportunities.

Step 2: Interview the instructor and record the results on the Interview Form

The results of the syllabus analysis become the "conversation starter" during a follow-up interview with the instructor. During the interview, the instructional design librarian clarifies previous data and probes for additional relevant information. Information gathered during this step is recorded on The Interview Form. While direct and closed questioning techniques are useful for directly addressing specific questions and criteria listed on the Interview Form, open-ended questioning techniques are effective for uncovering new information. It is also important to note that in addition to the syllabus analysis and interview, it may be necessary to reference other informational sources to complete the data criteria listed on the Interview Form. For example, discussions with other instructors, previous course survey results, and assessment

documents are helpful for identifying information about University demographics, programmatic trends, and student profiles as listed on the Form.

Step 3: Receive instructor feedback and revise

Upon completion of the Interview Form a draft copy is sent to the instructor for final review and approval. Retrospective review of the data collected on the Interview Form allows instructors to identify additional information literacy support not originally identified during the interview. Recommended changes often include suggestions for additional information literacy skills and concepts and clarifications to required information sources. Necessary revisions to the data are made according.

Design Phase

The purpose of the design phase is to analyze the data collected during the interview phase in order to identify information literacy content, resources, and instruction that support the academic course goals and objectives. Figure 3 displays the steps associated with the design phase. The Design Form (see Appendix B) is used to record the results of each step and is illustrated in the discussion below.

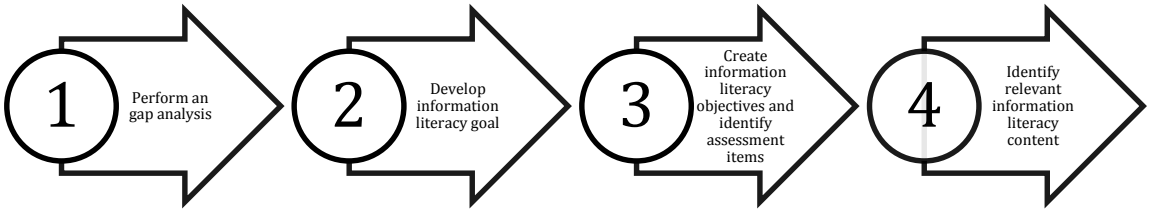

Figure 3. Design phase.

Step 1: Perform a gap analysis

The design phase begins with a gap analysis. In general terms, a gap analysis defines the difference between a current condition and a desired state. In the context of the Model, an information literacy gap is defined according to the difference between the students' prior information literacy and research experience and the complexity of information literacy course

tasks. The gap analysis begins with rating the students' prior information literacy experience as novice, intermediate, or advanced. Unless concrete data about students' prior learning levels is available, which is unlikely in higher academia, the rating is based upon inferences extracted from the data recorded on the Interview Form. To illustrate, a novice rating reflects students who have had minimal or obsolete information literacy knowledge and research experience. This rating may be assigned to returning adult students taking a bachelor completion program designed for career advancement. In this case, additional support and remediation may be required to address the academic gap years as well as advances in information literacy technology. Conversely, an advanced rating may be assigned to students participating in research intensive cohort program in upper level classes or advanced degrees. An intermediate rating represents student who have average or median levels of research experience, as is often the case with upper class courses.

The gap analysis continues by defining the overall complexity of information literacy tasks required by the course. Course information literacy complexity is rated as low, medium, or high depending on the difficulty and amount of information literacy and research activity. Low complexity tasks are simpler skills taught as a single element. An example of a low complexity task is using the Library of Congress classification system to locate books shelved within the library. Medium complexity tasks include moderate skills an average student is expected to perform. An example of a medium complexity task is an annotated bibliography formatted according citation style criteria. High complexity tasks consist of more difficult interrelated tasks performed over time. An example of high complexity is applying multiple search strategies to locate varied and relevant print and electronic resources when performing a review of the literature.

Step 2: Develop an information literacy goal

Based upon the gap between student information literacy experience and course complexity, a goal statement representing the overall information literacy outcome is created. The statement should include the general level of library support, the intended audience, and overall information literacy activity. An example goal statement may be "The library will provide embedded information literacy instruction, resources, and support for doctoral students in order to complete a significant scholarly research paper on contemporary educational issues."

Step 3: Create information literacy objectives and identify assessment items

Based upon the goal, performance objectives are created. Effective objectives include the following components: an observable task representing the required skills and knowledge, the conditions under which the task is performed, and the standards by which successful performance is measured within the context of the course. For each objective, parallel assessment items that serve as a criterion reference measure of student learning are identified. The assessment items will be analyzed during the assess phase of the model in order to evaluate and revise information literacy course content. Common qualitative and quantitative assessment items may include pretest, embedded, and post- tests, student artifact studies, faculty interviews, and student reaction surveys. Assessment items that do not already exist as part of the course curriculum may require development and approval from the instructor for integration within the course.

Step 4: Identify relevant information literacy content

Based upon objectives and assessment items, supporting information literacy content referred to as learning objects (LOs), library resources, and instruction are identified. When identifying LOs, it is most efficient to begin by identifying existing items available through

internal library content or open educational resources (OER) that may be applied or repurposed for the course. Multimedia Education Resource for Learning and Online Teaching (MERLOT) is an example of a high quality OER referatory that links to free LOs. Massive Open Online Courses (MOOCs) are a relatively new instructional model that offer distance learning objects and courses to unconventionally large numbers of students, often cost-free. CourseBuffet.com is an example of a MOOC aggregator for free open online learning classes. When no relevant LOs exist new modules are proposed and assigned to appropriate library personnel for development. In addition to LOs, the library resources required to meet the objectives are also defined. These resources may include databases, reference support and service information, catalogs, plagiarism tools, and citation generators. The final step of the phase identifies the general plans for library classroom instruction, whether "one-shot" or ongoing, and any additional library support that may be necessary for course success.

Embed Phase

The purpose of the embed phase is to identify strategies for the logical integration of information literacy content within course materials, and to plan for and implement the results. Figure 4 displays the steps associated with the embed phase. The Embed and Implementation Form (see Appendix C) is used to record the results of each step and is illustrated in the discussion below.

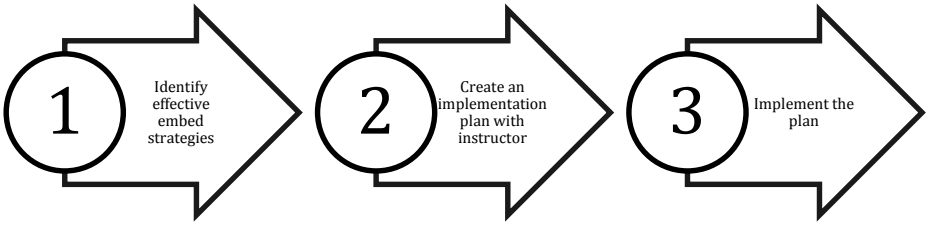

Figure 4. Embed phase.

Step 1: Identify effective embed strategies

The purpose of implementing embed strategies is to effectively reduce learning disruption. In the case of novice learners, learning disruption often occurs when students are taken off-task to search for relevant information. For example, students who must exit the course content to browse a library website for resources tend to deviate from the learning activity. Embedding direct links to information literacy resources including online tutorials, databases, library guides, e-books, articles, web pages helps minimize this disruption; in addition, including these links at the "point of need" in the course increases learning continuity. It is also useful to include clear and consistent instructions for seamless access to the information literacy resources, particularly when resources require login authentication or special technological requirements. To illustrate, a statement reminding students that an active barcode is required for remote access to the library databases decreases student confusion and reduces learning disruption.

Embed strategies are also effective for focusing student attention on relevant and critical content. From a cognitive learning perspective such strategies reduce wasteful mental functions used to attend to and reprocess existing knowledge. One strategy is to reduce redundancy by limiting repeated information, particularly when the same content is delivered via different modalities, such as a podcast and video on the same topic. A similar strategy that reduces redundancy is separating non-essential and remedial information from critical learning content. For example, including multiple descriptions about the library's circulation policy and procedure within essential course content is most likely redundant and remedial and shifts the focus from critical content. In this case, it is more effective to separate the information under a "library resources" heading that is easily accessed when the learner seeks it.

Instructional sequencing and scaffolding techniques are embed strategies that help determine effective placement of information literacy content within a course. Sequencing strategies address the logical order in which information is presented or tasks are performed. Because the research process is largely chronological in nature, with some tasks requiring completion before others, it is most effective to introduce research concepts and resources in a similar progression. For example, when teaching basic research skills it is logical to discuss how to conduct a review of the literature prior to introducing the mechanics of creating a bibliography. Scaffolding is a second instructional strategy that helps determine order by building upon simple concepts to more complex. While the sequence of content taught is not critical in scaffolding, it is key that students understand single, simple elements that can be learned in isolation before applying them to complex, relational activities. To illustrate, when teaching effective database searching it is logical to introduce the individual concepts of keywords, Boolean logic operators, and other limiters before having student perform a comprehensive search that applies all the strategies simultaneously.

Step 2: Create an implementation plan

After embed strategies are identified, an implementation plan and projected completion date are created in collaboration with the instructor. The instructional design librarian and instructor must first identify the specific placement of the information literacy content within the course calendar or outline. Next, a list of course materials that require creating or updating is developed including the syllabus, content management system, supplemental materials, and library resources. Finally, additional tasks or personnel necessary to implement the plan are defined, including the scheduling of events or support from information technology.

Step 3: Implement the plan

After the instructor and instructional design librarian approve the plan it is implemented. It is reasonable to expect ad-hoc modifications to the plan due to unforeseen events. These modifications are often due to unexpected technology or personnel issues. To ensure implementation success, it is recommended that the librarian manage the plan and track task completion.

Assess Phase

The purpose of the assess phase is to analyze assessment items identified during the design phase in order to validate student learning and program effectiveness. All assessment outcomes are iteratively applied to previous phases of the Model for the purpose of course improvement. Figure 5 displays the steps associated with the assess phase. The Assess Form (see Appendix D) is used to record the results of each step and is illustrated in the discussion below.

Figure 5. Assess phase.

Step 1: Implement formative assessments

Formative assessments are formal and informal measures used to evaluate whether course goals are met. Formative assessment outcomes are used to modify the teaching materials and learning activities. Traditional instructional design models recommend formative prototype testing of course content on student population samples. This proactive approach serves to collect data in order to effectively revise the course before its administration. While the approach is undoubtedly useful, pre-course trial testing is impractical in higher education due to the lack of

prior access to student samples and inherent time factors. For this reason, formative assessments must occur during and after a course. Embedded formative assessments are particularly useful for ensuring that students master information literacy competencies before progressing to new content. In response, remediation opportunities and responsive adjustments to information literacy course design and content are applied to improve course effectiveness.

The formative assessment begins with evaluating and analyzing the assessment items identified during the design phase. Effective ways to score criterion-referenced assessments include observations, rubrics, grades, item analysis, rating scales, and percent accurate (Linn & Gronlund, 2000). Based upon the score of the assessment items, the corresponding objective is rated according to a scale of developing, competent, or exemplary. A developing rating indicates that the IL objective was not clearly met through assessment. A competent rating indicates that the IL objective was somewhat met through assessment. An exemplary rating indicates that the IL objective was clearly met through assessment. Objectives rated as developing or competent are then iteratively reviewed according to previous phases and closely examined according to the original data, gap analysis, information literacy goal and objective, information literacy content, and embed strategies. Based on the formative results, modification plans for revising IL objectives, content and instruction is created.

Step 2: Implement summative assessments

Summative assessments are used to make an end-point judgment of the overall course effectiveness in the context of more global information literacy standards. While many of the qualitative and quantitative measurement tools used during the formative assessment apply, additional summative assessment tools including course-end evaluations, capstone projects, and artifact studies. Whereas the formative assessment results are used to modify and improve course

content, summative assessments focus on evaluating the course according to library strategic plans and information literacy student learning outcomes at departmental, institutional, regional, and national standards including American Association and Colleges (AAC&U) and Association of College and Research Libraries (ACRL).

Step 3- Implement Modification Plans

Formative and summative assessment results are used to modify the course design as well as guide future information literacy integration efforts. Modifications at the course level include changes to the information literacy course objectives, content, and instructional strategies. Modifications resulting from the summative assessments are used to guide information literacy efforts in subsequent courses and the direction of future library instructional efforts.

Limitations

Recognizing the limitations of the IDEA Model is important for future iterations of the Model at the author's University, its application at other institutions, and instructional design librarianship as a profession. First the IDEA Model is based upon the theoretical framework of cognitive and behavioral learning theory. Because the neuroscience of direct assessment of mental processes is in its infancy, the correlation between student learning and instruction are inferred.

It is also important to note that the Model is a general approach for integrating information literacy content and instruction in academic courses. Outside of the scope is the pedagogical design of individual learning objects including one-shot library instruction, tutorials, library guides. In addition, the model does not focus on any particular delivery method such as online or blended learning environments.

Finally, while the Model is adaptable for use at other libraries and universities, it is designed to address the demographics and strategic plans of the author's University and Library. In addition, the Model incorporates "lessons learned" from the author's experiences as a librarian, educator, and instructional designer. These guiding principles are unique and may not be shared by others. While the initial application of the Model at the author's institution appears successful, this judgment is based upon informal assessments from a limited number of samples. Based upon the assessment samples, the full application of the Model is time consuming and may not be practical for use in its entirety and in all learning situations.

Conclusion

The IDEA Model supports the theoretical and conceptual frameworks that the integration of empirical-based learning theory and instructional design best practices result in effective information literacy integration. This construct assumes that information literacy skills applied in the context of an academic discipline improve student academic performance. Because the application of the Model in its entirety is time consuming, the return on investment is greatest when the model is applied to courses that:

- have significant research requirements
- are frequently implemented
- include motivated faculty
- have reasonable development timeframes
- may be applied to other closely related courses

The next logical steps for validating the Model are empirical qualitative and quantitative assessments. Currently, the author is in the planning stages of implementing a formal single exploratory case study. Subsequent plans include additional multiple case studies of numerous

and varied courses at the author's institution. Results will be used to improve future iterations of the Model at the author's university as well as formulate generalizations that may apply to all academic libraries.

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