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Main article

A summary and analysis of education research in accounting information systems (AIS)

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ABSTRACT

We consolidate and summarize 102 articles on accounting information systems (AIS) education from three decades (1983–2013) published in eight journals: (1) *Journal of Accounting Education*, (2) *Accounting Education: An International Journal*, (3) *Advances in Accounting Education*, (4) *AIS Educator Journal*, (5) *Global Perspectives on Accounting Education*, (6) *Issues in Accounting Education*, (7) *Journal of Information Systems*, and (8) *The Accounting Educators' Journal*. The summarized literature is categorized as empirical articles, descriptive articles, or instructional resources. We describe and summarize the research design and primary analytical approach of the empirical articles, summarize the descriptive articles, and tabulate the instructional resources. Suggestions for future research in AIS education are presented.

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1. Introduction

The accounting profession has focused significant attention on the best ways to educate students for successful careers. One current trend emphasizes competencies as developed by the American Institute of CPAs (AICPA) in its *Core Competency Framework for Entry into the Accounting Profession* (AICPA, 2013; Bolt-Lee & Foster, 2003). The Pathways Commission on Accounting Higher Education (Pathways), a joint project of the American Accounting Association (AAA) and the AICPA, has developed a dynamic process to continuously improve accounting curricula to meet the future needs of the profession (AAA, 2013; Behn et al., 2012).[4] Pathways *Recommendation 4* focuses on the importance of developing and sharing curriculum models and learning resources (Behn et al., 2012). The importance of accounting information systems (AIS) topics to accounting education is one of the undercurrents of the AICPA and Pathways initiatives. In the spirit of *Recommendation 4*, we provide a review of AIS education scholarship for consideration and use by the academic community.

This article summarizes and describes the scholarship on AIS education that has appeared in eight journals that publish accounting education research. The seven education journals we reviewed include: (1) *Journal of Accounting Education* (JAEd), (2) *Accounting Education: An International Journal* (AE), (3) *Advances in Accounting Education* (AAE), (4) *AIS Educator Journal* (AIS), (5) *Global Perspectives on Accounting Education* (GPAE), (6) *Issues in Accounting Education* (IAE), and (7) *The Accounting Educators' Journal* (TAEJ). The eighth journal, *Journal of Information Systems* (JIS), is an accounting-oriented journal sponsored by the AAA,[5] which published education research until 2008.[6] Our analysis covers the entire period that each of the eight journals has published to date.

We describe our method of analysis in Section 2. Empirical AIS articles are reviewed and summarized in Section 3, including our subjective appraisal of the research rigor. Descriptive articles are summarized in Section 4 and instructional resources in Section 5. We conclude the article in Section 6 with observations and suggestions for future research in AIS education.

2. Method of analysis

We adopt Hurt's (2013, p. 4) definition of AIS as "a set of interrelated activities, documents, and technologies designed to collect data, process it, and report to decision makers." This definition focuses specifically on the accounting information system. We thus exclude published scholarship that addresses educational technology or assurance services that employ technology.[7,8]

We began our analysis by referring to the accounting education literature review series that covers relevant scholarship from 1969 to 2012, summarized in Table 1. Those review articles helped identify the accounting education journals included in our analysis. We also included *Journal of Information Systems* because it published education articles and instructional resources on AIS until 2008 and *AIS Educator Journal*, which originated in 2006.[9] Our next step was to manually review each issue of all eight journals to identify articles and instructional resources on the specific topic of AIS, and then reconcile those findings to the AIS articles reviewed in the published literature review series (Table 1). We

[4] *Issues in Accounting Education* dedicated an entire issue to the Pathways Commission on Accounting Higher Education in 2012 (Vol. 27, No. 3).

[5] http://aaahq.org/pubs/EdPolicies/JIS_EdPolicy.pdf.

[6] The AAA's accounting information systems (AIS) Section published education scholarship in *Journal of Information Systems* until 2008 (http://aaahq.org/infosys/archives/Previous_org/2008/AnnualMeetingExec2008.pdf).

[7] We do not review education articles dealing with information systems in journals that appear in other disciplines, such as computer science or management. For example, the *International Journal of Information Systems and Management*, the *Journal of Management Education*, and the *Academy of Management Learning & Education* may publish papers dealing with information systems. *Journal of Information Systems Education* publishes articles of interest to information systems educators. Our focus is on education scholarship dealing specifically with AIS.

[8] We also do not review material from the International Symposium on Accounting Information Systems (ISAIS), which provides a global forum for AIS scholars to interact. ISAIS is a collective of (1) the AIS Research Symposium (AISRS), (2) the European Conference on AIS (ECAIS), (3) the Asia-Pacific Research Symposium on AIS (APRSAIS), and (4) the International Research Symposium on AIS (IRSAIS). The ISAIS is alternately hosted by the University of Central Florida (USA), Tilburg University (The Netherlands), and The University of Melbourne (Australia).

[9] Fordham (2012) reflects on the history of *AIS Educator Journal*, from its genesis in 2006 through 2012.

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Table 1
Accounting education literature review series.

References	Time period covered by review
Apostolou, Dorminey, Hassell, and Watson, (2013)	2010–2012
Apostolou, Hassell, Rebele, and Watson (2010)	2006–2009
Watson, Apostolou, Hassell, and Webber (2007)	2003–2005
Watson, Apostolou, Hassell, and Webber (2003)	2000–2002
Apostolou, Watson, Hassell, and Webber (2001)	1997–1999
Rebele et al. (1998a)	1991–1997
Rebele et al. (1998b)	1991–1997
Rebele, Stout, and Hassell (1991)	1985–1991
Rebele and Tiller (1986)	1969–1985

Table 2
Journals reviewed and number of articles by type.

Journal	Abbreviation	Years covered by analysis	Last issue reviewed	Article type by journal			
				Empirical	Descriptive	Instructional resources	Total
[1] *Journal of Accounting Education*	JAEd	1983–2013	*31*(4)	4	10	2	16
[2] *Accounting Education: An International Journal*	AE	1992–2013	*22*(6)	4	3		7
[3] *Advances in Accounting Education*	AAE	1998–2013	*14*	2	3		5
[4] *AIS Educator Journal*	AIS	2006–2012	*7*(1)	5	5	16	26
[5] *Global Perspectives on Accounting Education*	GPAE	2004–2013	*10*				
[6] *Issues in Accounting Education*	IAE	1983–2013	*28*(3)	3	4	16	23
[7] *Journal of Information Systems*	JIS	1986–2013	*27*(1)	6	5	6	17
[8] *The Accounting Educators' Journal*	TAEJ	1988–2013	*23*	5		3	8
				29	30	43	102

classify an article as *empirical* if it reports conclusions derived from an analysis of data. Articles that consist of an essay about an AIS education topic or report student perceptions (without statistical analysis) regarding a pedagogical innovation are classified as *descriptive*. Articles that offer materials for classroom use (e.g., cases, projects, teaching notes) are classified as *instructional resources*. Table 2 presents a summary of the eight journals, issues reviewed, and the number and types of articles identified.[10]

We identified 102 articles in the 30-year time period reviewed: 29 empirical articles, 30 descriptive articles, and 43 instructional resources. The greatest volume of AIS work appeared in *AIS Educator Journal* (AIS), followed by *Issues in Accounting Education* (IAE),[11] *Journal of Information Systems* (JIS), and *Journal of Accounting Education* (JAEd). No AIS articles or instructional resources meeting our definition appeared in *Global Perspectives on Accounting Education* (GPAE) since it commenced publication in 2004. We include GPAE in our tabulations for completeness.

3. Empirical articles on AIS

We identified 29 empirical AIS articles published in the eight journals during the period 1983–2013 as summarized in Table 3. The topics are categorized as either curriculum-related ($n = 10$) or course-related ($n = 19$). A topic was classified as "curriculum-related" if the scope of the study extended

[10] Any omissions are unintentional and are the responsibility of the authors.
[11] *Issues in Accounting Education* dedicated an entire issue to AIS in 2010 (Vol. 25, No. 3).

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Table 3
Summary of empirical articles by topic.

Author/s (Year[a])	Journal[b]	Topic
Curriculum-related topics (n = 10)		
Boritz et al. (2012)	IAE	Business process representation
Badua et al. (2011)	TAEJ	Need for a second AIS course
Hackbarth et al. (2010)	AIS	AIS training environment
Fordham (2005)	JIS	Supplemental AIS course content
Theuri and Gunn (1998)	JAEd	Employer AIS skills expectations
Walton (1997)	TAEJ	Current structure of AIS curriculum
Groomer and Murthy (1996)	JIS	Factors affecting course content
Romney et al. (1996)	JAEd	Integrated instructional approach
Van Meer and Adams (1996)	AE	New Zealand curriculum
Campbell (1987)	JIS	Supply and demand of AIS curriculum
Course-related topics (n = 19)		
Kotb and Roberts (2011)	AE	E-business
Normand (2011)	AIS	Active learning techniques
Kearns (2010)	AIS	Knowledge and skills outcomes
Murthy and Ragland (2009)	AIS	Analysis of AIS and MIS course content
Daigle et al. (2007)	JIS	AIS learning assessment
Bressler et al. (2006)	AIS	Online AIS/EDP courses
Rezaee et al. (2006)	AE	Topics covered in e-business course
Gujarathi (2005)	AAE	ERP[c] software as teaching tool
Rose et al. (2005)	JIS	Service learning in AIS
Stanley and Edwards (2005)	JAEd	Interactive multimedia instruction
Mahoney and Welch (2002)	AAE	Teaching with computer movies
Akers and Doney (1997)	TAEJ	AIS content in certification exams
Sangster and Mulligan (1997)	AE	Integrating internet in AIS course
Smith and Bain (1993)	TAEJ	Topics covered by AIS textbooks
Heagy and Rakow (1991)	TAEJ	Disparity in course content
Heagy and McMickle (1988)	IAE	AIS course content
Fasci (1986)	JIS	Evaluation of AIS effectiveness
Chandler (1984)	JAEd	Systems development process
Wu (1983)	IAE	Teaching methods and topics in AIS

[a] Reverse chronological order by publication date; alphabetical by author by year.
[b] Abbreviations explained in Table 2.
[c] ERP = Enterprise Resource Planning.

beyond the specifics of teaching the AIS course. The empirical articles and corresponding topics are listed in reverse chronological order within each of the two categories to identify trends in research focus over time.

3.1. Curriculum-related topics

In a survey of course offerings at the undergraduate and graduate levels at 77 universities, Campbell (1987) initiated the examination of AIS curriculum topic importance. The potential for AIS courses and the future supply and demand for systems faculty also were described. Literature extending the discussion of structural issues surrounding the AIS curriculum includes Van Meer and Adams (1996), Groomer and Murthy (1996), and Walton (1997). This line of research identified (1) the structure of the AIS curriculum, and (2) the main determinants of how AIS content was being delivered. The literature points to several issues that faced AIS education in the late 1990s: (1) AIS was viewed as a difficult subject to teach and was insufficiently covered by approximately 25% of accounting programs in the US; (2) resources, namely textbooks, were inadequate to support the AIS course; and (3) a gap existed between AIS academic preparation and expectations for competencies in the workplace.

Badua, Sharifi, and Watkins (2011) and Fordham (2005) studied the importance of a second AIS course and attendant supplemental content. Romney, Cherrington, and Denna (1996) and Boritz, Borthick, and Presslee (2012) examined coverage of AIS concepts in the broader accounting curriculum and how diagrammatic and textual documentation of business processes can be used to enhance

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student understanding of control risks. Theuri and Gunn (1998) surveyed both academics and personnel from (1) accounting firms, (2) government entities, and (3) corporations about the AIS competencies of recent accounting graduates. A key finding was that fewer than 25% of the graduates were reported to have "above-average" AIS skills. Hackbarth, Dow, and Janvrin (2010) investigated the effect of training environment (computer classroom, traditional classroom, or a hybrid traditional and computer classroom) on knowledge and skill development and found that students in the hybrid environment outperformed students in the traditional and computer classroom environments.

3.2. Course-related topics

Wu (1983) authored the first course-related empirical study, which presented analysis based on personal experiences and the results of a survey of AIS instructors for the purpose of creating a general teaching model for AIS. Similar inquiry regarding method of delivery and content coverage in AIS was extended to cover textbooks, certification exams, and desired skills (Akers & Doney, 1997; Daigle, Hayes, & Hughes, 2007; Heagy & McMickle, 1988; Heagy & Rakow, 1991; Smith & Bain, 1993). Murthy and Ragland (2009) examined syllabi to compare topical coverage of AIS and MIS courses. Overall, these course-related studies since 1983 document the diversity of AIS delivery and topical coverage.

Heagy and Rakow (1991) and Smith and Bain (1993) surveyed AIS faculty and found that internal controls and associated systems were perceived as the most important topics in the AIS course. Smith and Bain (1993) concluded that contemporary textbook coverage was in general agreement with faculty perceptions about content at that time. Akers and Doney (1997) showed that for the period 1987–1994 the percentage of the CPA, CIA, and CMA exams covering AIS topics ranged from 1.2% to 29.1% of the total number of questions. Daigle et al. (2007) implemented a teaching structure based on the AICPA's *Core Competency Framework* (AICPA, 2013) and found that student performance improved across the functional competencies.

Bressler, Manrique, and Bressler (2006) showed that student success in online AIS and EDP audit courses was not associated with prior experience with online courses or computer knowledge. Kearns (2010) surveyed 103 undergraduate AIS students about knowledge, skill, interest, and enjoyment for accounting-oriented IT topics. Normand (2011) used textbook reading, an in-class project, and a reflection paper in an AIS course to measure the change in student perceptions of the importance of learning AIS topics.

Several authors analyzed the use of specific tools and structures (e.g., ERP software, service-learning) for AIS courses (Gujarathi, 2005; Mahoney & Welch, 2002; Rose, Rose, & Norman, 2005; Sangster & Mulligan, 1997; Stanley & Edwards, 2005). Fasci (1986) and Chandler (1984) studied delivery of specific topics within the AIS course. E-business is a topic that has emerged relatively recently in the AIS education literature. Examinations of course syllabi found that the most frequently covered topics in e-business included: (1) strategies and implementation; (2) introduction to the internet; (3) communication infrastructure; (4) marketing for a competitive advantage; and (5) e-business opportunities or models [Rezaee, Lambert, and Harmon (2006) in the US; Kotb and Roberts (2011) in the UK and Ireland].

Taken together, the AIS course-related empirical research during the period of our review explored specific course content, delivery methods and tools, and, to a very limited degree, assurance of learning. We conclude the following: (1) disagreement about AIS topics and skill priority has diminished over time; (2) specific tools have been identified as being useful to teach AIS; and (3) a sub-discipline of e-business exists within the larger realm of AIS.

3.3. Research designs in empirical articles

Table 4 presents a summary of the research design and primary analytical approach used in the 29 empirical AIS education articles published during the period of our review. Survey is the principal research design (24 of the 29 empirical articles, or 82.8%). Experimental design appeared only once (Boritz et al., 2012) and quasi-experimental design was employed in four articles (Daigle et al., 2007; Gujarathi, 2005; Normand, 2011; Rose et al., 2005). Tabulation was used as the primary analysis approach in the majority of empirical studies in AIS education (17 of 29 studies or 58.6%).

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Table 4
Summary of research design and analytical approach used in empirical articles.

Journal[a]	No. of articles	Research design			Primary analytical approach		
		Survey[b]	Experiment	Quasi-experiment	Tabulation[c]	Difference in means	Regression[d]
JAEd	4	4			3	1	
AE	4	4			3	1	
AAE	2	1		1	2		
AIS	5	4		1	2		3
GPAE							
IAE	3	2	1		1	1	1
JIS	6	4		2	2	3	1
TAEJ	5	5			4	1	
	29	24	1	4	17	7	5

[a] Abbreviations explained in Table 2.
[b] Includes convenience samples.
[c] Includes summarization and univariate statistics.
[d] Includes analysis of covariance and factor analysis.

In the early stages of theory development, survey and tabulation methods are valuable in identifying underlying associations and directions for future research. Some persistence of these methods is expected over time as the line of research matures. However, given the three-decade longevity of AIS education research, we expect greater use of (1) experimental collection methods that allow the researcher to control for confounding variables, and (2) rigorous analysis methods that more clearly isolate and test the effect of the construct of interest.

The rigor of the empirical analysis has not kept pace with that observed in discipline-specific research (i.e., scholarship about specific topics such as auditing or financial accounting). Apostolou, Dorminey, Hassell, and Watson (2013, pp. 145–146) note a deficiency in the rigor of empirical method and analysis in the broader accounting education literature:

> . . . but the rigor of the empirical analysis has not kept pace with that observed in discipline-specific research. Discussion of journal ranking lists affirms that at many institutions research in education-focused accounting journals typically is not rewarded for promotion and tenure decisions and resource allocations. At universities that are primarily teaching-oriented, accounting education research is more likely to be rewarded. Thus, a circular problem may exist: a significant segment of those who are capable of conducting rigorous empirical studies is not incentivized to do education research, which may distance faculty from the scholarship of teaching and learning. Thus it may be incumbent upon editors and editorial boards to emphasize rigorous research design and analysis.

The above-referenced observation regarding appropriate research rigor is not new. Ralph Benke, Jr., the first editor of *Journal of Accounting Education*, made the following observations regarding accounting education research in 1986, at a time when such research was just beginning to become established (Benke, 1986, pp. 66–67):

> Accounting education research has a relatively short history, and unfortunately, some of the published accounting education research contains faulty research design. In general, there has been a tendency not to control properly for extraneous variance, and to rely too heavily on survey research. In order for accounting education research to achieve academic respectability, researchers must give careful attention to research design. Only then will the results of the research be reliable and only then will academics view accounting education research with the same respectability as other accounting research.

We strongly recommend that AIS education researchers take a proactive stance in adopting a rigorous experimental approach when addressing empirical questions. Two AIS articles demonstrate relatively strong empirical work, and should serve as examples for conducting future research. Boritz

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et al. (2012) employed an experimental design and regression analysis to contrast the efficacy of narrative and diagrammatic presentations of information. Normand (2011) uses a pre- and post-treatment quasi-experimental design and ANCOVA/MANCOVA to examine the relationship between active learning and student perceptions of AIS. Examples of strong empirical accounting education research (i.e., design and analysis) also exist outside of the AIS discipline.[12]

Education theories abound to supply the foundation from which to launch testable hypotheses. Our understanding is lacking regarding clearly defined AIS-related content, AIS instructional approaches, and integrated tools for teaching AIS to optimize student learning and skills development. Clearly, the research design and analytical approach employed should be the most appropriate for the question studied. While future researchers may stand upon some of the practices and ideas published to date (Table 3), implementing a best practices approach is essential to gaining understanding from empirical AIS education research.

4. Descriptive articles on AIS

Table 5 presents a summary of the 30 descriptive articles on AIS topics, classified as either curriculum-related ($n = 8$) or course-related ($n = 22$). Articles are presented in reverse chronological order to reveal how the emphasis has changed over time. We summarize these descriptive articles below according to the classification.

4.1. Curriculum-related topics

The curriculum-related articles deal with informatics as a theoretical paradigm for the AIS curriculum (Krippel, Moody, Barra, Stone, & White, 2008), the security implications of wireless networks (Fordham, 2009),[13] graduate curricula (Dietrich et al., 1989; Kneer, 1986), a model AIS curriculum (O'Donovan, 1996), a financial information systems curriculum (Callaghan, Savage, & Peacock, 2003), XBRL in an accounting curriculum (Debreceny & Farewell, 2010b), and a career in information systems consulting (Jancura, Garceau, & McKeon, 1992). When considered together, curriculum-related articles inform faculty and administrators who are reflecting upon extant and future curriculum content. Both undergraduate and graduate programs are addressed, along with lessons learned and career opportunities generated by the programs.

4.2. Course-related topics

Articles about course-related topics address a range of issues, including tools and techniques for improving the delivery of an AIS course or course sequence, primarily related to the undergraduate experience. The first descriptive article appeared in 1984 and provides guidance on using case studies to teach an AIS course (Romney, 1984), similarly followed by Joy (1987). Others who describe using cases in an AIS course suggest using student-generated cases (Greenstein & Hall, 1996) or real-life consulting projects (Barkman, 1998; Latham, 2009). Other issues addressed include REA (McCarthy, 2003; Zanzig & Tsay, 2004), spreadsheets and databases (Alexander, 1996; Levitan, 1988; Maher, 1993; Simkin, 2006, 2007), software (Bagranoff, 1993; Hill, 2007), process mapping (Jones & Lancaster, 2001), flowcharts (Saunders, 1992), learning objectives and IT frameworks (Borthick, 1996; Qian, Ward, & Blaskovich, 2012), learning theory (Bromson, Kaidonis, & Poh, 1994), microcomputer integration (Goosen & Kusel, 1985), and designing a customized teaching system (Engle & Joseph, 1986).

[12] We offer three examples without intention to slight other strong empirical work. In a study of student characteristics, Berger and Boritz (2012) used an experiment and structural equation modeling to examine how students evaluate information integrity. Elikai and Schuhmann (2010) explored the association between grading policy and student achievement in a quasi-experimental design using regression analysis. Phillips, Alford, and Guina (2012), through a quasi-experimental ANCOVA approach, investigated the effectiveness of illustrations used in textbooks.

[13] Fordham (2009) reports empirical findings about security issues associated with wireless information without presenting the research design and data, so we present the article as descriptive rather than empirical.

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Table 5
Summary of descriptive articles by topic.

Author/s (Year[a])	Journal[b]	Topic
Curriculum-related topics (n = 8)		
Debreceny and Farewell (2010b)	IAE	XBRL in the accounting curriculum
Fordham (2009)	AIS	Wireless security issues
Krippel et al. (2008)	AIS	Informatics as a theoretical paradigm
Callaghan et al. (2003)	AAE	Financial information systems (FIS) curriculum
O'Donovan (1996)	AE	A model AIS curriculum
Jancura et al. (1992)	JAEd	Information systems consulting career
Dietrich et al. (1989)	JIS	Graduate curriculum (MBA/ISM)
Kneer (1986)	JIS	Graduate AIS curriculum
Course-related topics (n = 22)		
Qian et al. (2012)	AIS	Integrating IT frameworks in an AIS course
Latham (2009)	AAE	Business-student partnership experience
Hill (2007)	AAE	Use of trial-version software
Simkin (2007)	AIS	Spreadsheets to teach data extraction
Simkin (2006)	AIS	Spreadsheets to teach data encryption
Zanzig and Tsay (2004)	JAEd	REA modeling for revenue transactions
McCarthy (2003)	IAE	REA modeling approach to teaching AIS
Jones and Lancaster (2001)	AE	Process mapping and scripting
Barkman (1998)	JAEd	Consulting project
Alexander (1996)	JAEd	Spreadsheet design
Borthick (1996)	JIS	Learning objectives in AIS course(s)
Greenstein and Hall (1996)	JAEd	Student-generated cases to teach AIS
Bromson et al. (1994)	AE	AIS and learning theory integration
Bagranoff (1993)	JAEd	Software assignment (includes case)
Maher (1993)	IAE	Spreadsheet and database manager tools
Saunders (1992)	JAEd	Flowchart for complex macros
Raval (1991)	JIS	Student evaluations of AIS courses
Levitan (1988)	JIS	Database exercise
Joy (1987)	JAEd	Case strategy for teaching AIS
Engle and Joseph (1986)	JAEd	Customized system for teaching AIS
Goosen and Kusel (1985)	IAE	Microcomputer integrated in an AIS course
Romney (1984)	JAEd	Case study approach to teaching AIS course

[a] Reverse chronological order by publication date; alphabetical by author by year.
[b] Abbreviations explained in Table 2.

Raval (1991) describes how student evaluations of teaching may be difficult to interpret given the complexities of AIS teaching.

Clearly, AIS researchers have an opportunity for more scholarship that describes innovations and strategies for AIS education. The literature is derived primarily from US experiences. Articles that describe AIS educational practices elsewhere are needed so that the academy can expand the student's perspective on AIS topics beyond a US centric view.

5. Instructional resources on AIS

We identified 43 instructional resources[14] for the period 1983–2013. The largest number of instructional resources appeared in AIS ($n = 16$) and IAE ($n = 16$), followed by JIS ($n = 6$), TAEJ ($n = 3$), and JAEd ($n = 2$). No AIS instructional resources appeared in AE, AAE, or GPAE in the time frame we reviewed. We categorized the 43 instructional resources into six general AIS topical areas: (1) software implementation ($n = 6$); (2) software security ($n = 3$); (3) system controls ($n = 5$); (4) system design ($n = 11$); (5) transaction processes and controls ($n = 6$); and (4) XBRL ($n = 12$). The instructional resources identified in Table 6 are listed in reverse chronological order to emphasize how the nature of topics has changed during the review time period.

[14] We include descriptions of AIS course projects in this section.

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Our review reveals that the early published cases may continue to be relevant for AIS courses in two ways: (1) part of a presentation of an historical perspective on teaching AIS, or (2) an earlier context may be updated to the current technological environment. Given the central role of AIS in the accounting curriculum and profession,[15] we recommend that faculty continue to document and submit custom instructional cases and projects for publication in accounting education journals.

6. Contribution and suggestions for future research

We contribute to the accounting education literature by identifying and summarizing published articles on AIS education. While extant accounting education literature reviews cover articles across the spectrum of accounting topics, we consolidate three decades of AIS scholarship covered in nine separate literature review articles (Table 1), augmented by AIS articles published in journals not covered in those general accounting education literature reviews. The value of this concentrated effort is twofold: (1) AIS educators have a single resource from which to identify teaching materials; and (2) AIS education researchers may initiate future efforts by using our analysis as a starting point.

6.1. Suggestions for future research

AIS is critical to accounting work and education. Despite its importance to the careers of future accountants, there is relatively little existing research into relevant AIS education issues. Graduate and undergraduate curricular and teaching innovations have been described, but research on the efficacy of such innovations is needed. The academic community needs to know what has worked well and what must be improved. Instructors also need to know about innovations that have been tried but found not to work or to be efficacious as planned, along with reasons why. Assurance of learning or outcomes assessment programs should be described and tested. The best practices regarding the AIS curriculum should be reported. Only 18 articles (10 empirical, 8 descriptive) about the AIS curriculum have appeared in 30 years. This insufficiency is problematic for such a fundamental component of the accounting curriculum.

Future research should continue to explore more fully course structure and delivery relative to the success in developing competencies appropriate for an AIS career. However, to date this body of literature has been limited to understanding the *status quo* of the AIS courses and curriculum. Research is needed to study the role that AIS *should* play in both the undergraduate and graduate accounting curricula. Faculty efforts to identify a common body of AIS knowledge for accounting majors should be described and studied. The course materials and textbook content essential to support that knowledge also should be identified, described, and studied.

Course-related topics appear in print to a greater degree than curriculum-related issues, with 41 total articles (19 empirical, 22 descriptive). Authors report ways to improve and facilitate the delivery of AIS topics, with an emphasis on the case method and XBRL applications. For those who describe practices, perhaps the next step is to design an appropriate way to test the effectiveness of a delivery method or pedagogical innovation beyond a survey of student perceptions. Accounting faculty who have implemented successful strategies are encouraged to share their approaches. Further, consideration of how to address the shortage of AIS-qualified teachers also is essential.

The technology related to the effective delivery of AIS courses must be studied. Research is needed to understand whether in-class or computer lab, online, or hybrid delivery methods produce improved learning. Class size is a critical issue in the current environment of constrained resources (e.g., faculty shortage in AIS and limited computer lab size), and the academy is interested in knowing how to deliver the best educational experience. Given the highly technical nature of AIS course content, wholesale implementation of instructional approaches employed by other disciplines, and accounting subdisciplines, may not be effective in the AIS context. Valuable research on the interplay between the highly technical nature of AIS course content, student characteristics (e.g., technological expertise,

[15] Albrecht and Sack (2000, p. 62) highlight the importance of developing accounting curricula that integrates AIS.

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Table 6
Summary of instructional resources by topic.

Author/s (Year[a])	Journal[b]
Software implementation (n = 6)	
Antcliff, Doren, Harris, and Hayes (2012)	AIS
Hayes, Cook, and LaRosa (2011)	AIS
Brown and Pike (2010)	AIS
Matherly, Watson, and Ivancevich (2009)	AIS
Hayes and Bee (2008)	AIS
Jones and Mensching (2007)	AIS
Software security (n = 3)	
Bailey and Soileau (2011)	JAEd
Bhattacharya and Wasson (1997)	IAE
Christensen and Eining (1994)	IAE
System controls (n = 5)	
Cereola and Cereola (2011)	IAE
Lehmann (2010)	IAE
Norman, Payne, and Vendrzyk (2009)	IAE
Lehmann, Heagy, and Norman (2007)	JIS
Dunn, Gerard, and Worrell (2003)	IAE
System design (n = 11)	
Borthick, Schneider, and Vance (2012)	IAE
Bradford (2011)	IAE
Premuroso, Hopwood, and Bhattacharya (2011)	IAE
Borthick, Schneider, and Vance (2010)	IAE
Loraas and Key (2010)	IAE
Ballenger (2007)	AIS
Lin and Smith (2006)	JIS
Sinason and Normand (2006)	JIS
Geerts and Waddington (2000)	JIS
Herron (1998)	TAEJ
Savage (1993)	TAEJ
Transaction processes and controls (n = 6)	
Swanger and Jones (2012)	AIS
Walters (2011)	AIS
Segovia, Jessup, Weber, and Erickson (2010)	AIS
Barra and Savage (2007)	AIS
Bromley (2006)	AIS
Schafer and Hurtt (2006)	AIS
XBRL (n = 12)	
Basoglu, Edmonds, and White (2012)	AIS
Elam, Wenger, and Williams (2012)	IAE
Gomaa, Markelevich, and Shaw (2011)	JAEd
Capozzoli and Farewell (2010)	IAE
Debreceny and Farewella (2010a)	IAE
Grant, Sharifi, and Grant (2010)	TAEJ
Taylor and Dzuranin (2010)	IAE
White (2010)	IAE
Farewell (2006)	JIS
Tribunella and Tribunella (2006)	AIS
White (2006)	AIS
Geerts and White (2004)	JIS

[a] Reverse chronological order by publication date; alphabetical by author by year.
[b] Abbreviations explained in Table 2.

online experience), and characteristics of delivery (e.g., online, computer lab, class size) is largely untapped.

The student perspective of the AIS experience should be investigated, including approaches to learning, potential for academic dishonesty, skills and traits that lead to success in understanding

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AIS, and career opportunities for those with an AIS-related specialty. Education literature in other disciplines (e.g., computer information systems, computer science, and management) might be replicated or extended to the study of accounting majors. Unique characteristics of accounting students and AIS content necessitate an empirical evaluation of instructional approaches employed in other disciplines to determine those that can be effectively adapted for AIS. Understanding the student perspective may assist in integrating AIS topics throughout the curriculum in a way that coordinates topics and reinforces concepts (e.g., coordination of efforts between AIS faculty who use a computerized general ledger project and auditing faculty who then revisit the project from an auditing perspective).

Our analysis reveals 43 instructional resources published in the 30-year period of our review, addressing a variety of topics. Given that cases and projects are an important AIS teaching modality, we encourage faculty to continue publishing resources that are successfully developed for their own classes.

In sum, much work needs to be performed in AIS education research. In the early 1980s, the emphasis in accounting education was incorporating the microcomputer and using spreadsheets and databases in AIS classes. With sophisticated technology now part of societal fabric, AIS education scholarship can elevate to theoretical models and testing, including best practices to stay abreast of rapid changes, such as the role of social media in corporate disclosures. AIS education researchers should seek to improve the reliability and generalizability of their empirical research by using more rigorous methods than have been used in the past. Research rigor must be enhanced, and useful techniques for assurance of learning studied and prescribed.

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