A Scoping Review of the Application of Systematic Instructional Design and Instructional Design Models by Academic Librarians

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**Abstract**

Background: Academic libraries are providing more instruction than ever to increasingly diverse audiences. Librarians have also shown increased interest in learning theories and instructional design (ID). However, there has not yet been a systematic survey of the literature on how librarians are using ID models and systematic ID in professional practice.

Methods: The researchers conducted this scoping review of journal articles published since 1990 to look at what ID models or systematic ID are used in academic library instruction and what is role and influence of ID. Nine databases were searched to identify articles.

Results: Of the 11,221 abstracts, 58 articles described use of a systematic ID or an ID model to create an instructional product. The review found that ID models were sparsely represented in the literature and that it often appeared in a simplified or adapted form. However, it held particular promise as a tool for collaboration and reflective teaching practices.

Conclusions: While instruction represent a major skillset in academic librarianship, the application of ID needs further representation in the scholarly literature. Further reflection on librarian use of ID can inform teaching practices committed to accountability in higher education and learner centeredness for their populations.

**Keywords**

Instructional Design Models, Systematic Instructional Design, Academic Libraries, Scoping Review, Design Thinking

**Introduction**

Integrating library services and products in the higher education teaching and learning process raises awareness of and demonstrates the value of academic libraries and librarians (Bell & Shank, 2007). As librarians take a more active role in the curriculum, they spend increasing amounts of time creating unique instructional products to meet the educational demand of individuals and programs academic librarians support. Along with this increase in instruction, librarians have shown a growing interest in educational theory and the psychology of learning, typified by the shift from the Information Literacy Competency Standards to the Framework for Information Literacy, which cites scholarship on threshold concepts and metaliteracy as inspiration (*Framework for information literacy for higher education.*2015). However, translating this theoretical knowledge into best practices for instruction can be ambiguous, and without systematic study and assessment, the impact of all this effort is unclear. To ensure that these instructional products lead to meaningful learning for their intended audiences, librarians can engage with interdependent, systematic processes such as instructional design (ID) models that incorporate needs assessments, creation and delivery of instruction, and outcomes evaluation. ID models benefit teaching librarians by providing a clear guide for implementing an instructional planning process from start to finish, informed by learning theory and accountability. Given the ubiquity of instructional offerings in academic libraries, it is beneficial to examine how librarians are adopting systematic ID and ID models in their work to create instructional products for learners.

**Background**

Instructional design (ID) is the “systematic and reflective process of translating” theories and principles of “learning and instruction into plans for consumable instructional products for the learner and evaluative opportunities for the instructor” (Smith, P. L. & Ragan, 1999). To create successful instruction, educational psychologist Robert Gagne recommends a systematic approach of a “coherent framework and identification and delivery of specific learning outcomes” (Gagne, 1985). The systematic ID process facilitates the creation of reliable and consistent instruction, supports students in learning course content, and “provides the same effect across the lesson/course/group of students” (Reiser & Dempsey, 2012). Ideally, instructional products are the deliverables of the entire systematic ID process and can represent a variety for formats from in-person lesson plans to online, asynchronous tutorials.

Originally popularized in business and military settings, ID gained prominence in mainstream American education as a result of a confluence of trends, from the popularity of constructivism to the growing role of computers in the classroom (Reiser, 2001). ID models break down the phases of instruction planning to support understanding of the systematic ID process and the relationship of each phase of instruction planning, delivery, and assessment to the others (Chen, 2008). Seels and Glasgow list the following four purposes of ID models:

(i) to help to visualize a systematic process, which allows those involved to reach consensus on that process; (ii) to serve as a tool for managing both the process and project; (iii) to allow for testing of theories by integrating the theories in a practical model that can be implemented; (iv) to set tasks that can be used as criteria for good practice (Seels & Glasgow, 1998).

The ID model presents the relationships and order of important ID phases that together can assist in the comprehension and management of the learning process by the designer (Smith & Ragan, 1999).

There are over one hundred ID models (Chen, 2008). The majority are derived from the generic ADDIE model, which provides “the basis for understanding everything required to plan, strategize, organize, and deliver instruction” (Cordes, 2018). ADDIE’s five phases, analysis, design, development, implementation, and evaluation, each have a unique purpose but are dependent on each other. Branch presents an overview of these phases (Branch, 2009). Analysis identifies the probable cause for a target audience’s learning gap and determines educational goals. Design focuses on how to appropriately teach to the educational goals. Development generates and tests the learning materials. Implementation sets the learning product in the environment to engage the learner. Finally, Evaluation assesses the quality of the instructional product to determine its impact on the learning process. ADDIE can be transformed to reflect the needs of the academic librarian, allowing flexibility in design thinking when creating the instruction products (Campbell, 2014). The hope is that the use of an ID model helps to create consistent, high-quality instructional products and to make the creation process more efficient through systematic planning and allocation of resources (Andrews & Goodson, 1980).

No matter their role, academic librarians confront a wide range of teaching opportunities, from the one-to-one interaction with a student to the training of other library employees to the delivery of information literacy course curricula (Turner, 2016). The professional standards and competencies from the Association of College and Research Libraries, the Medical Library Association, and the Special Libraries Association have all highlighted the importance of librarians understanding and using ID skills in various academic and research settings (SLA Competencies Task Force, 2016; Standards and Proficiencies for Instruction Librarians and Coordinators Revision Task Force, 2017; Task Force to Review MLA’s Competencies for Lifelong Learning and Professional Success, 2017). With the demand from higher education audiences and the expansion of librarianship roles, librarians are adopting systematic ID and ID models into their instructional efforts and documenting that adoption through publishing case studies on their efforts.

The scholarly literature in LIS provides evidence of the use of ID models supporting collaborations between faculty, librarians, and instructional designers to create instructional products through a systematic, reflective, and iterative process. One touchstone for integrating systematic ID in libraries is Stephen Bell and John Shank’s *Academic Librarianship by Design* (Bell & Shank, 2007). Bell and Shank present ID as a way for librarians to claim authority and expand their roles from buyer and service provider to technology-savvy creative collaborator. As much as they advocate for instructional design, they acknowledge that ADDIE may be too onerous a process for most librarians to commit to most of the time. Especially for informal, one-off teaching, they promote applying the lessons of ID in a more streamlined and simplified way using the Blended Librarians Adapted ADDIE Model (BLAAM). Others have also called attention to the dedication of effort and time needed for systematic ID as well as the inflexible process of some models (Mullins, 2016; Nichols Hess & Greer, 2016; Roth et al., 2016; Wang, L., 2011).

To date, there has been no comprehensive review of the use of systematic ID and ID models in academic librarianship to create instructional products. The researchers sought to investigate the literature using a scoping review methodology.

**Research Purpose**

The following research questions were identified in the initial planning for review: (1) What examples of systematic ID and ID models are represented in the literature on academic library instruction? (2) What roles do systematic ID and ID models play in librarians’ development of instructional products and what are the contexts of their use? (3) What do the identified articles have to say about the usefulness of systematic ID or ID Models?

**Methods**

The researchers selected the scoping review methodology for this research. This review type is intended to address broad questions, “aiming to summarize and disseminate research findings” (Arksey & O'Malley, 2005). It is a rigorous review approach that “produces [a] profile of the existing literature in a topic area” to examine the state of the research and reveal areas in need of exploration for future research and practice (Brien et al., 2010). Examples of scoping reviews in library science research that investigate instructional aspects of professional practice include the development of curriculum, the delivery of instruction, and the assessment of information literacy in various audiences (Boruff & Harrison, 2018; Hirt et al., 2020; Ma et al., 2018; Ma et al., 2020; Smith, D., 2019; Stapleton et al., 2020). The scoping methodology framework comprises five recommended stages, from identifying relevant studies and selecting to charting and reporting the findings. Reporting of this scoping review follows the PRISMA-ScR reporting standards (Tricco et al., 2018).

The researchers determined the eligibility criteria prior to searching. We sought peer reviewed journal articles, published from 1990 to 2020 to reflect the past thirty years of publishing on instruction in academic libraries, and limited language to English.

We constructed a comprehensive search string through a formative process of identifying the concepts representing: “instruction” or “instructional products,” “librarians,” “academic library settings,” and “systematic ID” or “ID models.” This process allowed for identifying unknown controlled vocabulary and keywords. After agreement on terminology, the researchers conducted and modified the searches in nine databases between June 2017 and August 2017. The databases searched were Library Literature and Information Science (LLIS), Library, Information Science and Technology Abstracts (LISTA), Library and Information Sciences Abstracts (LISA), Educational Resource Information Center (ERIC) via EBSCOHost, Education Research Complete, PubMed (including MEDLINE), CINAHL Plus with Full text, Scopus, and Web of Science Core Collection. Here is an example search strategy from LISTA:

((librarian\* OR "information specialist" OR informationist\* OR "information professional" OR "knowledge worker" OR "information scientist" OR "information services") AND (("academic libraries") OR ("research libraries") OR ("special libraries") OR ("college libraries") OR ("medical libraries") OR ("junior college libraries")) AND ((model\*) OR (system\*) OR (design\*) OR (ISD) OR (IDM) OR (develop\*)) AND (((DE "LIBRARY orientation" OR DE "LEARNING" OR DE "INFORMATION services -- User education") OR ((instruct\*) OR (educat\*) OR (orient\*) OR (teach\*) OR (curricul\*) OR (train\*) OR (pedagog\*) OR (tutor\*) OR (lesson\*) OR (lectur\*) OR (learn\*) OR (webinar\*)))

Limiters –

Scholarly (Peer Reviewed) Journals;

Publication Date: 19900101-20170630;

Publication Type: Academic Journal;

Language: English

For the database search queries, see Appendix 1. In February 2020, the researchers repeated the searches to update the result from July 2017 to January 2020. All of the previous databases were consulted except for LISA as the researchers’ home library did not have access at that point in time.

Researchers engaged in two phases of screening, first looking only at the title and abstract to exclude articles that obviously did not meet the inclusion criteria, and then examining the full text of the remaining articles to make a final decision (Table 1). Articles that did not explicitly mention the use of a model were still included if they described a systematic process similar to other ID models: for example, by using headings that corresponded to ADDIE steps or describing how they analyzed student needs and defined and assessed outcomes. Covidence was used in both phases to track inclusion or exclusion.

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| **Table 1: Screening criteria to select sources of evidence** |
| **Screening Phase** | **Inclusion Criteria** | **Exclusion Criteria** |
| Screening One (Title/Abstract Review) | * Academic library setting
* Evidence of creating or revising an instructional product
* Peer-reviewed journal articles
 | * Public, school, or special library setting
* No evidence of creating or revising instruction
* Literature reviews, editorials, newsletters
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| Screening Two (Full-Text Review) | * Uses systematic instructional design or an ID model
* Evidence of creating or revising an instructional product
* Instruction targeted students
* Academic library setting
 | * No systematic instructional design or ID model
* No evidence of creating or revising instruction
* Not a journal article (Literature reviews, editorials, newsletters
* Not for students
* Continuing education for Librarians
* Not academic library setting
* Duplicate records
 |

Researchers initially screened a sample of 100 titles/abstracts together to test for agreement on inclusion criteria for identifying articles that represent the creation and implementation of instruction by academic librarians within the citation sample. There was agreement on 93 citations and researchers discussed the remaining 7 citations. We examined our individual interpretations of the inclusion criteria to come to a consensus on the instructional setting, the article types available, and the creation or revision of instruction. Post-consensus, the researchers divided the work of title/abstract screening so that only one review was required per title/abstract for the first round of screening. The second screening required both researchers to independently review the full text of each article to prepare for extraction.

The survey tool Qualtrics was used to build a form for data entry from each article (Qualtrics, 2020). The fields documented included: first author, year of publication, country, aims/purpose of the paper, article type, target audience, academic sector, instruction delivery medium, the context of the instruction (course-integrated or credit-bearing), ID model identified, phases of ID model represented within the article, and what method was used, if any, to evaluate the instructional product if any. Researchers also documented the article’s conclusions and the benefits of using an ID model as stated by the article‘s authors. No critical appraisal was undertaken as our scoping review was exploratory in nature.

The researchers pilot tested the charting form on a sample of known articles to ensure the capture of relevant information, and any disagreements were resolved by discussion and consensus. The two researchers divided up the list of included articles and independently charted 29 articles each. The charting was then reviewed by the other researcher and any differences within the data charting were resolved through discussion.

Through the data charting, the results are reported using descriptive statistics and themes that emerged through discussion between the two researchers.

**Findings**

*ID in library literature*

The first round of search results represented January 1990 to June 2017. Database searches yielded 17,294 citations, and another 200 citations were found in the reference lists of identified and charted ID model articles. After removing duplicates, 10,160 unique citations were identified for screening. RefWorks Bibliographic Management Software and Covidence were used for duplicate citation removal (Ex Libris ProQuest, 2020; Veritas Health Innovation Ltd, 2020). The second round of search results represented July 2017 to January 2020. 2,661 new citations were found and 1,600 duplicates were removed, for a total of 1,061 moving to the next stage. Combining results from the 2017 and 2020 searches, researcher one screened 5,637 title/abstracts and researcher two screened 5,584 title/abstracts. Of the 323 articles reviewed in this phase, 46 described librarian use of a systematic ID or an ID model to create an instructional product and met the criteria for inclusion in the charting of the evidence. In the summer of 2020, 48 articles were added to review full-text and 10 additional articles were identified. The PRISMA flow chart (Figure 1) provides the details of the screening process. A total of 58 articles were included in the study and shown in the charts results of Table 2 and Table 3.

**Figure 1: PRISMA Flow Diagram**

Studies included in qualitative synthesis
(n = 58)

Full-text articles excluded, with reasons
(n = 313)

No systematic instructional design or model (n=193)

Not about creation of instruction (n=64)

Not journal article (n=26)

Not for students (n=17)

Continuing Education for Librarians (n=6)

Not academic library setting (n=5)

Duplicate record (n=2)

Foreign Language (n=1)

Full-text articles assessed for eligibility
(n = 371)

Records excluded
(n = 10850)

Records screened
(n = 11221)

Records after duplicates removed
(n = 11221)

Additional records identified through other sources
(n = 200)

Records identified through database searching
(n = 20155)

In terms of publication patterns, articles were clustered in a handful of journals and most appeared quite recently. Of the 58 articles included in the study, all were published since 2000, and nearly half (24) were published in the most recent five years of the period under review. Of the 24 journals represented in the study, six accounted for just over half of the included articles. *Journal of Library & Information Services in Distance Learning* had the most with eight articles; *College & Research Libraries* and *Reference Services Review* tied for second place with 5 articles each; and *Communications in Information Literacy*, *Internet References Services Quarterly*, and *Medical Reference Services Quarterly* allhad four.

Only 34 of the 58 articles explicitly named a model or framework, and three more said they used an ID model but did not identify it, as shown in Table 2. The most frequently observed model by far was ADDIE, with nine mentions. ARCS (Attention, Relevance, Confidence, Satisfaction) Model and Wiggins & McTighe’s Backwards design were both mentioned four times. Blended Librarians Adapted ADDIE Model (BLAAM), Dick & Carey, ILIAC (Information Literacy Instruction Assessment Cycle), and Quality Matters (QM) were all mentioned twice, and several more were mentioned once. These included ADDR, Bigg’s, Didactic Relations, IDEA (Interview, Design, Embed, Assess), Information Literacy Curriculum, Lesson Study Cycle, Quality Course, Successive Approximation, and Zheng & Smaldino Framework. Although some, such as ARCS and QM, were not technically created to be ID models, they still provided the authors some type of systematic framework for the reflective creation of instruction.

There were 21 articles that did not identify a model or framework at all but follow a systematic ID process, as documented in Table 3.

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| Table 2: ID Models Represented in the Library Literature |
| One ID Model Represented |
| Primary Author/ Year | **Target Patron:**  | **Academic Sector:** | **Instruction Delivery Medium / Offering(s):**  | **ID Model in Article:** | **Phases of ID Represented:** | **Aims/Purpose of Paper:** | **Evaluation Methods:** | **Authors' reported benefits when using an ID Model** | **Article's Conclusions:** |
| An & Quail, 2018 | Undergrad. & Graduate | Economics and Business | Tutorial (asynchronous) | ADDIE | Analysis, Design, Development | Describes the creation of an online toolkit, or a tutorial, consisting of videos and pdfs to promote IL for business students. | N/A | ADDIE helped structure the design and development of the tutorial, particularly in focusing attention on student needs and faculty input through focus groups, surveys, and curriculum mapping. | In creating the toolkit, librarians learned about online learning, adult learning theory, and the importance of soliciting input from students. |
| Behney, 2019 | Undergrad. | Natural Sciences | Tutorial (asynchronous) | ADDIE | Analysis, Design, Development, Implementation, Evaluation | Describes the creation of an information skills badge for a chemistry class | Student video assignments and course evaluation | ID helps educators create learning experiences that meet stated objectives and align with learning theories rather than focusing on the particular teaching tool. | Well-designed badges are an effective and seamless way to assess student learning and motivate students to learn.  |
| Easter et al., 2014 | Undergrad. | Arts and Humanities | Online | ADDIE | Analysis, Design, Development, Implementation, Evaluation | Describes collaboration between librarians and faculty using the ADDIE model to provide point-of-need instruction for students in a distance education course. | Page views counts. | ADDIE is flexible, responsive but not reactive, and allowed them to frontload work. | Collaboration between librarians and faculty lead to better instructional outcomes |
| Kavanagh Webb & Hoover, 2015  | Undergrad. | Natural Sciences | Tutorial (asynchronous); Series of Sessions | ADDIE | Analysis, Design, Development, Evaluation | Describes how librarians created a tutorial for biology using principles of Universal Design and ACRL standards for Science and Technology. | Student usability testing with speak-aloud method | Systematic tutorial design using both ADDIE and UDL to differentiate means of representation of information will result in a positive educational experience for all students. | Positive outcomes of use of ADDIE and UDL principles, as well as mapping media types and considering student learning styles. |
| Mi, 2016 | Professional Degree Program | Health and Medicine | Online; Series of Sessions | ADDIE | Analysis, Design, Development, Evaluation | Describes the development of an online IL curriculum for medical students that shows how the use of ID principles can maximize learning, with emphasis on student self-assessment for lifelong learning. | Informal faculty feedback during development; student surveys | The model helped to organize the development of instruction. | Accrediting bodies' requirements for self-directed learning provide opportunities for librarians to integrate an online IL curriculum into medical education. |
| Nichols Hess & Greer, 2016 | Undergrad. | Generic - academic | Online; Credit-bearing Course | ADDIE | Analysis, Design, Development, Implementation, Evaluation | Describes the use of ADDIE to build a credit-bearing IL course and to integrate current e-learning best practice. | Student final project assignments evaluations. | A systematic approach in the design and evaluation process provided a blueprint that gave clarity. Use of scholarly literature in the analysis and design phases helped focus efforts. | ADDIE helped authors focus on engaging students with course content, one another, and the instructors in innovative ways. The systematic design process can be scaled to design engaging learning opportunities. |
| Reinbold, 2013 | Professional Degree Program | Health and Medicine | Blended; Series of Sessions | ADDIE | Analysis, Design, Development, Implementation, Evaluation | Provides librarians with a guide to the framework behind ID through a review of ADDIE and application of ADDIE to library instruction at the author's institution. | Polling activities, informal feedback, course evaluations, final examination; librarian self-assessment; use statistics. | ADDIE is an iterative process that promotes creation of learner-centered instruction that measurably meets both librarian and student learning goals. | ADDIE can help librarians teach more effectively and collect data that demonstrate student learning. |
| Russell et al., 2013 | Undergrad. | Generic - academic | Tutorial (asynchronous) | ADDIE | Analysis, Design, Development, Implementation, Evaluation | Outlines the development of online reusable learning objects and how the resources have been used, shared, and revised to promote IL.  | Survey and usage statistics | N/A | The project enhanced academic collaboration and cooperation and created a landscape for the sharing of knowledge, skills and quality teaching and learningresources.  |
| Loo & Chung, 2006 | Undergrad. | Generic - academic | In-person; Credit-bearing Course | ADDR | Analysis, Design, Development, Implementation, Evaluation | Describes creation and implementation of IL course that conforms to the needs and mission of a liberal arts institution.  | Student questionnaires; faculty comments and feedback. | The course development model allowed the creators to align the instruction with the institution's individual mission and unique environment. | The revision of the course to align with the university mission enhanced student abilities including problem solving, critical thinking, creativity, collaboration, communication and presentation |
| Leslie, 2017 | Unspecified Audience | Health and Medicine | Tutorial (asynchronous) | ARCS Model | Design, Development, Evaluation | Describes the creation of an interactive tutorial using Guide on the Side to enhance student search skills and understanding of bibliographic databases. | Student usability testing | N/A | Collaboration is important for managing open source technologies for tutorial development. This project promotes the creation of further subject-specific tutorials. |
| Reynolds et al., 2017  | Undergrad. | Generic - academic; Nursing | In-person; One-time Session | ARCS Model | Design, Development, Implementation | Documents how three librarians have approached and integrated motivational design into instruction. Best practice for instructors are also presented for librarians interested in use of the ARCS model.  | Course interest survey. | For instruction librarians wanting to add motivational elements to teaching, ARCS is helpful in engaging students with research skills during one-shot IL sessions. | ARCS is a flexible model that librarians can use to customize their instruction to better meet student needs. |
| Roberts, 2017  | Community College | Generic - academic | In-person; One-time Session | ARCS Model | Evaluation | Examines the engagement of community college students in an IL session and evaluates the effectiveness of motivational design models and problem-based learning for non-traditional students | Pre- and post-test student evaluation. | ARCS aids in the development of lessons that motivate and engage students using active, problem-based learning. | To engage with nontraditional students, preparing instructional sessions with problem-based scenarios can motivate learners and build student's research skills.  |
| Wijetunge & Manatunge, 2014 | Undergrad. | Law | In-person; Series of Sessions | Bigg's Constructive Alignment Model | Design, Development, Implementation, Evaluation | Describes IL program for undergraduate law students, using Constructive Alignment Theory and the Empowering 8 IL Model. | Student pre- and post-test, evaluation forms | N/A | The first two years of implementing the program helped librarians identify areas in need of revision to promote IL and partnerships with faculty. |
| McGowan, 2019 | Undergrad. | Health and Medicine | Blended; Credit-bearing Course | BLAAM | Analysis, Design, Development, Implementation, Evaluation | Describes the redesign of an evidence based practice course for nursing students in which librarian is co-teacher and co-designer.  | Pre- and post-course student surveys | ID provides a clear process and promotes adoption of best practices in teaching and assessment. | The redesign was successful in promoting student engagement and confidence. Adopting ID, a mix of assessments, and flipped classroom can foster student-centered learning. |
| McGowan, 2019 | Undergrad. | Health and Medicine | In-person; Series of Sessions | BLAAM | Analysis, Design, Development, Implementation, Evaluation | Describes the development of an inclusive extracurricular hackathon event that encourages health sciences students to work with large biomedical datasets.  | Post-event interviews | BLAAM's user focus helped to create a more inclusive hackathon and avoid pitfalls related to competitiveness, scheduling, and lack of diversity.  | Design thinking can enable teachers to communicate their learning goals to diverse audiences in culturally sensitive and meaningful ways. |
| Petersohn, 2008  | Undergrad. | Generic - academic | In-person; One-time Session | Dick and Carey | Design, Development, Implementation, Evaluation | Evaluates effectiveness of Classroom Performance Systems in improving student learning in library instruction as measured by pre-and post-test questions.  | Assessing student performance based on questions posed during the instruction.  | The use of ID was a key element in attempting to make two instruction sessions pedagogically equal for the purposes of a research study.  | The process highlighted the potential of ID for study design, as well CPS for classroom management and domain-specific learning. |
| Skagen et al., 2009 | Undergrad. | Generic - academic | Tutorial (asynchronous) | Didactic Relation Model | Analysis, Design, Development, Implementation, Evaluation | Describes use of the didactic relation model to enrich IL educational practice and enrich the design of online education.  | Focus group and online questionnaire | DRM provided a framework to reflect on key factors of IL and to conceptualize how online instruction can support the learning process. | The tutorial was successful in promoting evidence based practice, which in turn will contribute to resources to improve student learning online. |
| Mullins, 2016 | Graduate | Education | Blended, Tutorial (asynchronous); Series of Sessions | IDEA | Analysis, Design, Development, Implementation, Evaluation | Describes how the IDEA model was used in a pilot case study to design a blended course consisting for doctoral education students | Student questions and discussion, course assignments grades | Because following ID model is time-intensive, it is most helpful for research-intensive courses that are frequently offered by motivated faculty, have reasonable timeframes and class sizes, and require greater virtual support. | Librarians should adopt systematic and collaborative approaches to embedding IL in the curriculum to address student demands for flexible learning environments and the shift in librarian roles to instructional partners. |
| Wang, 2011 | Undergrad. | Generic - academic | N/A | IL Curriculum Integration Model | Analysis, Design, Development, Implementation, Evaluation | Based on interviews with librarians from 3 universities, presents a model of integrating IL instruction into the undergraduate curriculum. | N/A | Use of the model helps librarians to conceptualize the relationship between IL instruction and the broader curriculum. | The model shows promise for adapting to different disciplinary contexts for curricular integration and the study provides a framework for others doing similar work |
| Gustavson, 2012 | Undergrad. | Generic - academic | Blended; Series of Sessions | ILIAC | Analysis, Design, Development, Implementation, Evaluation | Describes the development and implementation of an assessment plan over three years to improve student learning in first-year library instruction and provide evidence to higher education accreditation. | Classroom assessment techniques (3-2-1 assessment, muddiest point), end of class quizzes.  | ILIAC was an effective model for building a program-wide assessment model. | Formative assessment methods do not provide high-quality data about student learning and are ineffective for assessing an instruction program. Favors summative data and other authentic assessment data. |
| Oakleaf, 2009 | Undergrad. | Generic - academic | Tutorial (asynchronous) | ILIAC | Analysis, Design, Development, Implementation, Evaluation | Presents the IL Instruction Assessment Cycle, using examples to show its benefits. | Rubric analysis of student performance on learning activities | Assessment analysis led to improvement of instruction and of assessment rubric, and their report to faculty increased interest. | The two rounds of assessment provided valuable data about student learning and allowed librarians to improve the learning modules significantly.  |
| Watson et al., 2013 | Undergrad. | Generic - academic | In-person; One-time Session | Lesson Study Cycle | Design, Development, Implementation, Evaluation | Describes the process of using the lesson study model to streamline the one-shot instruction session and promote cross-disciplinary collaboration and creativity in instruction planning. | Student survey and focus groups  | The study helped librarians understand the disconnect between librarian and student perceptions. Librarians and faculty developed shared expectations for a library instruction session.  | The process of conducting the lesson study was more valuable than the resulting lesson plan. Librarians gained insights into teaching and collaboration promoted sharing new perspectives |
| LeMire, 2016  | Undergrad. | Generic - academic | Tutorial (asynchronous) | Quality Course Framework | Analysis, Design | Describes the revision of the IL curriculum from in-person, one-shots to an online, modular, embedded course within an undergraduate writing class. | N/A | The model was used to map the Writing 2010 learning objectives to the ACRL competency standards and Framework. | The revised IL course's modular design increased flexibility for meeting students' curricular needs while requiring only minor adjustments going forward. |
| Loesch, 2011 | Undergrad. | Math and Computer Science | Online; Credit-bearing Course | Quality Matters | Design, Development | Documents collaboration between librarians and faculty to create an online course that introduces IL concepts from a computer science point of view. | N/A | N/A | Collaboration led to greater collegiality and learning among authors. Librarians are innovators in distance education. |
| Newby et al., 2014 | Professional Degree Program | Library and Information Science | Online; Credit-bearing Course | Quality Matters | Design, Development, Implementation, Evaluation | Describes how Quality Matters can be used to create online instruction for IL. | Teacher evaluations. | Working as QM evaluators benefited authors as teachers, and students approved of course elements inspired by QM. | QM facilitates the design and implementation of library instruction. |
| Roth et al., 2016 | Undergrad. | Generic - academic | Tutorial (asynchronous) | Successive Approximation Model  | Design, Development, Implementation, Evaluation | Describes the process of creating an online library scavenger hunt as an orientation activity for first year students. | Usability testing, completion/failure rate analytics, and pre- and post-tests. | For shorter projects, ADDIE is impractical, too time consuming, and too linear and inflexible. The alternative SAM model avoided these pitfalls and focused attention on most important issues. | SAM is a successful alternative model for short-term projects and led to the creation of a useful tool. |
| Guise et al., 2008 | Undergrad. | Generic - academic | In-person; Series of Sessions | Unnamed ID Model | Analysis, Design, Implementation, Evaluation | Creates a first-year university students' summer learning institute in research, writing, and presenting to support the transition from high school to university.  | Student surveys.  | Flexibility to be applied to other programs; allowed faculty to continually improve the program by reflecting on each part. | The program accomplished its goals, engaged students and provided them with tools to ease the transition into the university.  |
| Johnson, W. G. et al., 2001 | Community College | Generic - academic | In-person; One-time Session | Unnamed ID model | Analysis, Design, Development, Implementation, Evaluation | Provides overview of guidelines for access-based, assignment-specific instruction for general introductory bibliographic instruction.  | Student and faculty instruction evaluations. | ID principles enable the library to move from resource-based instruction to access-based. | ID helps librarians demonstrate its value in contributing to the academic success of students.  |
| Van Houlson, 2007 | Undergrad. | Generic - academic | In-person; Series of Sessions | Unnamed ID Model | Design, Development, Implementation, Evaluation | Describes workshops created for students in first year writing classes | Post-instruction test | Helps to distinguish between essential and non-essential goals and to break up instruction into modules that minimize cognitive load. | The workshops were successful. It is important while teaching to organize content into meaningful groups and provide opportunities for active learning. |
| Mills et al., 2019  | Undergrad. | Generic - academic | In-person; One-time Session | Wiggins and McTighe | Analysis, Design, Development, Implementation, Evaluation | Describes redesign of a library lesson focusing on "Searching as Strategic Exploration" using Wiggins and McTighe's backward design process. | Rubric to evaluate student worksheets | Use of backward design led to a lesson with more active learning that students engaged with and learned more from. | backward design is an effective tool for faculty collaboration and promotes critical thinking for students. |
| Olesova & Melville, 2017 | Graduate | Education | Online; Credit-bearing Course | Zheng and Smaldino Framework | Analysis, Design, Development, Evaluation | Describes a collaboration between a professor and a librarian using ID to embed library services throughout an online graduate course in education.  | Student course projects, student satisfaction with library services | Zheng and Smaldino's guided framework helped create a successful partnership, particularly when assessing learners and planning content organization. | Collaboration in the online learning environment requires communication and flexibility. This project benefits all stakeholders and provides a model for the future. |
| Multiple ID Models Represented |
| Christensen, 2015 | Undergrad. | Generic - academic | In-person; One-time Session | ARCS Model; Wiggins and McTighe | Design, Development, Implementation | Describes the use of backward design and ARCS to design one-shot instruction sessions dedicated to IL threshold concepts, knowledge practices, and dispositions.  | N/A | ARCS is a flexible model that enabled them to orient teaching to student success and simplified the process of creating one-shot sessions. | Use of threshold concepts helped orient instruction planning around learning outcomes, and ARCS helped manage the content and delivery of instruction |
| Fox & Doherty, 2012 | Graduate | Generic - academic | Tutorial (asynchronous); Series of Sessions | ADDIE; Wiggins and McTIghe | Analysis, Design, Development, Implementation | Describes how the idea of intentionality to the creation of learning modules that provide students with effective approaches to find and evaluate professional literature.  | N/A | By using backward design, the authors were able to scaffold the learning to help students acquire the knowledge of IL from a novice to expert levels.  | Intentionality was essential to the project's success, particularly specifying learning outcomes and product specifications and selecting the design team. |
| Rimland & Raish, 2017 | Undergrad. | Generic - academic | Blended, Tutorial (asynchronous) | Dick & Carey; Wiggins & McTighe; Kemp | Analysis, Design, Development, Implementation, Evaluation | Explains how ID principles can be considered in the design of digital badges for library instruction in a concept paper. | N/A | ID enables teachers to plan instruction in a way that is consistent with learning theory as well as with teacher-defined learning outcomes. | Librarians can create successful instruction by considering audience, goals, approach, implementation, and scalability. |

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| Table 3: Systematic ID Represented without ID Models in the Library Literature |
| Primary Author/ Year | **Target Patron:**  | **Academic Sector:** | **Instruction Delivery Medium / Offering(s):**  | **Phases of ID Represented:** | **Aims/Purpose of Paper:** | **Evaluation Methods:** | **Article's Conclusions:** |
| Anderson & Mitchell, 2012 | Undergrad. | Generic - academic | Tutorial (asynchronous) | Analysis, Design, Development, Implementation, Evaluation | Describes the creation of an online tutorial on IL | Student worker pre-implementation test; faculty post-implementation questionnaire | The online tutorial was useful and the platform used to create it was easy and flexible. |
| Argüelles, 2015 | Undergrad. | Health and Medicine | In-person; Series of Sessions | Analysis, Design, Development, Implementation, | Describes process of creating course-integrated IL instruction for a community health course. | N/A | Lessons were learned about the importance of collaboration with faculty, holistic and reflective assessment from multiple sources, and multiple curriculum-integrated sessions. |
| Bloom & Deyrup, 2003 | Undergrad. | Generic - academic | Tutorial (asynchronous); Series of Sessions | Design, Development, Implementation, Evaluation | Documents collaborative effort to create an IL program for incoming students. | Student survey, journals, quizzes, and anecdotal feedback. | Web tutorials will continue to play an important role in IL instruction as more data is collected and tutorials evolve. |
| Blummer et al., 2010 | Graduate | Education | Blended; Series of Sessions | Design, Development, Evaluation | Presents a potential lesson plan concept paper to address the lack of research skills and IL competencies among students in an education master's program.  | Website usability tests, pre-/post-tests, student project paper grades, focus groups. | Teaching proposal is an attempt to maximize graduate student use of appropriate resources by adopting constructivist learning theory.  |
| Bussmann & Plovnick, 2013 | Undergrad. | Natural Sciences | Tutorial (asynchronous) | Analysis, Design, Development | Describes the evaluation and revision of an online tutorial about finding science information that is contextualized within the information lifecycle. | N/A | It's important to revise online tutorials based on usability testing, as well as contextualizing instruction within information life cycle. |
| Chin Roemer & Greer, 2016 | Undergrad. | Generic - academic | Tutorial (asynchronous); Series of Sessions | Analysis, Design, Development, Implementation, Evaluation | Outlines the process of creating and implementing a multi-part, asynchronous online workshop on conducting literature reviews to better accommodate user demands and diverse schedules. | Student and tutor surveys. | The asynchronous workshop model was a success and suggests directions for further growth, including developing discipline-specific iterations and reducing drop-off in participation over the 5 modules. |
| Donaldson, 2000 | Undergrad. | Economics and Business | Tutorial (asynchronous) | Design, Development, Implementation, Evaluation | Reports on the collaboration between librarians and faculty to develop and implement an online interactive tutorial for first-year business students.  | Student assignments and evaluation on the tutorials features; informal faculty feedback. | The tutorial's success led to its adaptation for use in other disciplines. |
| Faulk, 2018 | Undergrad. | Generic - academic | Tutorial (asynchronous); Series of Sessions | Analysis, Design, Implementation | Describes the creation of a scalable and sustainable IL program for the online Continuing Professional Studies undergraduate programs. | N/A | The online IL program has increased the library's reach to students the CPS program and has created efficiencies with staff workloads around the program with the online "stable lesson" module.  |
| Greer et al., 2012 | Undergrad. | Generic - academic | Tutorial (asynchronous) | Analysis, Design, Development, Implementation | Describes the creation of an online tutorial of 6 modules aimed at preventing plagiarism to replace an outdated tutorial. | N/A | Instruction planning benefited from the use of a multi-disciplinary task force, as well as incorporating active learning and integrating into the LMS. |
| Hegarty & Carbery, 2010  | Undergrad. | Health and Medicine | In-person; Series of Sessions | Analysis, Design, Development, Implementation, Evaluation | Describes the development and implementation of an information training program for undergraduate nursing students. | Online student survey. | The program allowed the librarians to address the student information across the curriculum and helped students be more confident library users. |
| Holliday & Fagerheim, 2006 | Undergrad. | Generic - academic | In-person; Series of Sessions | Analysis, Design, Development, Implementation, Evaluation | Describes the implementation of a scaffolded IL program for core English composition classes at both first-year and sophomore/junior levels. | Student self-assessment survey and focus groups; instructor survey. | The project succeeded in raising the profile of IL instruction on campus and led to additional partnerships. |
| Jackson, 2006  | Undergrad. | Generic - academic | Tutorial (asynchronous) | Analysis, Design, Development, Implementation, Evaluation | Assesses undergraduates' understanding of plagiarism using an online tutorial. The tutorial overviews and tests knowledge of plagiarism, paraphrasing, and citation. | Student pre- and post-session survey questions. | The study provides evidence to support the need for more instruction on paraphrasing. The tutorial was successful but requires reinforcement in the classroom. |
| Johnson, C. M. et al., 2011 | Undergrad. | Natural Sciences | In-person; Series of Sessions | Design, Development, Implementation, Evaluation | Describes creation of scaffolded instruction for honors class on scientific ways of knowing, coinciding with revision of honors college curriculum. | Student pre-course self-assessment/survey, post-course quiz/survey, and final course evaluations. | Assessing at multiple points is important to address failures, make improvements, and collaborate with faculty. |
| Kavanagh, 2011  | Undergrad. | Economics and Business | In-person; Series of Sessions | Analysis, Design, Development, Implementation, Evaluation | Describes the development of a four-session IL module for undergraduate marketing students over a three year period using a reflective and research-based approach. | Student surveys and assignments  | Adopting a reflective approach to embedded IL modules can lead to an increase in student confidence and improve academic performance.  |
| Kumar et al., 2012 | Graduate | Education | Tutorial (asynchronous); Series of Sessions | Analysis, Implementation, Evaluation | Reports on a library instruction needs assessment conducted with incoming doctoral students in two online programs in education and how librarians restructured instruction based on the results. | Student survey | A student needs analysis is especially important for online learning because of the advanced planning required and the difficulty of getting student feedback during the course. |
| Macklin & Fosmire, 2005 | Undergrad. | Generic - academic, Natural Sciences | In-person; Series of Sessions | Analysis, Design, Development, Implementation, Evaluation | Describes the development of an information-centered curriculum that integrates ACRL IL competencies and based on workshops with 50 faculty to identify key skills. | Student pre- and post-session self-assessments | The considerable time needed to develop the courses will lead to future benefits including the reuse of the curriculum, stronger faculty relationships, and increased demand for library services. |
| Miller & Putnam, 2015 | Undergrad. | Generic - academic | In-person; One-time Session | Implementation, Evaluation | Demonstrates use of SAMR framework to understand tablet integration, offering librarians ideas for evaluating the use of instructional technology. | Coding SAMR evaluation for iPad integration in the one-shot instruction session. | Librarians can use educational frameworks to understand and implement the classroom use of new technologies in a flexible and creative way. |
| Parang et al., 2000  | Undergrad. | Generic - academic | Blended; One-time Session | Analysis, Design, Development, Evaluation | Describes how librarians revamped first-year instruction to include more active learning. | Post-instruction test | Assessment data from the first semester of instruction will be used to improve in further semesters. |
| Raquepau & Richards, 2002 | Undergrad. | Natural Sciences | In-person; Credit-bearing Course | Design, Development, Implementation, Evaluation | Describes creation and improvement of a credit-bearing course on research skills in environmental and natural sciences. | Student pre- and post- self-evaluation survey; Librarian self-assessment on teaching. | The online lessons were successful and raise various assessment-related methodological questions for future research. |
| Schulte, 2008 | Undergrad. | Health and Medicine | Online; Series of Sessions | Analysis, Design, Development, Implementation | Overviews the integration of an IL unit into a nursing informatics class, including collaboration with nursing faculty and the relationship of IL to evidence based practice and informatics. | N/A | This ID article is an example for other librarians to pursue to engage with the nursing profession, supporting students to become evidence-based practitioners. |
| Sloane et al., 2018 | Undergrad. | Natural Sciences | In-person; Series of Sessions | Design, Development, Implementation, Evaluation | Describes the development of an IL lesson by incorporating the ACRL framework and collaborating with science faculty. | Rubrics to evaluate student learning, student essay reflections. | The Framework is a useful tool for developing library instruction, and ID can enable librarians to integrate IL into the curriculum |
| Stiwinter, 2013 | Community College | Generic - academic | Blended | Design, Development, Implementation, Evaluation | Documents the creation of an online tutorial for first year students to teach research skills through active learning. | Student pre- and post-test, feedback survey | Adhering to best practices and enabling interactivity resulted in tutorials that were well designed and successful. |
| Tagge, 2018 | Professional Degree Program | Health and Medicine | Tutorial (asynchronous); One-time Session | Analysis, Design, Implementation, Evaluation | Discusses collaboration of librarians and medical faculty using a flipped classroom model to promote IL, critical thinking, and teamwork for students at multiple stages of pre-clerkship period. | Rubric scoring student responses | The creation of curriculum integrated instruction let librarians work as content experts collaborating with medical faculty to support developing student IL in a flipped classroom model. |
| Thielen et al., 2017 | Graduate | Engineering and Architecture | In-person; Credit-bearing Course | Analysis, Design, Development, Implementation, Evaluation | Describes the process of creating and implementing a credit-bearing course about data management for engineering graduate students. | Student pre- and post-class surveys, reflections | Data management skills are crucial but not adequately covered in traditional engineering curricula. This course was a successful first step to meet that need. |

*Roles and contexts of ID*

Most librarians had institutional affiliations in the United States (47), but Canada was represented by four articles and Ireland represented by three articles. China, New Zealand, Norway, and Sri Lanka each had one article. Forty-four of the articles described instruction targeted at undergraduates, seven at graduate students, four at professional students, and three at community college students. One article did not specify a target audience. Most of the instruction had no particular disciplinary emphasis and was intended as a general orientation or as part of a first-year writing program, but STEM and professional fields were well represented. Thirty-one were not subject-specific. Health and medicine was represented by nine articles, the natural sciences by seven, education by four, and economics and business by three. Arts and humanities, engineering, law, LIS, and math and computer science were each represented once.

Twenty-two articles described in-person instruction, but most had some type of online component. Twenty-three were asynchronous tutorials, nine synchronous online, and eight blended. Of the 41 articles with some discernable time component, 23 described a series of instruction sessions, only ten were for one-time instruction, and eight were for credit-bearing classes. All but five articles were some type of case study; the remainder consisted of two conceptual papers, a needs assessment survey, an experimental design comparison, and an interview-based study.

The researchers were also curious about which phases of ID received the most coverage in the journal literature, as displayed in Figure 2. The phases that were most represented were Design (55) and Development (51), with Implementation (47), Evaluation (47) and finally, Analysis (39) was least represented. The most common method of evaluation was some type of survey, interview, or questionnaire administered at the end of the class or after the delivery of instruction, represented in 28 articles. Sixteen articles examined student performance on a test or assignment and eleven used pre- and post-test with an eye to the effectiveness of the instruction. Usability testing was represented in six articles and informal feedback was collected in five articles. Benchmarking, classroom activities, and focus groups each appeared in four articles.



*Reported usefulness of ID*

Of the 34 articles that discussed using an ID model, 30 made some comment on its usefulness. In most cases, the description of the model’s use was incidental to the larger goal of how the instruction was developed, but in some cases, the use of the model was more central to the article’s purpose. The researchers identified several types of comments on the usefulness of a model depending on what the articles emphasized. For example, many articles focused on how using the model led to a superior instructional product, one that was more purposeful, student-focused, active, etc., and led to better outcomes, although generally this was self-reported, not based on any explicit or rigorous evaluation. Others focused instead on how the model improved the instructional *process*, regardless of any difference in the final product, and claimed that using the model gave them a useful framework that made creating and scaling instruction easier or more satisfying. In particular, many articles commented on how the model facilitated collaboration among teams developing instruction, so that librarians, professors, and instructional designers could all have a common vocabulary and make the whole process, including inputs and outputs, more legible to all parties.

**Discussion**

**Summary of Results**

This study’s results allowed the researchers to observe and reflect on the range of systematic ID and ID models in academic libraries. Each charted article provides an example of the process of creating or revising instructional products that fit particular situations and sets of needs. From the creation of an in-person one-shot session to a comprehensive asynchronous tutorial design, the application of ID models and the underlying process of systematic ID are represented in the library science and information literacy literature.

Several themes emerged when charting the literature in this scoping review. The models are not pedagogical straitjackets, but quite flexible as librarians adapt pared-down or revised versions of ID. We also noticed that many articles use the language of ID even if they do not explicitly name a model. Systematic ID and ID models seemed especially promising as a tool for collaboration, giving all members of an instructional team a common language, or as a tool for project management in keeping track of the ID phases at play in larger projects. Despite the great interest in instructional design and its potential, two of the most important parts of the design process, Analysis and Evaluation, were often minimally described, and the methods for evaluation did not consistently result in useful data for improving instruction. The remainder of this section will expand on these themes, provide examples, and propose ideas for application to or research of instructional practice in academic librarianship.

**ID Model Representation in the Library Literature**

ID models provide a systematic and visual pathway, guiding the instructional designer through the different phases of ID and establishing how instructional effectiveness will be evaluated for a consistent, high-quality instructional product. Due to ADDIE’s position as one of the most common ID models in education and how it encompasses the foundational phases of the systematic ID process, it makes sense that academic librarians applied it most frequently to support the creation of library instruction.

Librarians have even created their own unique models, including BLAAM, ILIAC, IDEA, IL Curriculum Models, that focus on essential information literacy (IL) skillsets for the learner and how to assess that learning occurred (Gustavson, 2012; McGowan et al., 2019; McGowan, 2019; Mullins, 2016; Oakleaf, 2009; Wang, 2011). As Librarians have grown their expertise in ID, they have the insights to formulate their own effective ID models and should be encouraged to publish on their instructional process for others to try in their own academic environment. This will increase the body of literature on ID models and could encourage further evaluation of their effectiveness in library instruction.

**“Instructional Design Lite”**

One phenomenon that emerged in the screening process was the frequent use of the vocabulary of instructional design, particularly the terminology of ADDIE, without fully exemplifying its principles or explaining its process. For example, an article might talk about “designing” a lesson instead of simply “planning” it. In other cases, an article might use ADDIE as scaffolding to organize a written case study into sections on Analysis, Design, etc. even when there is no evidence that ADDIE was used as part of a systematic, intentional design process. This phenomenon, which the researchers came to refer to as “ID lite,” may be due to the prestige of ID and the resulting desire to dress up ordinary instruction planning in the technical language of ID. However, it may also be due to the increasing familiarity with instructional design methods and principles, so that it becomes the baseline or mental model for instruction librarians, even when they are not self-consciously engaged in a formal design process. One of the articles charted for this study remarked on this phenomenon: “Librarians and faculty alike, even if they don’t realize it, often use instructional design models as their framework for curriculum and course development, information literacy programming, and learning objects" (Easter et al., 2014). The lack of a fully articulated design process is not unexpected, and even instructional design proponents Bell and Shank acknowledge without criticism that “academic librarians’ instruction is rarely the result of a thoughtful design process but rather is quickly developed simply to provide a requested instruction session” (Bell & Shank, 2007). Another article charted in this study also recognized the great time commitment required in a full application of an instructional design model and recommended that it could be most useful in those situations where it would have the most impact, for example, in frequently taught classes with motivated faculty (Mullins, 2016).

**The Flexibility of ID Models & Systematic ID**

During the extraction and charting process, the researchers recognized the flexibility and adaptation of systematic ID and ID models where authors adjusted systematic ID and ID models to fit their needs. The majority of the articles present a predetermined linear ID plan in sequential order; however, few examples documented instructional phases happening concurrently or recursively in the ID process, including an exemplary article by Skagen et al., who used the Didactic Relation Model (DRM) (Skagen et al., 2009). The concurrent process may speak to academic librarians due to the interrelation or overlapping of many of the stages represented during their instructional creation. Skagen’s use of the DRM allowed multiple instructional stages to occur simultaneously while the designer reflected on the interdependence of the stages influencing a teaching situation. Skagen’s approach allowed for innovative implementation of the instructional product, highlighting the adaptability of ID models to achieve learning goals and research outcomes in a library setting.

Some frameworks were not designed as formal ID models, but librarians have adapted them to create instructional products much in the same way they use ID models. One such framework is the Quality Matters (QM) rubric, a checklist ensuring courses meet online delivery standards for learning. Newby et al. used the QM Rubric as a model in the creation of their own online course; in Loesch’s virtual information literacy course, the QM Rubric reminded the instructors to double-check hyperlinks before students were enrolled for accessibility to the learning materials (Loesch, 2011; Newby et al., 2014).This type of framework facilitated the design of an instructional product in a systematic process for these librarians. For future investigations into the use of systematic ID and ID models, using flexible definitions and terminology to identify these works is appropriate. The use of consistent definitions in instructional design are not reliable throughout the educational and librarianship fields (Edmonds et al., 1994; Göksu et al., 2017).

Several articles used ID models to support the integration of learning theory in the instructional product. Learning theory can provide insights on how people attain knowledge, supporting designers to best structure materials to facilitate learning. The Attention, Relevance, Confidence, Satisfaction (ARCS) model, used by both Christensen and Reynolds, implements motivation design theory, which is formulated on the premise that “individuals are motivated to learn if there is value in the knowledge presented” and encourages the designers to arrange resources and activities to bring about changes in how the participant engages in learning (Christensen, 2015; Reynolds et al., 2017). Following the ARCS model allowed instructors to practically apply the learning theory of motivational design to information literacy instruction, promoting the success of the students in obtaining the set learning outcomes. Finding a model with educational theory underpinnings may help bridge the “theory-to-application gap” in instructional design and further encourage reflection of theory by academic librarians to support their own practice (Tompkins, 2009).

**Collaboration with Instructional Partners**

Over half of the articles charted in this scoping review mentioned the collaborative effort in systematic ID to create, deliver, revise, and evaluate the instructional product between librarians and academic faculty or instructional designers. This is consistent with the strong emphasis placed on collaboration by professional organizations, as in an ACRL position paper, which stresses the importance of building relationships of “mutual respect, trust, and understanding” between instructional collaborators, as opposed to providing a service with minimal input or cooperation (Standards and Proficiencies for Instruction Librarians and Coordinators Revision Task Force, 2017). Argüelles documents how the collaborative design method allowed the team to “take an important step towards integration,” allowing librarians to be innovative and lead collaborative work with academic faculty (Argüelles, 2015). Easter et al.’s pilot information literacy project involved collaboration with faculty and highlights the “importance of finding common professional ground, offering a track record of performance and receptivity to new ideas, as well as … some degree of personal trust and common cause” (Easter et al., 2014). Fox and Doherty captures the power of collaboration by accomplishing an “intersections of content, technology, and pedagogy, where everyone contributed to each component” resulting in a robust ID process and outcome, a “golden triangle” between their team of librarians, academic faculty, and instructional designers (Fox & Doherty, 2012). Systematic ID and ID models can engage academic librarians and faculty in the interdisciplinary field of the scholarship of teaching and learning, whether it be at a consultant level to partnering as a member of the instructional team in an active collaboration (McClurg et al., 2019; McNiff & Hays, 2017; Otto, 2014). Systematic ID or an ID model provides the structure to find common goals and support for voicing unique perspectives to facilitate learning in target populations and solve instructional problems.

**Project Management**

The creation of an instructional product, whether a single lesson or a full curriculum, can become arduous and time-consuming. Individually or as a design team, there are many instructional phases to oversee and the use of systematic ID and ID models can provide a basic pathway or plan to manage the completion of a project. Fox and Doherty noted how using systematic instructional design allowed the design team to “better understand the complexity of the task and the time required” for that phase of development and how a more formal project planning would allow the team to account for scheduling and task management for timely completion of the instructional product (Fox & Doherty, 2012). Many other charted articles mentioned the challenges of timely completion and meeting the set project objectives of the instructional product (Bussmann & Plovnick, 2013; Mi, 2016; Wang, 2011). While the ID models identified supported project management, it is essential to note that many ID models were not designed for accountability of cost or personnel management needed for large projects (Clements et al., 2012). It may be appropriate to use formalized project management techniques in addition to an ID model for successful and timely completion of more complex instructional projects (Hiller Clark, 2014).

**Lack of Representation of Needs Assessment and Analysis**

By examining the phases of the systematic ID and ID model process, the researchers captured how librarians document the input-process-output of an instructional product. In the body of the literature, there was less discussion than expected of needs assessment or analysis as the foundation of an instructional product. Bell and Shank reflect this observation as well, discussing how instructional “products are created based on librarians’ own perception of what the learners need to know… they are not informed by an in-depth analysis or assessment of what the learners already know or what they really need to know” (Bell & Shank, 2007). By not representing all elements within the scholarly publication, authors potentially dilute the reader’s understanding of ID as a systematic process and it may be interpreted as unnecessary.

In the needs assessment and analysis phase, designers identify the learning gaps and set priorities for intervention for the learner, while taking into account the physical, technical, and organizational capacity of the instructional situation (Morrison et al., 2013). Reinbold highlights how the needs assessment can identify learning gaps or problems that could “stem from a change in culture, a resource or technology issue, or another solution unrelated to training” (Reinbold, 2013). When a target population was unavailable for a needs assessment, particularly for a one-shot instruction session, a few strategies exist to know more about their needs. Nichols Hess and Greer approached the professional literature to help “focus and refine” the instructional scope, rather than only relying on their own experiences with the targeted population (Nichols Hess & Greer, 2016). Another example would be to use pre-assignments or pre-test assessments, submitted prior to the session to the librarian to gauge understanding on and student readiness for the targeted learning objectives (Brooks, 2013; Wang, R., 2016).

The investigation may also lead to other potential opportunities beyond an instructional intervention, blending other outreach initiatives or services for academic programs. Another example from this study includes Kumar et al. who discussed how the needs assessment furthered its designs beyond an online tutorial to include specialized support for distance learners (Kumar et al., 2012). Other needs assessment research in the literature confirms this effort by librarians of preparing surveys and interviews to investigate potential services, including instruction, to address the needs of a target population (Bussell et al., 2017; Fong et al., 2016; Ritterbush, 2014). Incorporating the needs assessment, even a scaled-back process of ID models, can ensure that the ID process remains learner-centered and provide a basis for the evaluation of the learner and instructional service.

**Evaluation of instructional products**

Systematic ID and ID Models provide multiple opportunities for formative and summative evaluation of the instructional stakeholders. As a key component of design thinking, the evidence provided by evaluations can be integrated into the delivery of the instructional product or used as a source of future development of new library initiatives (Bell & Shank, 2007). The wide range of methods and purposes for collecting evaluation data, from general page view counts to testing with comprehensive exams of student learning to rate the instructor’s effectiveness, affirms that there was no single method to be used for evaluation in all settings or all types of instruction (McAdoo, 2013). For example, Roth et al. implemented multiple evaluation methods in a first first-year student scavenger hunt, including usability testing, user analytics, and pre- and post-tests (Roth et al., 2016). The use of multiple methods not only provided data on the participants’ learning attainment and confidence in using the library but also provided support for the adoption of a new technology to implement for the library scavenger hunt. The data was then used to support the continued use of the activity and technology in subsequent iterations of the scavenger hunt.

Of particular note concerning the evaluation of instructional products was the number of articles emphasizing the importance of meeting defined competencies of accreditation bodies in higher education (Gustavson, 2012; Mi, 2016; Mullins, 2016; Parang et al., 2000; Thielen et al., 2017). Accreditation bodies for general higher education or specific disciplinary competencies, like nursing or engineering, have been seeking evidence of student success and competency in information literacy since the late 1980s and 1990s (Gratch-Lindauer, 2002; Lutzker, 1990). Gustavson used ILIAC to facilitate the creation of first-year information literacy programming to meet the reaffirmation of the Commission of Colleges Southern Association of Colleges and Schools (SACS) accreditation (Gustavson, 2012). Thielen et al. provided a charted example of evidence of aligning a data management course design to meet the competency standard of the Accreditation Board of Engineering and Technology for graduate education (Thielen et al., 2017). By engaging in accountability to accreditation bodies, academic librarians can use the instructional products to provide evidence of improving student learning outcomes and the impact and value of library services.

**Practical Implications and Future Research**

Academic librarians can look to the scholarly literature to find examples of Systematic ID and ID Models for many types of audiences. In this scoping review, we want to emphasize that a systematic ID process is a pathway or framework that can guide librarians in the creation or revision of instruction. The process can enhance collaboration with instructional partners, management of all of the phases of instructional creation, and encourage creators to engage with needs assessments and effective evaluations for accountability in learning products. Systematic ID and ID models do not have to be followed exactly as described, and as seen in the charted articles, the systematic ID process or model was adapted, or even transformed, in the creation of instruction.

By representing the systematic ID and ID models in the literature, other librarians can see how to engage with the ID process, reflecting on applications to their own work or identifying their own needs for ID professional development. Our field needs documented examples of all of the phases in these publication as they highlight how to apply the ID process when creating instructional products in academic librarianship. Ideally, this process will help academic librarians engage more in the scholarship of teaching and learning to report on creative methods and practice.

**Limitations of the research study**

This research study has limitations and potential areas of bias. The researchers decided to limit the search to journal articles only, as there was no comprehensive way to seek books, book chapters, or grey literature for inclusion in the study, and also excluded non-English language articles. The inclusion of these other types of sources and foreign-language material may have resulted in additional or different findings, including international perspectives. While we attempted to systematically search the scholarly literature using multiple databases, using a combination of keywords and controlled vocabulary, the translation of the search strategies between the databases was challenging. While the keywords transitioned well, the database-specific subject terminology required adjustment and matching with other terms. The process was made especially problematic in databases without definitions associated with the terms. As a result, evidence may not have been identified for inclusion in this study. While identifying relevant evidence during the title/abstract and full-text screening process, we experienced challenges in identifying the full representation of the systematic process for the design of instructional products. While we were sensitive to the limitations of journal guidelines and editorial restrictions of the scholarly articles to not include all phases of the systematic ID process, the examination of the ID phases represented in our sample was still important to document for this scoping review. Another limitation associated with the scoping research methodology is there is not a quality appraisal component of the gathered evidence. We were able to find evidence of the use of systematic ID and ID models by academic librarians, but the quality of the articles was not appraised as part of this investigation.

**Conclusions**

Although academic libraries are providing more instruction than ever to increasingly diverse audiences, this scoping review’s results show that there is more opportunity for investigation of systematic ID and the use of ID models in library instruction. The researchers identified examples of systematic ID and ID models and how these processes contribute to the creation of instruction in the library journal literature, but there is still insufficient exploration on how systematic ID and ID models influence the effectiveness of instructional products for participants. Given the amount of time and other resources invested in creating, promoting, implementing, and assessing instructional programs, it is worthwhile for librarians to take advantage of existing ID models and ideas as part of a reflective teaching practice committed to accountability and learner-centeredness. A fully articulated systematic ID process may not be necessary, or even desirable, in all cases, but engaging with ID principles and adapting them to local circumstances can provide librarians with a clear pathway for undertaking instruction focused on learners and outcomes as well as a framework for collaboration. Ultimately, ID has the potential to set librarians up with a successful plan that not only saves them time and resources in the long run, but also provides a means to connect with students, collaborate with faculty, and communicate library value.

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