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A Bibliometric Study of Instructional Design Journal Articles, 2001-2020

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A BIBLIOMETRIC STUDY OF INSTRUCTIONAL DESIGN JOURNAL ARTICLES, 2001 – 2020

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by

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Dedicated to the memories of my husband, Burle Wheeler,

and of my parents, Laverne and Woodrow Hosmer.

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ABSTRACT

Wheeler, Rebecca L., Ph.D., University of South Alabama, August 2022. A bibliometric study of instructional design journal articles, 2001-2020. Chair of the Committee: Gayle V. Davidson-Shivers, Ph.D.

The purpose of this study was to examine instructional design (ID) articles in a broad range of scholarly journals published from 2001 through 2020 to determine the field's state of publication. By using three bibliometric methods, content analysis, citation analysis, and network analysis, the publication patterns and content of the articles were examined. Specific purposes were to determine the most prolific and highly cited scholars, countries, and journals; to determine trends evident in the bibliometric data; and to compare the differences in coverage and accuracy of the citation indices Web of Science, Scopus, and Google Scholar within the parameters of the study.

Bibliometric data for the study were collected by searching each of the three citation indices for articles with the keywords "instructional design" from 160 journals selected for the study based on prior compilations of significant publications in the field of ID. These articles were limited to publications dates 2001-2020 and English language. The searches retrieved 853 articles from the Web of Science, 973 from Scopus, and 8069 from Google Scholar. Bibliometric analyses were applied to the retrieved articles. Results of the analyses identified the most prolific authors as J. J. G. van Merriënboer, F. Paas, and P. A. Kirschner. D. M. Merrill, M. D. Dickey, and T. A. Brush were the most cited

authors. Authors in 61 countries published articles matching the study's parameters. The United States was the most active country in publishing ID articles, followed by the Netherlands, Taiwan, Germany, and Australia. Topics in ID articles changed during the timeframe of the study. In 2001, frequent topics related to the mechanics of instructional design, but in 2020, technology and instructional delivery platforms had become the most frequent topics, perhaps due to the COVID pandemic and the resulting transition from classroom instruction to elearning and remote instruction. Journals with the highest number of ID articles were *Computers in Human Behavior*, *Instructional Science*, *Educational Technology & Society*, and *TechTrends*. *Educational Technology Research & Development* and *Computer & Education* were also the most highly cited ID journals during this 20-year period. Citation analyses revealed that ID authors tend to repeatedly cite the same authors. Additionally, co-citation and bibliographic coupling are common among ID articles. Numerous instances of co-authorship are evident as well.

Scopus and Web of Science were noted to be similar in coverage and accuracy. Google Scholar retrieved many more articles but included more irrelevant items, thus requiring time-consuming efforts from the researcher to identify pertinent items. Google Scholar also contained more errors in names and punctuation. It appears to be best suited for a broad search for information on a topic, while Scopus and Web of Science are more suitable for scholarly research.

This study offers insight into the productivity, trends, and emphases of specific ID journals as well as of the ID field in general. The research supports scholarly communications by identifying collaboration patterns and opportunities for researchers and their institutions.

CHAPTER I

INTRODUCTION

This chapter begins with an overview of bibliometrics and the types of bibliometric research methods. Next, a discussion of the importance of scholarly journals within a given field is presented. A description of the instructional design (ID) field follows with a brief review of representative bibliometric studies in the ID field. At the end of the chapter, the general research questions, an overview of the study's methodology, and definitions of key terms are provided.

Journals enable scholars and practitioners to share ideas, observations, and research. In fact, journals are the primary communication platform among researchers, scholars, and professors (Piotrowski, 2013). Journals also allow the dissemination of information throughout countries and institutions to facilitate collaboration between individual scholars and researchers. Over time, patterns in scholarly and professional journals may indicate the most influential researchers, theorists, scholars, and institutions in a field. Additionally, peer review of articles submitted for publication provides scholars an avenue to have their work by others in the field. Overall, the study of publication patterns is important to understand the impact and influence of specific journals and their authors. These studies are relevant to understanding the network connections among journals, authors, institutions, and countries.

Scholarly articles help define the boundaries and scope of a discipline by the published research topics. Conley (2012) described the purpose of academic journals as fostering communication among scholars, detecting and resolving errors in ideas, and documenting scientific knowledge. Investigating scholarly journals through bibliometric analysis enables researchers to evaluate scholarly publications and examine the contribution of studies to future publications. For instance, a bibliometric study might be used by a scholar to identify potential collaborators and others with similar research interests.

As Jacobs (2010) described the bibliometric process, researchers apply bibliometric data, methodology, and theory to reach conclusions regarding productivity, topics, and connections between documents, authors, journals, and institutions. The data derived from the bibliometric analyses can be used to construct structural maps of scholarly activity as well as help construct models of growth or change in a discipline.

From the standpoint of individual authors, bibliometric studies can be helpful in considering where to publish research or where to find potential collaborators by identifying the most suitable journals and the most appropriate contributors to the field (Andersen, 2018). As Rorissa and Yuan (2012) pointed out, authors who are more active in collaboration are also more productive. Furthermore, Conley (2012) noted the role of scholarly publication is often a requirement for professors to attain tenure and promotion, and in gaining an idea of individual authors' quality and centrality in a discipline.

Defining Bibliometrics

Bibliometrics is a quantitative method that uses a statistical approach to analyze the bibliographic information of publications (Holden et al., 2005). Bibliometrics is based on the concept that citations of scholarly publications can indicate past and present practices in the research of disciplines (Lee & Su, 2010). Huang et al. (2006) noted that "bibliometric data has been used to describe and evaluate countries, universities, research institutes, journals, specific research topics and specific disciplines" (pp. 75-76)**.** These patterns might be about specifics in terms of what types of journals are being used by authors in a given field. Because journals are probably the most significant forms of scholarly communication in any discipline, bibliometric analysis may illuminate the scientific productivity, trends, and emphases of research in a discipline as well as the journal itself. Use of bibliometric findings may reflect changes in the interests and concerns of authors and of the discipline in general; the findings also provide a body of scholarly publications within a discipline to determine the field's identity and direction.

Many disciplines use bibliometric research methods to investigate the impact of their field, researchers, or a journal or article. Researchers often use bibliometric methods to determine the influence of a single writer or to describe the relationship between two or more writers or works. These methods can also be used to investigate a variety of other questions about the discipline. For example, they are used to study scholarly literature for its content, representation of a theme, or topic changes over time. Researchers often accomplish bibliometric analysis by using various citation indices, or bibliographic databases, such as Scopus or Web of Science (WoS) (Ellegaard & Wallin, 2015).

Types of Bibliometrics

Content Analysis

Content analysis, one of the three main types of bibliometrics, is used to measure the frequency of terms and subjects (or keywords) of individual articles. The keywords are then related to specific authors, institutions, academic journals, and regions of activity. Content analysis supports the understanding of content, themes, and trends in published literature according to Baker and Moukhliss (2020).

Measuring scholarly publications began as content analysis, commonly known as descriptive bibliometrics (Jacobs, 2010). The selected publications are examined for the presence and distribution of identified keywords and phrases to identify topics which were most popular among authors . Content analysis provides information about productivity by author, geographic area, time period, institution, or field through raw counts of data at a point in time (Archambault & Gagné, 2004). Content analysis, however, does not examine the knowledge structures and links among authors, articles, or journals in a field.

Citation Analysis

The second type of bibliometrics, citation analysis, is used to examine the types of knowledge structures and various links among authors, articles, and/or journals of a field (Borgman & Furner, 2002). Its purpose is to identify relationships among authors or their works and is often conducted using citation indices. Common indices used include WoS and Scopus, to determine the popularity and impact of various attributes of publications, such as identifying specific authors, types of articles, institutions, and publications. Garfield (1972) was instrumental in developing the tools and methodologies of citation

analysis by envisioning the citation index as a means to access and share all scholarly publications.

One way citation analysis can be used is by examining an article's referring documents to determine the number of times a publication is cited within other publications. Researchers accept that heavily cited articles tend to have a greater impact on the field than less-often cited publications (Sharplin & Marby, 2007). Such numbers indicate the relative impact on a discipline by author, article, institution, or journal. Innes (2006) explained the use of citation analysis as describing social and scholarly networks, cross-disciplinary sharing of ideas, authors' influence on peers, the level of trustworthiness among scholars, and the relationships among authors, ideas, articles, and journals.

Another major area of citation analysis is used to establish relationships between authors and their work. When one author cites another author, a relationship is established. Citation analysis uses citations in scholarly works to establish links. Different links can be ascertained such as links between authors, between scholarly works, between journals, between fields, or even between countries. Citations both from and to a certain document may be studied. Citation analysis may be used to determine the impact of a single author on a given field by counting the number of times the author has been cited by others. One possible drawback of this approach is that authors may be citing the single author in a negative context, such as suggesting that the author does not know what they are talking about (Osareh, 1996).

Frequency statistics generated by citation analysis do not describe the structure of influence in a discipline.

Network Analysis and Mapping

The third main type of bibliometric technique is network analysis and mapping. Network analysis is an approach to indicate the relationships and structural patterns between elements within a system. It enables the investigation of relational and structural attributes of data groups and involves mapping the scholarly activity in an illustrative manner or model to visually show growth or changes in a discipline. According to Scott (1991), network analysis might be applied to the study of scholarly publications. As applied to bibliometrics, network mapping is a spatial representation of the relationships between authors, publications, authors, or disciplines. Through network analysis various research networks may be revealed to include collaboration patterns such as relationships between authors, institutions, or countries. Furthermore, network analysis may also enable the identification of the number of individuals responsible for publications. Additionally, network analysis can show the relative strength of the relationships between them and the most prominent members of the network (Scott, 1991).

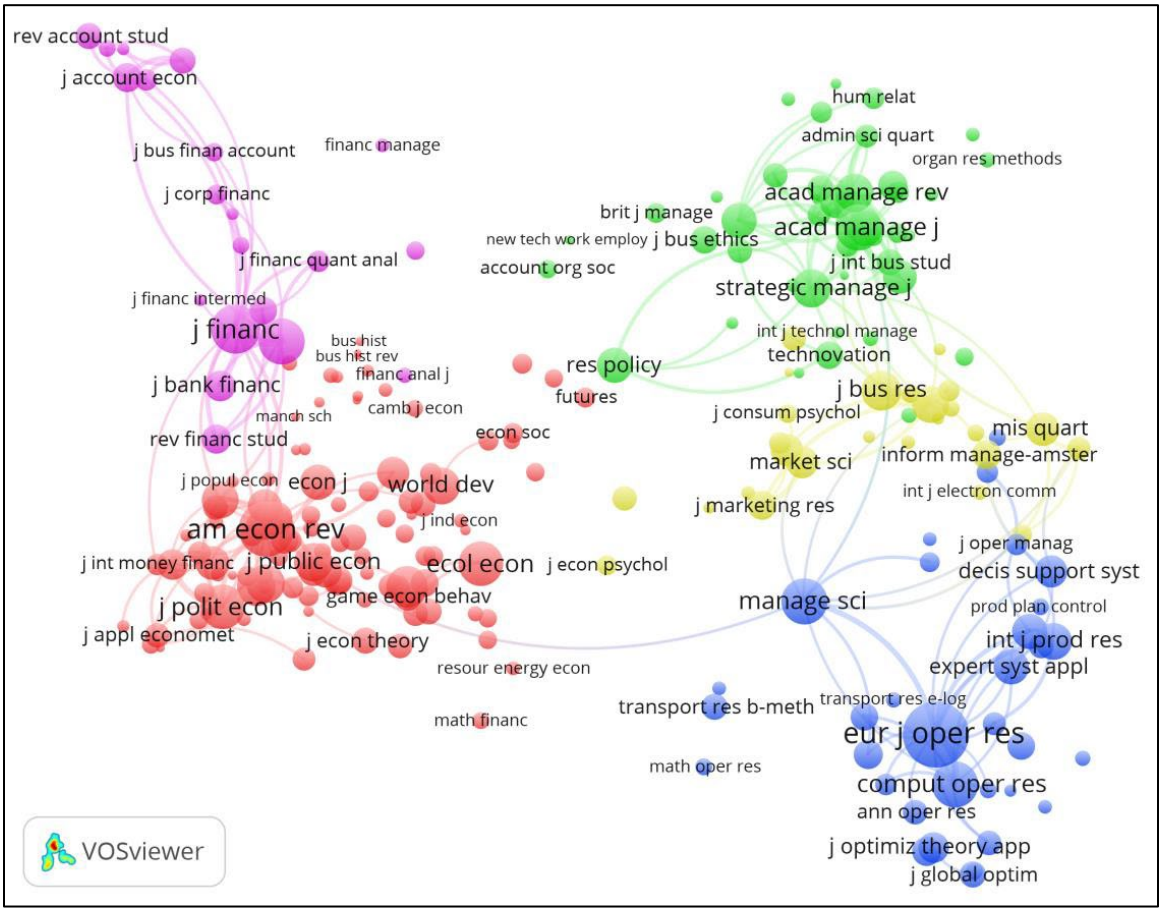
Such networks consist of nodes and links. The nodes can represent publications, journals, authors, or keywords. The links can represent relationships between pairs of nodes, for example, citation relationships, keyword co-occurrence, and co-authorship. Generally, bibliometric networks are weighted networks, in which the links indicate both the existence of relationships and also the strength of the relationship (van Eck & Waltman, 2014).

The VOSviewer software (van Eck & Waltman, 2010), developed specifically for bibliometric network analysis, uses a distance-based visualization of bibliometric networks. This approach displays the nodes but may or not display the links in a network.

In VOSviewer visualizations, the relatedness of the nodes is indicated by the distance between nodes in large networks. As shown in Figure 1 a bibliometric network may have large differences between nodes in terms of the number of links they have, compared to other nodes. VOSviewer applies association strength normalization to construct a normalized network. Next, the nodes are positioned in a two-dimension space, so that strongly related nodes are located near each other, and weakly related nodes are located far apart from each other. VOSviewer also assigns the nodes to clusters, or a set of closely related nodes. Each node is assigned to one cluster. VOSviewer uses colors to indicate the cluster to which a node is assigned. The next step is to display the network. VOSviewer uses overlay visualization in order to have color indicate a property of the node. For example, a node may represent a journal, and the node's color may indicate the number of citations the journal has received. VOSviewer also creates density visualizations. In this approach, colors are used to indicate the distribution of nodes in two-dimension space. This allows immediate identification of dense areas where numerous nodes are located close to others (van Eck & Waltman, 2014).

Figure 1

Sample Network Visualization of Co-Citations between Selected Journals



Note. Reprinted from *VOSviewer Manual* by van Eck, N. J., & Waltman, L., copyright 2017, Oct 23. https://www.vosview.com/documentation

VOSviewer can construct co-citation and bibliographic coupling networks depicting publications, journals, and researchers. Text mining functionality for constructing co-occurrence networks of terms can also be done (van Eck & Waltman, 2014).

The three types of bibliometric analysis (content analysis, citation analysis, and network analysis) can be used separately or together. Andrés (2009) suggested that a comprehensive bibliometric study should include a descriptive analysis (content analysis) along with a citation analysis, as well as analyses of an author's or journal's productivity and collaboration. Additionally, network analysis and mapping enhance users' understanding of network structure and are considered the easiest way to visualize bibliometric data according to Solomon (2015).

Scholarly Journals

The terms academic journal and scholarly journal are often used interchangeably. According to Elton B. Stephens Company (EBSCO, 2018), there is a difference between the two. Academic journals publish articles with footnotes and bibliographies, are intended for an academic audience, and may or may not be peer-reviewed. Scholarly journals are similar to academic journals, but in contrast, publish peer-reviewed articles. Publications are often identified as professional journals and professional magazines and for use by a particular professional audience. These publications are relevant to theorists, scholars, and researchers in a field.

Journals and magazines are often published by a professional organization. Professional journals may contain both research articles and practical articles relevant to the profession. The articles may require some background knowledge, and do not usually cite their sources. For this study, peer-reviewed articles found in scholarly journals is the focus.

Scholarly journals have an essential role in the academic community. Piotrowski (2013) noted that publishing in scholarly journals is a discourse process which serves two

purposes. First, publication shares findings with colleagues and imparts knowledge to others, including students. Second, a body of academic research is accumulated, which in turn provides a framework to advance a field's knowledge. Similarly, and based on Schaffner's (1994) work, Solomon (2007) described five distinct functions fulfilled by journals. The five include building a collective knowledge base, communicating information, validating the quality of research, distributing rewards, and building scientific communities.

Solomon's Five Functions of Journals

Building a Collective Knowledge Base

One of the most important roles of a journal is creating a discipline's archive of knowledge (Solomon, 2007). Accuracy and quality are of primary importance in this regard. Peer review of articles submitted to a journal serves to ensure accuracy and quality, but may slow the speed of publication. Generally, a peer-reviewed article takes 12 to 18 months from submission to publication. Nevertheless, accuracy and quality are more essential than timing to the knowledge base (Solomon, 2007).

Communicating Information

Technology has enabled scholars to communicate through a variety of channels other than journals. Yet, while communication increases through these alternate channels, journals appear to retain a significant role in communication. Research findings on informal communication suggest that much of what scholars discuss is in journal articles (Solomon, 2007).

Validating the Quality of Research

Journals help maintain standards in how research and scholarship are conducted. Journals are considered the most visible platform for this validation to occur because they filter what is published and disseminated. More subtle effects occur as well. For instance, experienced scholars have become familiar with how the research and scholarship in their field are to be conducted and described. By contrast, novice scholars are less adept at conducting and writing about scholarly research. Therefore, they are more likely to be harshly reviewed in the publication review process and conversely, the more experienced scholar is published (Solomon, 2007).

Distributing Rewards

Scholars are evaluated on publication in peer-reviewed journals, in terms of both quantity and prestige of the journals in which they publish. Within academia, publication performance heavily influences tenure, promotion, and research grants (Harzing & van der Wal, 2008). Additionally, journals serve to document the ownership of intellectual property. Peer review is an important part of this role (Solomon, 2007). According to Solomon (2007), peer review is effective in enhancing the quality of published articles. Journals may have more than one individual review a manuscript because generally, the more reviews, the more likely that errors will be identified.

Building Scientific Communities

Journals tie together a scholarly community. A discipline's 'coming of age' is often evidenced by a new journal, which in effect marks the boundaries of the new field. Editorials, opinions, news announcements, and letters to the editor can serve as a forum for debate of the issues. Journals might help to form and maintain scholarly communities

by sharing information about conferences, new appointments to positions, or the passing of a well-known member (Solomon, 2007). Disciplines need to be able to identify core journals and also classic or most-cited articles (Piotrowski, 2013). Bibliometric analysis provides the capability to accomplish these things as well as enable scholars to identify potential collaborators.

Instructional Design

Over the past 50 years, journals in the ID field have adapted to the needs of both scholars and practitioners. For example, the number of instructional designers working outside of an academic setting has grown. This change has led to a shift of influence, from almost exclusively scholars to the inclusion of practitioners. The evolution has created increased opportunities for collaboration between scholars and practitioners. It has also resulted in acceptance of instructional designers working outside academia. This growth in the application of ID led to the emergence of a new journal, the *Journal of Applied Instructional Design*, to support practitioners as well as academics (Association for Educational Communication and Technology, 2020).

According to Bodily et al. (2019), ID scholarship is dispersed throughout various disciplines, such as educational technology, instructional systems, learning sciences, curriculum development, and psychology. In terms of fields, ID is a relatively young or new field; yet it can be very diverse in terms of having a wide range of journals where academicians publish. This is due, in part, that not only is it a field in and of itself, but it can also dovetail into other academic disciplines. Not only do its scholars publish in the germane instructional design journals, but articles written by its scholars and relevant to the field's interests are found in dozens of journals not exclusively devoted to ID.

Additionally, instructional designers conduct research in a variety of other fields. Thus, articles directly related to ID are published in journals ranging from *Urban Anthropology* to *Journal of Sports Science and Medicine.*

Bibliometric Studies in Instructional Design

Bibliometric studies in ID have been infrequent. Generally, bibliometric studies in ID have focused on a specific topic (Baker & Moukhliss, 2020; Göksu et al., 2017).

Publications often provide a record of productivity and communication efforts because they reveal trends occurring in a given field of study. One such study was a content analysis conducted by Göksu et al. (2017) to examine research trends in ID models. They analyzed 113 papers published in 44 journals and found that system-based models were the most commonly used with the top five being Analyze, Design, Develop, Implement, and Evaluate (ADDIE), Keller's Attention, Relevance, Confidence, and Satisfaction Model of Motivation (ARCS), Gagné and Briggs, 4C-ID (Four Components Instructional Design Model), and the Dick and Carey model. For instance, Göksu et al.'s (2017) study was a content analysis to identify research trends and investigate studies using ID models. The authors identified specific ID models that were shown to improve specific learning outcomes. Furthermore, Göksu et al. (2017) found that the most predominant research methods used in the studies they examined were qualitative, followed by literature review, quantitative methods, and mixed methods. The reviewed studies were carried out mostly in the fields of computer and instructional technology, science education, engineering sciences, and social sciences.

The largest number of papers in the study were published in *Educational Technology Research and Development (ETR&D)*, *Computers & Education*, and *British*

Journal of Educational Technology (BJET). Göksu et al. (2017) concluded that because these journals focus on ID studies, researchers may prefer to submit their studies to them for publication. However, it may be the case that researchers prefer these journals because they are highly prestigious, and publishing in them would improve the researcher's professional status.

Other studies focused on a particular journal. For instance, Bond et al. (2019) conducted a content and authorship analysis of research articles published in the *British Journal of Educational Technology (BJET)* from 1970 into 2018. The purpose was to provide a deep overview of the key topics published during *BJET*'s history. The authors found that since 2008, articles related to the topics online learning and learning environments had begun to appear.

Bond et al. (2019) also identified seven trends in terms of topics/subject matter. They are as follows:

- teaching and learning in distance education
- emergence of ID
- practitioner/learning designer misunderstandings
- issues in pre- and in-service teacher education
- technology uptake by educators and students
- technology skills and students; technology skills of teachers and students and
- lack of institutional support for training and integration.

Bond et al. (2019) further noted that articles by international authors increased over 1970 to 2018, with 79% of the authorship outside the United Kingdom. Collaboration of

authorship was also strongly evident (82%) in the articles beginning in 2010 through to 2018.

Other bibliometric researchers in ID have taken a different view than focused on individual authors, one topic, or one particular journal. For example, Anglin and Towers (1992) used citation analysis methods to identify dominant individuals among scholars publishing in the ID field. They investigated citations in three instructional design and technology (IDT) journals and identified that the 10 most frequently cited and, therefore, influential authors from 1985 to 1990 were C. M. Reigeluth, R. M. Gagné, L. T. Briggs, D. H. Jonassen, M. J. Hannafin, D. M. Merrill, J. M. Keller, W. Dick, R. D. Tennyson, and B. Bratton.

Purpose of the Study

The dearth of bibliometric studies that cover a comprehensive range of research results in a knowledge gap about the research influences and relationships in ID. In my review of the literature, no previous bibliometric studies of such publications could be located nor were they comprehensive in their selection of ID journals published over an extended period of time. Hence, an examination of a broader range of journals in the ID field is needed.

The purpose of this study was to examine a broad range of scholarly journals in the ID field in order to identify the current state of publication. By using all three bibliometric methods, I was able to examine the publication patterns and content of such articles. A second purpose was to determine whether there is impact on the ID field by any specific scholars, institutions, or countries. The third purpose was to determine whether any trends are evident in the bibliometric data. Finally, a comparison was made

of the differences in coverage and accuracy of the citation indices WoS, Scopus, and Google Scholar (GS) within the parameters of the study. Using these methods, the study provides a comprehensive and current understanding of the publication world of ID over a recent 20-year period.

Overview of Methodology

To address the research questions, the study uses the bibliometric methods of content analysis, citation analysis, and network analysis and mapping to collect and analyze data from the journals selected.

Assumptions

Smith (1981) identified five assumptions, which are generally accepted for bibliometric studies. They are as follows:

1. Citation of a document implies use of that document by the citing author.
2. Citation of a document (author, journal, etc.) reflect the merit (quality, significance, impact) of that document (author, journal, etc.).
3. Citations are made to the best possible works.
4. A cited document is related in content to the citing document; if two documents are bibliographically coupled, they are related in content; and if two documents are co-cited, they are related in content.
5. All citations are equal (pp. 87-89).

Significance of the Study

This study offers insight into the productivity, trends, and emphases of specific ID journals as well as of the ID field in general. The research supports scholarly

communications by identifying collaboration patterns and opportunities for researchers and their institutions. Additionally, it may help identify the most prolific authors in individual journals, and support recognition of those journals and their contribution to the ID knowledge base.

As Bodily et al. (2019) noted, the dispersion of ID scholars and scholarship among other fields makes full comprehension of the scope of the ID field difficult. This study may help to close this gap in understanding.

General Research Questions

There are six main research questions regarding scholarly journals of the ID field for the period 2001 – 2020; they are as follows:

1. What main themes, individuals, journals, institutions, and geographic areas have influenced the ID field?
2. What relationships among authors, academic publications, and references may be identified through citation analysis?
3. What structure(s) of the ID field may be identified through network analysis and mapping?
4. What trends in ID can be identified?
5. What were the major shifts in bibliometric variables over the study period from 2001 to 2020?
6. Are any differences in coverage and accuracy for ID publications evident between the WoS, Scopus, and GS databases?

Definition of Key Terms

The following are key terms for the study.

Bibliographic coupling - two works cite a third work (Diodato, 2012).

Bibliometrics - " . . .the statistical analysis of books, articles, or other publications . . . to measure the output of individuals/research teams, institutions, and countries to identify national and international networks, and to map the development of new (multi-disciplinary) field of science and technology (Organisation for Economic Co-Operation and Development (OECD) Glossary of Statistical Terms, 2007).

Citation analysis – a bibliometric method that studies the citations to and from documents. Citation analysis may focus on the documents themselves, or on their authors, the journals in which they are published, or the organizations or countries in which the documents were produced (Diodato, 2012).

Co-citation - occurs when two documents are cited together by other documents (Diodato, 2012).

Content analysis – a bibliometric method that examines the textual and nontextual elements of a document (Diodato, 2012).

Instructional design – "the science and art of creating detailed specifications for the development, evaluation, and maintenance of situations which facilitate learning and performance" (Richey et al., 2011, p. 3).

Network analysis and mapping – a bibliometric technique that " . . . examines and visualizes the relationships between publications based on authorship, citations, or common terms." (National Oceanic and Atmospheric Administration, 2022).

Chapter Summary

This chapter introduced the bibliometric study of scholarly journals as related to the ID field. It began with an overview of what is bibliometrics, followed by an overview

of instructional design. The role of scholarly journals within a discipline was described. The chapter ended with a definition of key terms.

In Chapter II, the pertinent literature is reviewed. Further descriptions of bibliometric research as well as the instructional design field are provided. Chapter II ends with specific research questions, their corresponding hypotheses, and the expectations for results based on the review of literature.

CHAPTER II

REVIEW OF THE LITERATURE

Chapter II is a review of the literature related to this study. The chapter begins with an overview of the ID field and its scholarly publications. The chapter also includes descriptions of bibliometric studies first in general and then in ID. Next, a brief review of bibliometric software follows. The chapter concludes with specific research questions, hypotheses, and my expectations for results.

Instructional Design Field – What is It?

Defining Instructional Design

Reigeluth (1983a) conceptualized ID as a linking science between learning theories and instructional interventions. As he defined ID, it is "a body of knowledge that prescribes instructional actions to optimize desired instructional outcomes, such as achievement and affect" (p. 5). Gustafson and Branch (2007) see ID as "a systematic process that is employed to develop education and training programs in a consistent and reliable fashion" (p. 11). Reiser and Dempsey (2006) observed that the ID field is acknowledged as an interdisciplinary field which helps improve other disciplines.

For the purpose of this study, the term 'instructional design' is used. Also, for this study, ID is defined as the systematic process of assessment of the need for instructional

or noninstructional intervention, followed by design, development, implementation, and evaluation of materials and experiences to foster motivation to learn, learning, and demonstration of learning.

The Historical Roots of the ID Field

The roots of ID appear to have begun with the school museum movement and the visual and audiovisual instruction movements of the early 20th century (Reiser, 2001a). Later, during World War II, ID began in earnest due to the need for training for the military. Over time, the use of media in instruction and the use of systematic procedures to design instruction became defining elements of the ID field. In the 1950s and 1960s, training became viewed as a system, and thus systems-based ID models were first developed. Programmed instruction and learning objectives played a major role in instruction during this time period. Other influences during the early 1960s included the criterion-referenced testing movement, learning hierarchies, and subordinate skills. In addition, Gagné (1965) published the first edition of *The Conditions of Learning* which included identification of domains of learning, outcome levels, and his nine events of instruction. This publication was significant because it helped shape and solidify ID as a field and provided a framework for the systematic processes of instructional design (Curry et al., 2020).

In 1957, the Soviet Union's launch of Sputnik set in motion a chain of events affecting the ID process. The United States government undertook an initiative to improve math and science education. By the mid-1960s, it was clear that the instructional materials developed were not effective. In the early and mid-1960s, a variety of ID models were proposed (Edgar, 2012).

The ID field saw rapid and far-ranging development in the 1970s. There was a substantial increase in the number of models used, and a focus on a systems approach. Interest in ID grew in many areas. In the military, an ID model was implemented. In academia, instructional centers were established to help faculty improve the effectiveness of instruction, and graduate programs in ID were created. The business sector began to use the ID approach. ID spread internationally as well. The *Journal of Instructional Development* was first published in 1970 and covered these developments in the field throughout the next decade (An, 2021).

Interest in ID continued to grow in the military, business, and international sectors throughout the 1980s. However, this interest had limited impact in the K-12 education sector. The introduction of microcomputers for instructional purposes during this decade strongly affected the field. This innovation led to the creation of computer-based instruction and automation of some tasks in the ID process (Reiser, 2001b).

In the 1980s and 1990s, the ID field saw a renewed interest in instructional-design theories. This resulted in part from publication of Reigeluth's books, *Instructional-Design Theories and Models: An Overview of their Current Status* (1983b) and *Instructional-Design Theories and Models: A New Paradigm of Instructional-Theory* (1999). These publications impacted a paradigm shift from teacher-centered to learner-centered instruction.

In the 1990s, the performance technology movement, now known as human performance improvement, began to exert influence on the ID field. Additional influences during this time included constructivism and distance learning (Reiser, 2001b). As An (2021) d, the public availability of the Internet changed the ways teaching and

learning occur. During this decade, instructional designers became interested in the use of computers and the Internet as tools to improve both learning and job performance.

Instructional Design Field in the 21st Century

Bodily et al.'s (2019) bibliometric study suggested that scholarship in the ID field between 2007 and 2017 was largely technology-centered and focused on hard, computer-based technologies. Moreover, Bodily et al. (2019) found only limited scholarship on theories of learning, instruction, and design frameworks during these years. An's (2021) analyses support such findings and noted a focus on social media, as well as online, blended, and mobile learning. Additionally, An (2021) found an emphasis on the open education resource (OER) movement and massive open online courses (MOOCs). According to An (2021), technology-based instructional innovations including virtual and augmented reality, gamification, and digital game-based learning were also prominent during this time period.. As a consequence of technology availability, online and blended learning have become major trends for the ID field due to their capacity for increasing accessibility, flexibility, and choice.

Professionals in the ID field continue to often use systematic ID procedures and often employ a variety of instructional media to accomplish their goals. Moreover, in recent years, designers pay increasing attention to non-instructional solutions to some performance problems. Research and theory related to each of these areas is also an important part of the field. (Reiser, 2001b)**.**

Baker and Moukhliss (2020) noted that the ID field faced debates and challenges in defining its scope and nature. This is reflected in the frequent association of the terms 'educational technology' and 'instructional technology' with 'instructional design.' One

reason might be, as suggested by Reiser (2001b), stated that ID in the past focused on the use of systematic ID processes and now seems to be merged with the use of media for instruction to form the instructional design and technology field.

Scholarly Publications in Instructional Design Field

Journals with a variety of titles arose in response to growth and new focuses in ID. The variety may be due to ID's multidisciplinary character as well as its association with other closely related fields, such as educational technology. Currently, only the *Journal of Applied Instructional Design* includes the term, 'instructional design' in its title, but there are additional current journal titles which relate directly to ID (Table 1).

Table 1

Current Journal Titles Directly Related to ID

Title
British Journal of Educational Technology
Computers & Education
Educational Technology & Society
Educational Technology Research and Development
Instructional Science: Selected Journals
International Journal of Designs for Learning
International Journal of Distance Education Technologies
International Journal of E-Learning & Distance Education
International Journal of Instruction
International Journal of Instructional Media
International Journal of Web-Based Learning and Teaching Technologies
The Internet and Higher Education
THE Journal (Technological Horizons in Education)
Journal of Applied Instructional Design
Journal of Computer Assisted Learning
Journal of Educational Computing Research
Journal of Interactive Media in Education
Journal of Research on Technology in Education
Journal of Scholarship of Teaching and Learning
Online Learning
Quarterly Review of Distance Education
TechTrends

Note. *TechTrends* has been considered a professional magazine but in recent years has become more scholarly-oriented. For the purpose of this study, *TechTrends* is treated as a journal.

In addition to the titles shown in Table 1, ID scholarship is dispersed throughout a broad range of other academic fields, and articles related to ID are being found in journals of other disciplines, for example, *Sustainability* and *Trends in Anaesthesia and*

Critical Care. This broad range is due in part to the breadth of the ID influence on other fields.

Two compilations of journals directly relevant to the ID field were completed in the last decade. First, Ritzhaupt et al. (2012) compiled a list of the most important publication outlets in ID by requesting academics and professionals to identify and then rate journals. Their result was a noninclusive list of 59 journals. Four years later, Perkins and Lowenthal (2016) compiled a list of 23 open access journals in educational technology; many were not on Ritzhaupt et al.'s 2012 list. The journal titles from these two compilations are shown in Appendix A.

Bibliometric Studies

Defining Bibliometric Studies

Bibliometric analysis has been defined as the use of statistical methods to analyze a body of literature to reveal historical development. In other words, bibliometrics is the quantitative study of published units on the basis of citation and text analysis (AlRyalat et al., 2019).

Historical Origins of Bibliometric Studies

A precursor to contemporary bibliometric studies was carried out by James Cattell, a psychologist at Columbia University, beginning in 1903 and continually updated until the 1930s. According to Godin (2006), Cattell compiled a biographical directory of men who conducted scientific research. His intent was to study the productivity and performance of these researchers, and to measure the scientific productivity of countries. His directory formed the basis for measuring the growth of science by collecting and analyzing statistics (Godin, 2006).

Buchner (1911) used a method similar to Cattell's in annual reviews from 1904 to 1913. Buchner's reviews focused on counting scientific papers in the field of psychology and were published in the *Psychological Bulletin* (Godin, 2006). Godin (2006) reported that Pritchard coined the term 'bibliometrics,' and defined it as the application of mathematics and statistical methods to forms of communication.

Bibliometric Studies in General

Bibliometric methods have historically been used to trace the relationships among academic journal citations. Subsequently, bibliometric studies have examined a broad range of academic disciplines.

Bibliometric Studies in Instructional Design

Of the few bibliometric studies found in the literature, most were focused on either a specific topic related to ID or a specific journal. For instance, as examples of studies of a specific topic, Göksu et al. (2017) conducted a study on research trends in ID models, and Baker & Moukhliss (2020) investigated publications about design thinking and human-centered design. Examples of studies focusing on a specific journal are Ku's (2009) analysis of productivity in *ETR&D* over 20 years, and Bond et al.'s (2019) examination of publications in the *British Journal of Educational Technology*.

Yet, other bibliometric researchers went beyond a single topic or journal. For example, as one of the earliest bibliometric studies, Anglin and Towers (1992) investigated citations in three IDT journals for the time period of 1985 – 1990 and found that the authors receiving the highest number of citations were R. M. Gagné, R. D. Tennyson, and R. Kaufman. Additionally, Anglin and Towers identified 53 groups of highly cited authors, which indicated a strong tendency toward collaboration and co-

authorship at that time. They further concluded that these groups of frequently cited authors significantly influenced the development and practice of ID and development.

Gall et al. (2010) analyzed references from and citations to articles published in *Educational Technology Research and Development (ETR&D*) during the period 1990-2004. They identified nine journals that were consistently most often cited by *ETR&D* and frequently cite it. Thus, the study revealed a network of journals that co-influenced each other, and revealed informal connections through the citation record. The nine journals were *Contemporary Educational Psychology*, *Educational Psychologist*, *Instructional Science*, *Journal of Computer-Based Instruction*, *Journal of Educational Computer Research*, *Journal of Educational Psychology*, *Journal of Educational Research*, *Journal of Research in Science Teaching*, and *Review of Educational Research*.

West and Borup's (2014) bibliometric study focused on research published in 10 journals in the IDT field from 2001 to 2010. They categorized articles according to methodology, keywords, authorship, and citation trends. They identified trends which indicated an emphasis on technology, distance learning, communication strategies, and instructional methods.

There were other studies that focused on a few journals to contribute to an understanding of highly visible journals in a field, but their perspective is limited. For example, Lee et al. (2010) examined trends in topics and research methods of four major distance education journals. Their study yielded limited information about publication patterns, but this was limited due to only a few journals. As such these studies did not

yield patterns within those journals nor journal characteristics over the range of journals in a field.

More recently Bodily et al. (2019) analyzed all instructional design and technology articles indexed in the SCOPUS database from 2007 to 2017. The purpose was to identify research trends, most-cited articles, publishing countries, universities, keywords, and authors. In regard to trends, they found a focus on computer-based technologies, and a lack of studies on learning theories and design frameworks. One finding was a large international presence in the ID field. Additionally, they found small positive relationship between author collaboration and paper citation counts.

Göksu et al. (2021) investigated publications in the ID field from 1975 to 2019 indexed in the WoS database. The most frequently used keywords during this timeframe were e-learning and online learning. In more recent years keywords included massive open online courses (or MOOCs), mobile learning, flipped classroom, gamification, and augmented reality. The most published authors were Fred Paas and Jeroen van Merrriënboer, with the most cited author being John Sweller. They also found that 9344 authors collaborated as co-authors.

Considerations in Bibliometric Studies

There are two key factors to consider when conducting a bibliometric study. The first is coverage of the database because it directly influences citation counts according to Andrés (2009). Although databases provide citation counts, the count is only per each database. Thus, the more journals included in a database, the more citations there are to count. Coverage refers to the extent to which a database includes all of the written scholarly literature in a field. For a database to be considered to have wide coverage, it

must not be biased toward particular countries, languages, or publishers (Neuhaus & Daniel, 2008). The second factor is accuracy, which refers to whether the data are consistent and correct in terms of spellings of author names and standardization of journal titles and affiliations (Neuhaus & Daniel, 2008).

Different databases are used to do bibliometric analysis; each database has different characteristics and can provide different services. The main indices currently in use for bibliometric analyses are WoS, Scopus, GS, Microsoft Academic (MA), and Dimensions. These are described as follows.

- WoS is accessible through subscription. It was originally produced by the Institute for Scientific Information (ISI). Its intellectual property later transferred to Thomson Reuters, and maintenance transferred to Clarivate Analytics. WoS provides access to numerous databases and citation data for 256 disciplines. These cover science, social science, arts, and humanities. The number of records accessible through WoS exceeds 90 million, with a timeframe of 1900 to the present (Moral-Muñoz et al., 2020).
- Scopus provides access to multiple databases and citation data in life sciences, social science, physical science, and health science. Access is available through Elsevier (2021) by subscription. The number of records in Scopus is approximately 69 million (Moral-Muñoz et al., 2020).
- GS is a freely available website launched in 2004. In 2018, the number of records available through GS was estimated at 389 million.
- Microsoft Academia, formerly known as Microsoft Academic Search, was relaunched as a new bibliographic service in 2016. Microsoft supplies and

maintains Microsoft Academia as a free web search engine. 88 million journal articles are indexed by Microsoft Academia.

- Dimensions, a database launched in 2018, is supported by Digital Science and Research Solutions, Inc. It offers different products, including a free version. It contained more than 102 million publications in 2019.

Coverage

The databases of WoS, Scopus, and GS are all multidisciplinary; that is, they do not specialize in a particular field and are not limited to one particular subject area. Piotrowski (2013), comparing features of WoS, GS, and Scopus found that in terms of coverage, WoS provided extensive coverage, but was limited in its coverage of the fields of education, social sciences, and humanities. Scopus provided very comprehensive coverage, and more than the two other databases. In another comparison, Haddow and Genoni (2009) found that Scopus outperformed WoS in citation measurements of education journals, and that GS was quite comprehensive for all fields.

WoS is considered to be the benchmark for bibliometric research (Piotrowski, 2013). An advantage of the WoS is that it is derived from a multidisciplinary citation index. Its Journal Impact Factor is the most widely used indicator of the importance and influence of journals. At the same time, the WoS has been criticized for its strong influence on author and journal evaluation as well as the ongoing debate regarding impact factors (Andrés, 2009).

The Scopus database is well regarded by the academic community and is considered to offer wide coverage and ease of use (Andrés, 2009). However, a

disadvantage of Scopus is that it does not always adequately differentiate between authors who have the same last name (Bar-Ilan, 2008).

All three databases noted inconsistencies in their coverage. Jasco (2005) found that on occasion the same article received variation in the numbers of citations by the three databases.

Accuracy

Accuracy is a second major consideration when choosing a database for a bibliometric study. While mistakes and errors cannot be completely eliminated from databases, the bibliographic researcher should choose those in which errors are minimal in the citations of indexed documents. Jasco (2005) noted that the system used by Scopus was promising in minimizing errors related to authors and institutions.

GS has received mixed reviews from the scholarly community. Positive attributes include its usefulness and open access Andrés (2009). Other studies (Jasco, 2005; Bar-Ilan, 2008) found that GS contained inaccuracies regarding author name and publication dates. Falagas et al. (2008) criticized GS's accuracy for displaying results based on number of user visits instead of other quality indices.

Van Raan (2005) pointed out the primary mistakes that might be found in a database used for citation analysis. One is institutional productivity; databases may differ in attributing publications to the correct organization because there is not a standard approach for specifying affiliations in an article. Additionally, there may be different ways of writing the name of the same university.

One possible bias related to the author's names is multiple researchers having the same surname and possibly the same initials. Moed (2002) emphasized that such

occurrences present a problem in conducting analyses based on author names only in terms of productivity and collaboration patterns.

The accuracy of bibliometric data can also be influenced by a journal's characteristics. For example, Moed et al. (1999) presented the example of journal name change or merger as a potential source of bias. Further, Andrés (2009) stated that a title change can influence impact factors. During a certain period of time after a title change, no citations will be counted for the journal and result in the appearance of no citations which may increase the Journal Impact Factor. Citation count can also be influenced by the number of documents across volumes and numbers of a journal. Moed (2002) observed that those journals which use dual or combined volume numbering systems will be most strongly affected.

The way citations are collected and counted creates a limitation of potentially biased data. Working with multiple data from different sources, such as with the large databases in bibliometric studies, will inevitably include mistakes and incomplete data. These biases in citation counts can lead to many citations being lost in reference counts. Additionally, there are some limitations to the usefulness of citation data, including incomplete, inconsistent, or biased and incorrect citing of sources. The only way to solve such problems and ensure that the analysis is valid is for the researcher to exercise extreme accuracy in working with citations and making every possible effort to identify mistakes in the citations gathered (Andrés, 2009). For this reason, Meho and Yang (2007) as well as Levine-Clark and Gil (2009) recommended using multiple complementary databases to mitigate or reconcile discrepancies.

Databases Used in Bibliometric Studies

Scholarly literature databases, also known as citation indices, are commonly used for bibliometric analysis. Citation indices enable researchers to search for publications and extract information about the publication characteristics. The information contained in bibliographic databases (including citations, keywords, titles, journals, authors, and institutions, among others) provides a valuable sample source for bibliometric studies. The data can be analyzed to ascertain the popularity and impact of specific authors, articles, and journals. Such data may be used for a quantitative assessment of the core journal titles in specific disciplines. Additionally, such data can identify interrelationships among authors.

The first citation databases were created by the Institute for Scientific Information (ISI). In 1964, ISI introduced the Science Citation Index (SCI), followed by the Social Science Citation Index in 1973 and the Arts and Humanities Citation Index in 1978. Later, the three were moved online and became WoS in 1997.

Gusenbauer (2019) used the acronym ASEBD (academic search engines and bibliographic databases) as a comprehensive term to include the GS search engine and bibliographic databases such as Scopus and WoS. The terms ‘database’ and ‘academic search system’ are often used inclusively to refer to academic search engines such as GS, as well as bibliographic databases.

Databases Selected for the Study

One of the first steps in a bibliometric study is choosing the databases from which data will be extracted. For the purposes of this study and based on database comparisons, the three databases chosen were WoS, Scopus, and GS.

Web of Science

WoS is one of the most frequently used databases. It offers advanced search and filtering functions, along with citation analysis tools. The WoS database is now maintained by Clarivate Analytics. WoS includes publications from 256 disciplines focusing on science, social science, arts, and humanities. It indexes science and social science journals from 1900 to the present, and arts and humanities disciplines from 1975 to the present. It contains 79 million records, including 21,419 journals, books and conference proceedings. An advantage of the WoS is that journals are rigorously evaluated prior to their selection (Web of Science, 2021).

Scopus

The Scopus database was released in 2004 and contains an estimated 78 million records in the disciplines of life sciences, social sciences, physical sciences, and health sciences. Scopus, like WoS, is frequently used for bibliometric studies. Among its features are advanced search and filtering functions, and citation analysis tools (Elsevier, 2021).

Google Scholar

GS, unlike WoS and Scopus, does not provide advanced search and filtering functions. Its coverage is broader than either of the other two databases for this study, as it covers non-peer-reviewed data. It is faster at indexing than either WoS or Scopus. It is open source, and therefore freely available online. A disadvantage of GS is that it does not have data exporting capabilities. Thus, data cannot be directly exported from it and other software, such as Publish or Perish (PoP) must be used to transfer GS data to other platforms for analysis.

Martín-Martín et al. (2021) found that GS provides more data coverage than WoS or Scopus, so citation counts are generally higher. Using a sample of 2319 highly cited documents, the study indicated that GS is the most comprehensive source. GS found 88 percent of all citations, including many not found in the other databases. GS also found 89 to 94 percent of the citations found by the other sources. Scopus and WoS, in contrast, found fewer (57 and 52 percent, respectively) of citations identified by all six databases combined.

Conversely, GS has been criticized for its broad view of scholarly publications. GS searches scholarly journals and also theses, dissertations, technical reports, books, abstracts, and court opinions. These sources may originate from websites, online repositories, journal hosting services, university and professional organizations, as well as academic publishers. This view results in the inclusion of non-peer reviewed non-scientific contents.

GS does not index all scholarly articles, and this may result in citations being undercounted. Conversely, it includes citations from a variety of sources, such as PowerPoints and Word documents, so citation counts may be inflated. It includes all disciplines.

In regard to its advantages, GS is easily accessible, free, and open source. Enhanced data analysis is available through the PoP open-source software.

Analytic Software Used in Bibliometric Studies

In order to conduct bibliometric research, researchers need specialized tools to retrieve publications, extract data, and conduct analyses. Several software tools are available to assist bibliometric analysis. Moral-Munoz et al. (2020) reviewed the

available software and concluded that bibliometrics can be divided into two major subject areas:

1. Performance analysis to evaluate different entities (researchers, institutions, countries, etc.) through indices based on publication and citation data.
2. Mapping analysis to visually represent the cognitive and social structure of a given research field.

Moral-Muñoz et al.'s (2020) software review covered the most relevant software for performance and mapping analysis which are currently available in final form, in an up-to-date status, and still maintained. Each of the reviewed software tools has its own advantages and disadvantages. Almost all software tools can import data downloaded from WoS and Scopus. The review revealed that there is a great deal of variability in the features of the software. Therefore, a user should choose based on their objectives and desired output.

Research Questions, Hypotheses, and Expectations

The six main research questions for this study identified in Chapter I were further refined based on the literature review. The specific research questions, their corresponding hypotheses, and the expectations for results are identified as follows.

General Research Question 1

What are the main themes, individuals, journals, and geographic areas which have influenced the field of ID?

Research Question 1.1

What are the main themes found in the instructional design articles during the period of 2001 to 2020?

Hypothesis 1.1. The data will show that the themes which reflect online instruction, delivery platforms, social media and technology, and complex learning will be the most prevalent topics in instructional design articles 2000 to 2020.

Expectations for Results 1.1. Online learning, e-learning, distance learning, social media, social presence, technology, and complex learning were expected to be the most frequently occurring keywords in research articles. This expectation is based in part on West and Borup's (2014) research, findings showed an emphasis on technology in the ID literature, Bodily et al.'s (2019) study, which found that research articles often focused on computer-based technologies, and Bond et al.'s (2019) study, finding that online learning and learning environments have been emerging trends since 2008. Similarly, the most frequent keywords in Göksu et al.'s (2021) study were online learning and e-learning.

Research Question 1.2

Who were the most prolific and highly cited authors from 2001 to 2020?

Hypothesis 1.2. Five to seven authors were the most influential in ID from 2001 to 2020.

Expectations for Results 1.2. van Merriënboer, Sweller, Ertmer, Kirschner, Paas, and Renkl were expected to be found as the most influential authors. Authors' influence was measured by number of articles published, the journals in which they published, and the number of citations their work received. Göksu et al. (2021) found that three of these authors had been among the most published and most cited since 1975. Others expected to be most influential have co-authored articles with the most published scholars.

Research Question 1.3

Which journals published the greatest number of articles?

Hypothesis 1.3. Three or four journals will have most strongly influenced instructional design, based on numbers of research articles published.

Expectations for Results 1.3. The *British Journal of Educational Technology, Computers & Education, Educational Technology Research & Development,* and *TechTrends* are expected to have published the greatest number of articles among journals in ID. This expectation is based on the long-standing reputation of these four journals.

Research Question 1.4

Which countries' authors were most frequently published from 2001 to 2020?

Hypothesis 1.4. Most journal articles on ID are authored by individuals in three countries: the United States, Australia, and Turkey according to Bond et al. (2019).

Expectations for Results 1.4. The United States, Australia, and Turkey were expected to be the most predominant countries of authorship for ID articles. This expectation is based on a finding by Bond et al. (2019) of a recent increase in international authorship, while the United States, Australia, and Turkey have maintained a strong presence in publishing in the ID field.

General Research Question 2

What relationships among authors, academic publications, and references may be identified through citation analysis?

Research Question 2.1

Do authors tend to repeatedly cite the same authors?

Hypothesis 2.1. Authors frequently cite the same authors in different articles.

Expectations for Results 2.1. Individual authors' articles are expected to consistently cite several of the same researchers. This expectation is based on Gall et al.'s (2010) discovery of 10 journals that co-influenced each other; it is reasonable to assume that this finding extrapolates to authors.

Research Question 2.2

Which journals received the greatest number of citations?

Hypothesis 2.2. Authors will favor articles published in the most prominent journals in the ID field.

Expectations for Results 2.2. Citation analysis was expected to show a large number of citations to the most frequently cited journals, e.g., The *British Journal of Educational Technology, Computers & Education, Educational Technology Research & Development,* and *TechTrends*. This is due to the recognized quality of each of these journals. Additionally, it was expected that the most influential and prominent authors prefer to submit articles to the most prominent journals so consequently those authors and journals would receive the most citations.

Research Question 2.3

Do co-citation and bibliographic coupling occur frequently in ID research articles?

Hypothesis 2.3. Co-citation and bibliographic coupling occur frequently in instructional design articles.

Expectations for Results 2.3. Citation analysis is expected to reflect that a large number of ID articles are co-cited and/or bibliographically coupled. This expectation is based on Bond et al.'s (2019) finding of strong evidence of authorship collaboration.

General Research Question 3

What structure(s) of the ID field may be identified through network analysis and mapping?

Research Question 3.1

Does bibliometric analysis show any connections between authors?

Hypothesis 3.1. Network analysis and mapping will show repeated strong connections between the same authors indicating collaboration, and growing occurrences of multinational collaboration.

Expectations for Results 3.1. Based on Bodily et al.'s (2019) research, evidence of increasing collaboration (number of authors per article) over time is expected to be found. Additionally, it is expected that the same authors will continue to collaborate with each other, and there will be a steady increase per year in the number of countries represented by the authors.

General Research Question 4

How have the trends in ID topics changed from 2001 to 2020?

Research Question 4.1

What topics were most often published about in 2001, and in 2020?

Hypothesis 4.1. Constructivism and authentic learning were frequently written about in 2001. In 2020, popular topics were Web-based instruction, gaming, and simulation.

Expectations for Results 4.1. Publishing trends in the topics of distance learning, remote learning, motivation, learner engagement, and interactive learning are expected to continue.

General Research Question 5

Are any differences in coverage and accuracy evidenced between the WoS, Scopus, and GS databases?

Research Question 5.1

Are WoS, Scopus, and GS similar in terms of accuracy and coverage?

Hypothesis 5.1. The databases WoS, Scopus, and GS differ in their coverage and accuracy.

Expectations for Results 5.1. Based on findings from the Martín-Martín et al. (2021) study, it is expected that a comparison of retrieved articles from all three databases will find more errors in the GS results, in terms of spelling and punctuation errors. On the other hand, it is expected that GS will exhibit greater coverage by retrieving a greater number of pertinent articles for the searches.

General Research Question 6

How or what differences will be identified between findings in this study in comparison to the impact factors published in the Journal Impact Report?

Research Question 6.1

In terms of citations, how will the citation numbers found in this study compare to the published Journal Impact Factors?

Hypothesis 6.1. Journal Impact Factors will differ from the journal citation numbers found in this study.

Expectations for Results 6.1. Journal Impact Factors are expected to be higher and more accurate than the journal citation numbers for this study, due to the fact that the data from which the Journal Impact Factors are derived is more comprehensive, and more analytical resources are available to determine them.

Chapter Summary

This chapter presented a review of the literature on ID and bibliometric studies. It also reviewed software used to conduct bibliometric analyses. As a result of current research, six main research questions were submitted. My hypotheses and expectations were stated for each specific research question. Chapter III describes the methodology that was used in this study.

CHAPTER III

METHODOLOGY

In this study, research articles published between 2001 and 2020 in ID scholarly journals were analyzed through bibliometric methods. This chapter describes how the databases, journals, and articles were chosen. Additionally, the chapter discusses the types of data that were extracted and compiled, the bibliometric tools used, and how the data were managed. Further, the research methods of content analysis, citation analysis, and citation network analysis are described. At the end of the chapter, the procedures of the study are discussed as well.

Research Design

The bibliometric methodology for this study consisted of three parts: (1) Data compilation, (2) software, data management, and data cleaning, and (3) analysis, interpretation, and visualization.

Data Compilation

Time Period Selection

A review of the literature found no guidelines for a recommended number of years for a bibliometric study. Reviews of previous bibliometric studies found that 10 or 20 years is frequently used. The most recent 20 years were chosen to conduct this study because this time period would most likely reveal changes and evolving patterns in the

published research. Additionally, the most prominent authors, journals, institutions, and topics could be discovered as well as providing an up-to-date picture of the current status of published journal articles in the ID field.

Database Selection and Use

My analyses used three bibliographic databases: WoS, Scopus, and GS. WoS and Scopus are both available through the databases provided by Marx Library at the University of South Alabama. Marx Library is the main library for the university, and the databases it provides are available at no cost to the university community. GS is readily available as an open source database. The three databases were selected based on their convenient access and their frequent use among scholars and researchers.

The use of multiple databases was recommended by other bibliometric researchers (Levine-Clark & Gil, 2009; Meho & Yang, 2007; Martín-Martín et al., 2021). Their reason for this recommendation was to reduce the likelihood of potential errors or discrepancies in the data.

Choice of Search Parameters

Articles were retrieved from journals selected through the citation databases, using the keywords, instructional design, in quotations to search titles, abstracts, and author-supplied keywords for relevant articles. The 20-year time frame was the publication dates 2001 through 2020. Filters applied in the article selection were the general search filtering criteria of full-text, peer-reviewed, English language, articles only.

Selection of Journals and Articles

I referred to lists of ID journals found in two bibliometric or database studies to identify appropriate journals for selection. The lists used by Ritzhaupt et al. (2012) and Perkins and Lowenthal (2016) were most helpful because journals similar to the other list were chosen. Appendix A contains a consolidated list of the journals they selected.

Other publications were also reviewed which included lists of main ID journals from Martindale (2020), Bentley (n.d.), and on the web site, InstructionalDesign.org (n.d.). After comparing and consolidating these journal sources, a master list was achieved and then reviewed for duplicates. By removing any entries which were exact duplicates or differed only in minor title elements, a preliminary list of 160 journal titles (Appendix B) resulted that were considered for this study.

Journals were selected from this preliminary list for the study if they met two criteria. One, they had been deemed by professionals in the ID field as relevant and important to the discipline. Two, the journal could be retrieved through the keyword search for instructional design in one or more of the three designated databases.

Bibliometric Characteristics

After journals were identified and articles selected, and the following information about each article's bibliometric characteristics were extracted and entered into an Excel spreadsheet according to column headings as shown in Figure 2. These characteristics were analyzed to produce a comprehensive overview of the scholarly literature in the ID field.

Figure 2

Bibliometric Characteristics Spreadsheet Headings

Author(s)	Doc Title	Year	Source Title	Citation Count	Affil	Geo Area	Abstract Keywords	Author Keywords	Database Keywords

Software, Data Management, and Data Cleaning

Software Selected for the Study

Based on my review of available data management and bibliometric software, three programs were selected: *PoP*, *Excel*, and *VOSviewer.* These programs offered features necessary to meet the requirements and purposes of this study.

Publish or Perish. *PoP* is a software package for bibliometric analysis which was developed by A. W. Harzing. Its selection for performance analysis in this study enabled the export of data from GS to *Excel* for data management and statistical analyses (Harzing, 2007).

Microsoft Excel. *Excel* is a spreadsheet program that can be used to create tables and store, organize, and analyze data sets. *Excel* was selected for this study for its ease of use and versatility. *Excel* was used to create tables into which bibliographic data were exported, and *Excel*'s formulas were used to calculate basic bibliometric descriptive statistics from those data. *Excel* was also used for data-cleaning tasks such as correcting obvious errors in uploaded data and removing duplicate records.

VOSviewer. *VOSviewer* is a software tool produced by the University of Leiden, the Netherlands, and it is used to provide visual representation of the networks and

patterns found (van Eck & Waltman, 2010). Network analyses of the bibliographic data were carried out to construct structural maps or patterns to visually represent trends and relationships. *VOSviewer* was chosen for network analysis and mapping because this program can perform a wide range of visualizations. These visualizations showed instances of co-citation, bibliometric coupling, co-authorships, and co-occurrence. *VOSviewer*'s zoom and scroll functionalities that support detailed examination of bibliometric maps were also a factor in the selection of this tool.

Data Management

Data management is essential in bibliometric studies. Organizing data into manageable spreadsheets allowed for the analyses to be set up appropriately. To facilitate data management, bibliometric characteristics found in the data collection were identified. When data collection of journal articles was completed, the data were organized into *Excel* spreadsheets.

These data were sorted either alphabetically or numerically based on each type of characteristic. Numerical sorting determined the most frequent entries for the characteristic. The alphabetical sorting included Author(s), Document Title, and Source Title, which aided in identifying and removing duplicates. Figure 2 shows the database columns of the *Excel* spreadsheet.

Data Cleaning

The preliminary journal list was reviewed to ensure that all journals were a good fit with ID. Journals which were found to have published articles relevant to ID remained on the list. Those journals without a good fit were removed from the final list.

Additionally, article lists from the three databases were manually reviewed to remove duplicates. Once the bibliometric characteristics had been exported into *Excel,* the files were reviewed for duplicate entries by identifying identical or closely similar titles, as well as reviewing other fields to either confirm or disconfirm a duplicate entry.

Analysis, Interpretation, and Visualization

With data cleaned, analyses could begin. Data extracted from WoS and Scopus were exported separately as comma separated value (.csv) and imported into the custom *Excel* spreadsheet (Figure 2). For the GS database, searches on the bibliometric characteristics of interest were conducted using *PoP* software. The results were exported in .csv format to the custom *Excel* spreadsheet.

Combining all three approaches enabled investigations of descriptive statistics through content analysis, and links between authors and publications through citation analysis. Additionally, the combination of approaches provided data for network analysis to occur.

Content Analysis

Descriptive data were compiled from the characteristics of the retrieved articles as shown in Figure 2.

Topics. To analyze the topics, author-supplied keywords were collected. If author keywords were not available, abstract keywords or database keywords were sought. Similar terms (i.e., e-learning and online learning) were combined. The resulting list was sorted by frequency of keywords.

Authors. Authorship was analyzed by first listing all authors published in each journal from 2001 to 2020, and identifying authors with multiple publications. Next, the

list was sorted to identify the most prolific authors in the sample of journals. Number of authors applies to the number of authors who contributed to each article (Andrés, 2009). These data provide some indication of the degree of collaboration among authors.

Most productive authors were identified by their number of publications. A count was given whether the author was primary or co-author.

The total number of articles identified by specific keywords was examined by each year covered by this study. Changes in these numbers over time were used to indicate whether topics were emerging in the ID field.

Citation Analysis

The citation patterns for the published articles were analyzed to identify the most frequently cited articles and determine the overall citation counts. Citation analysis was done to determine the relative prominence of authors. Prominence of institutions and geographic areas of productivity was traced through author affiliations and determined in terms of citedness. *PoP* software was used to detect and analyze the citation patterns for the published articles, identify the most frequently cited articles, and determine the overall citation numbers.

Network Analysis and Mapping

VOSviewer software was used to conduct network analysis and construct bibliometric maps in order to visually represent bibliometric networks. These included networks of citations between publications or journals; co-authorship between researchers; and co-occurrence between keywords.

The *VOSviewer* software used a distance-based approach in 2-dimensional space. It assigned each node to a cluster, a set of closely related nodes. *VOSviewer* used colors to indicate a node's assignment to a given cluster.

VOSviewer is capable of processing WoS output files. Therefore, bibliographic data were downloaded from the WoS database in a tab-separated format. The full record for each article, including cited references, was downloaded. The WoS database was recently upgraded to allow downloading for up to 1000 publications at a time. Therefore, based on the number of articles retrieved through WoS for this study, data were uploaded to *VOSviewer* in one batch. Commands within *VOSviewer* were selected and executed to analyze citations, bibliographic coupling, co-citation, co-authorship, and word co-occurrence in the downloaded data.

Chapter Summary

Chapter III described the research design for the study, how the time period and databases were selected, how journals and articles for the study were selected, and how the software for the study were selected. A description of the data extraction procedure and the three bibliometric analyses of content analysis, citation analysis, and network analysis and visualization were provided. Bibliometric measures used in the study were operationalized.

CHAPTER IV

RESULTS

The purpose of this study was to examine a broad range of scholarly journals publishing articles in the ID field from 2001 to 2020 in order to identify the current state of publications. Additionally, the study purpose was to:

- Determine any impact on the ID field by author, journal, or country.
- Identify if trends of ID are evident and
- Compare coverage and accuracy of WoS, Scopus, and GS as they relate to the topic of instructional design.

This chapter presents the results through a description of the data analysis and related findings. For brevity, WoS, Scopus, and GS are all referred to as databases, although GS is technically a scholarly search engine. The results are broken down by research question.

Analysis of Data

A preliminary search of the three databases was conducted to locate relevant data for this study. Each database was searched for the journals (Appendix B) which were considered the most influential journals in the field of instructional design based on compiled lists (Ritzhaupt et al. (2012), Perkins and Lowenthal (2016), Martindale (2020),

Bentley (n.d.), and InstructionalDesign.org (n.d.)). Once journals were identified in at least one of the three databases, the next step was to search for articles published from 2001 through 2020 with instructional design as a keyword in Web of Science and Scopus. Although GS does not specify keywords, I searched broadly for the presence of the keyword instructional design with the realization that GS was less precise than the other two databases.

After articles were retrieved, duplicates were removed from the resulting lists as well as any non-English articles and those that clearly did not match the study's criteria. The lists were reviewed for missing data in the fields that would be used in the study: Journal title, article title, number of authors, author(s)' name, year of publication, number of citations received, and author(s)' geographic area. Any missing data were filled in if they could be located by accessing the article electronically. The Scopus and WoS search results were exported as comma-separated value files and uploaded to Excel files, in order to sort and search data so bibliographic information could be extracted and summarized. Additionally, the GS data were exported to Publish or Perish software to enable uploading to Excel for analysis and management. The body of data collected through this approach would address the research questions.

There were six general research questions that guided this study. The results related to each of these research questions are described as follows.

General Research Question 1

What are the main themes, individuals, journals, and geographic areas which have influenced the field of instructional design? To address this question, the bibliometric characteristics of articles were examined for the most frequently occurring values of

characteristics. These were related to the following specific questions of Research Question 1.

Research Question 1.1

What are the main themes found in the instructional design journals during the period of 2001 to 2020?

The hypothesis was that frequent keywords would be online learning/e-learning, distance learning, social media, social presence, technology, and complex learning. The results indicated that after instructional design, both online or e-learning and technology had relatively high counts. However, complex learning and social media were not among the counts. Other keywords showed some frequency; those occurring at least nine times are listed in Table 2.

Table 2

Most Frequent Keywords in ID Articles in Journals Selected for the Study, 2001 – 2020

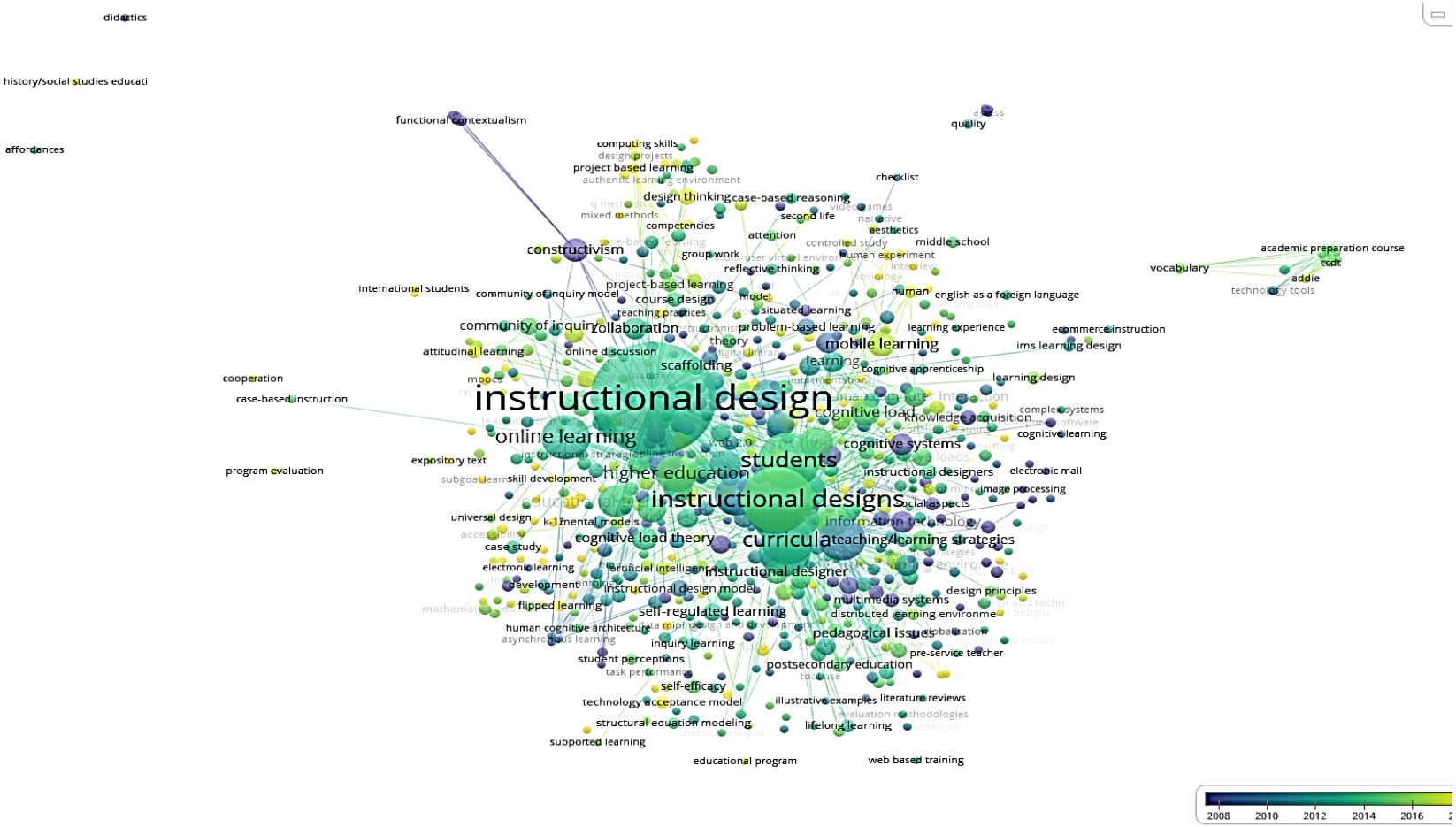
Keyword	Count
Instructional design	627
Technology, educational technology	246
E-learning, elearning, online learning	236
Cognitivism	124
Learning environments	117
Collaborative learning	103
Motivation	57
Cognitive load	56
Higher education	55
Problem-solving	48
Active learning	41
Multimedia	38
Assessment	33
Engagement	33
Distance learning	27
Blended learning	25
Interactive learning	24
Mobile learning	23
Technology integration	22
Teacher education	21
Game-based learning	20
Virtual reality	20
Constructivism	19
Learning object	19
Computer-mediated communication	18
Instructional design model	17
Community of Inquiry	16
Scaffolding	14
Critical thinking	10
Learning community/communities	10
Web 2.0	10
Ill-structured problem solving	10
Computer-based instruction	9

The hypothesis was partially supported by the data. The closely-related keywords of technology and educational technology were the most frequent used. Additionally, elearning, online learning, and E-learning were used almost as frequently in the selected journals during 2001 – 2020, as expected. However, contrary to expectations the keyword distance learning was used only infrequently during the time span of the study. Additionally, social media, social presence, and complex learning, which had been expected to play a larger role in the research literature, were seldom selected as keywords (Table 2).

When keywords repeatedly occur together in the research literature, this can indicate a more targeted focus on an area or point to growing interest and research activity in a specialized topic. Using VOSviewer software, Figure 3 was created to show the frequency of co-occurrence between keywords. Colors in the figure indicate the clusters to which items belong. Within these color clusters, co-occurrence of the keywords is common. The distance between nodes which represent keywords is another indicator of the strength of the connection between keywords; the shorter the distance, the stronger the connection. The links also connect keywords that co-occur less frequently but nevertheless are related. The size of the nodes indicates their relative weight, which can mean importance or number.

Figure 3

Co-occurrence of Keywords in ID Articles in Journals Selected for the Study, 2001 - 2020



Research Question 1.2

Who were the most prolific and highly cited authors from 2001 to 2020?

It was anticipated that between five to seven authors would be both most prolific and highly cited. Based on past bibliometric studies, van Merriënboer, Sweller, Ertmer, Kirschner, Paas, and Renkl were considered to be most prolific and cited. The most prolific authors were identified by the number of articles published during 2001-2020. These numbers (Table 3) were extracted from the Web of Science. The number for each author includes counts for all authorship and co-authorship; all are equally weighted.

Table 3

Twenty Most Prolific Authors of ID Articles in Journals Selected for the Study, 2001-2020

Author	Number of Articles Published
van Merriënboer, J. J. G.	21
Paas, F.	20
Kirschner, P. A.	13
van Gog, T.	13
Watson, S. L.	11
Elen, J.	9
Yanchar, S. C.	9
Choi, I.	8
Ertmer, P. A.	8
Stefaniak, J.	8
Tracey, M. W.	8
Watson, W. R.	8
Chen, C. H.	7
Costley, J.	7
Hwang, G. J.	7
Lange, C.	7
Scheiter, K.	7
West, R. E.	7
Gerjets, P.	6
Veletsianos, G.	6

The findings of the most prolific authors partially aligned with the expectations. Van Merriënboer is credited with 21 articles; Paas, 20; Kirschner and van Gog were tied for 13 each; and Elen, 9. However, some authors were less published than anticipated. For instance, Ertmer published 8 articles during 2001-2020, Renkl had 5, and Sweller, 3.

The most highly cited was based on the total number of citations their articles received, according to Scopus (Appendix C). D. M. Merrill ranked first, with 849 citations to his 2002 article "First Principles of Instruction" published in *Educational Technology, Research & Development*. The article with the second highest number of citations was published in *Computer and Education* in 2014 and was "Effectiveness of Virtual Reality-Based Instruction on Students' Learning Outcomes in K-12 and Higher Education: A Meta-Analysis" by Merchant, Goetz, Cifuentes, Keeney-Kennicutt, and Davis. It has been cited 619 times.

Research Question 1.3

Which journals published the greatest number of articles?

Based on findings of other bibliometric studies, *British Journal of Educational Technology*, *Computers & Education*, *Educational Technology Research & Development*, and *TechTrends* were expected to have higher numbers of published articles. Instead, *BJET* ranked seventh, with 31 articles. The other three journals expected to rank highest appeared in the top six rankings, with over 50 articles each (Table 4). Journals that ranked higher than anticipated were *Computers in Human Behavior*, *Instructional Science*, and *Educational Technology and Society*. Each of these journals published over 50 instructional design articles.

Table 4

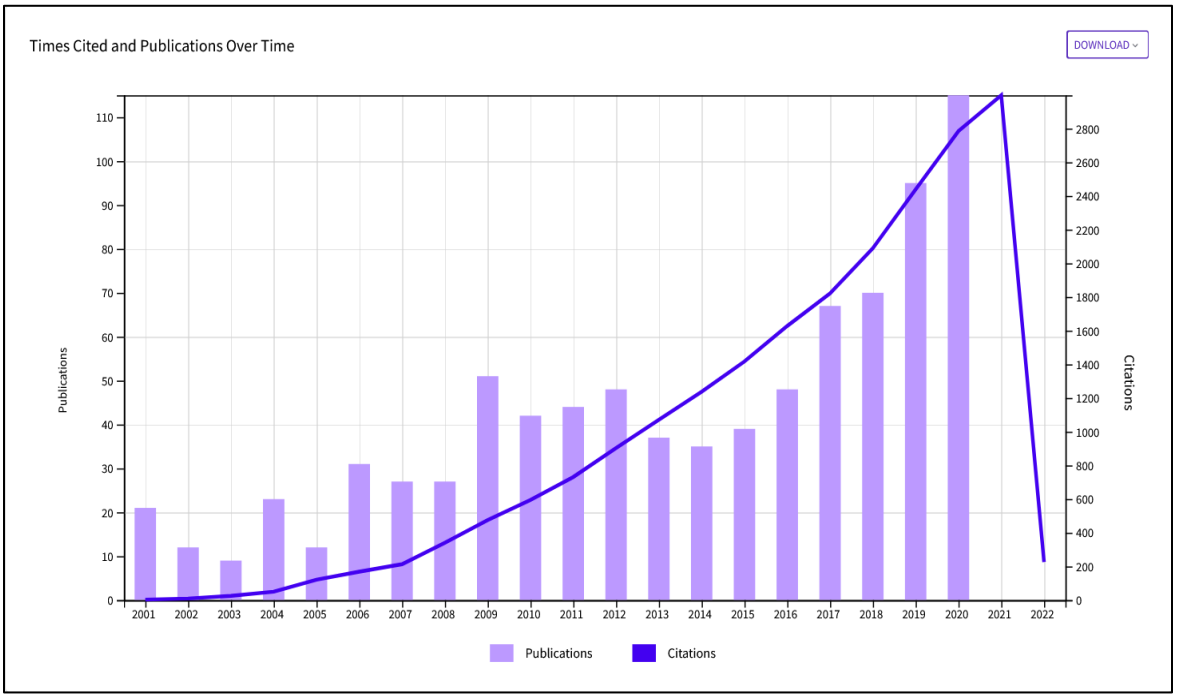
Number of ID Articles Published in Top 10 Journals Selected for the Study, 2001-2020

Journal Title	Number of Articles
Educational Technology Research & Development	74
Computers & Education	64
Computers in Human Behavior	58
Instructional Science	56
Educational Technology & Society	56
TechTrends	55
British Journal of Educational Technology	31
Journal of Computing in Higher Education	24
Interactive Learning Environments	24
Journal of Educational Learning Research	23

The number of citations generally kept pace with the number of articles during 2001 – 2020 (Figure 4). During this period, Web of Science data revealed that 853 articles matching this study's criteria were published and indexed, and were cited 21,347 times. 20,464 of those were without self-citations. On average, each item was cited 25.03 times (Figure 4). From 2013 to 2019, the growth rate of publications and citations was roughly equal, although citations were slightly higher than the number of publications (Figure 4). It should be noted that this data is derived from only the Web of Science, and only for the journals selected for this study. Additionally, the number of citations reflects those citations that occurred in each specific year shown in Figure 4, rather than a cumulative number.

Figure 4

Number of ID Articles with Number of Citations in Journals Selected for the Study, 2001 - 2020



Note. *Web of Science* (2021).

Research Question 1.4

Which countries' authors were most frequently cited from 2001 to 2020?

Based on findings of other bibliometric studies, the hypothesis was that the United States would have been cited most frequently, followed by Australia and Turkey. Authors were ranked by number of citations to their articles indexed in the Web of Science (2021), and their geographic areas were identified.

As hypothesized, authors in the United States were by far most frequently cited. However, contrary to expectations, neither Turkey nor Australia was among the countries

with the highest number of citations. The United States was followed by the Netherlands, Taiwan, and Germany. Australia and Turkey followed next (Table 5).

Table 5

Number of ID Articles Ranked by Country in Journals Selected for the Study, 2001-2020

Country	#Articles	Country	#Articles	Country	#Articles
United States	422	New Zealand	6	Oman	2
Netherlands	85	Chile	5	Philippines	2
Taiwan	67	Saudi Arabia	5	Portugal	2
Germany	46	Singapore	5	Russia	2
Australia	40	South Africa	5	Slovenia	2
Turkey	36	Estonia	4	Bangladesh	1
Canada	35	Israel	4	Columbia	1
England	28	Japan	4	Costa Rica	1
People's Republic of China	27	Scotland	4	Croatia	1
South Korea	24	United Arab Emirates	4	Ecuador	1
Spain	22	Algeria	3	Egypt	1
Belgium	18	Denmark	3	Ethiopia	1
Malaysia	16	Ireland	3	Ghana	1
Greece	13	Italy	3	India	1
Norway	11	Pakistan	3	Lebanon	1
Switzerland	11	Poland	3	Peru	1
Finland	9	Serbia	3	Romania	1
Cyprus	8	Sweden	3	Tunisia	1
France	7	Austria	2	Vietnam	1
Mexico	7	Brazil	2		
Indonesia	6	Iran	2		

Note. Web of Science (2021).

General Research Question 2

What relationships among authors, academic publications, and references may be identified through citation analysis?

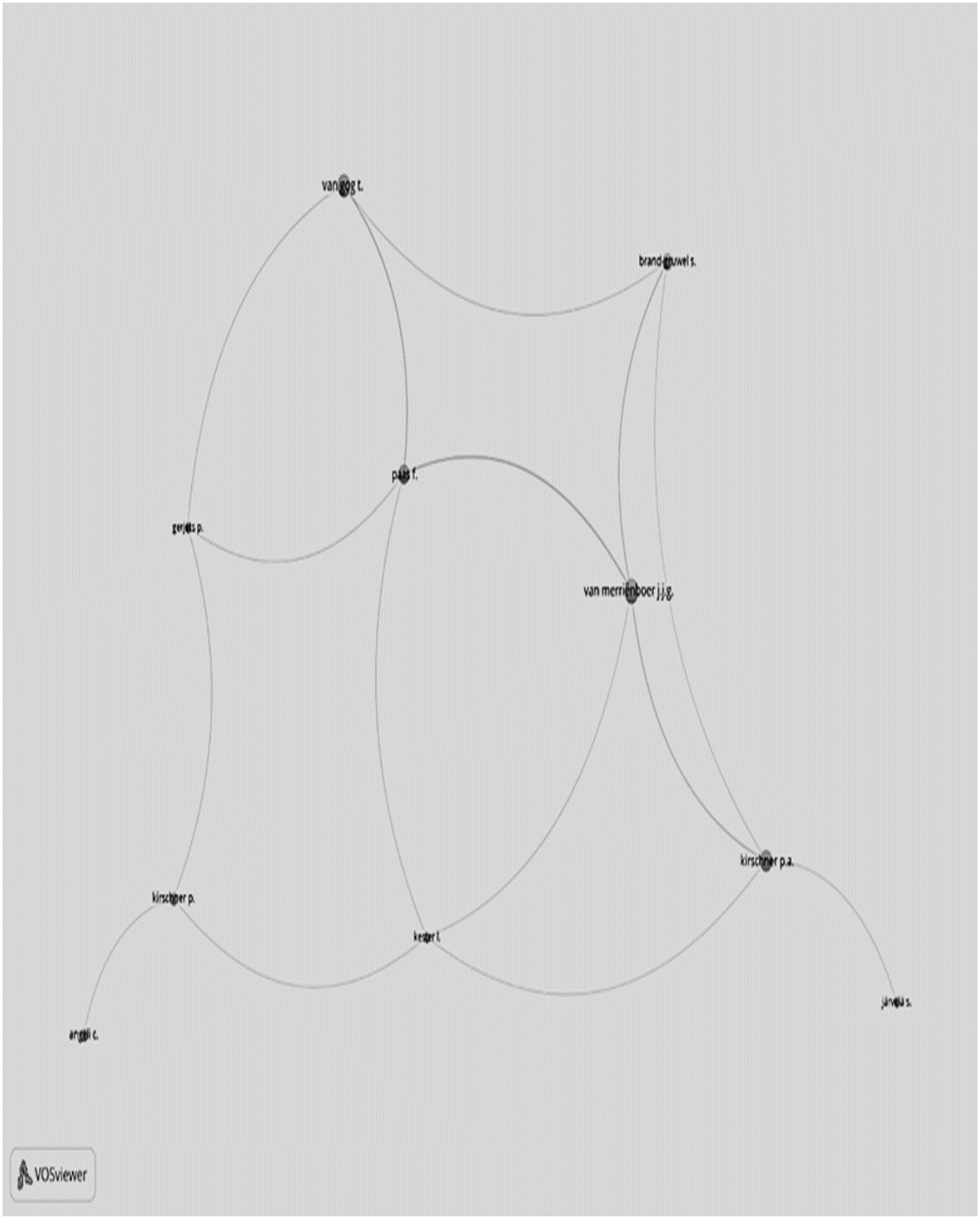
Research Question 2.1

Do authors tend to repeatedly cite the same authors?

Based on the literature review, it was expected that authors would repeatedly cite the same authors. This expectation was supported (Figure 5). Tracing the connections between authors' names reveals that citations by one author to another are repeatedly connected. Fewer unique connections were apparent.

Figure 5

Network of Citation Connections between Authors in Journals Selected for the Study, 2001-2020



Research Question 2.2

Which journals received the greatest number of citations?

It was expected that the most influential and prominent authors prefer to submit articles to the most prominent journals and as a result those authors and journals would receive the most citations. Therefore, the most highly cited journals were anticipated to be *British Journal of Educational Technology*, *Computers & Education*, *Educational Technology Research & Development*, and *TechTrends*

These expectations were partially supported by the data. Each journal that was expected to be highly cited was among the top 10, but not in the rank order anticipated *Computers & Education* was ranked first, and *Educational Technology Research and Development* was second. *British Journal of Educational Technology* ranked seventh, followed by *TechTrends* in eighth rank. The full list of the top 50 cited journals is shown in Appendix D.

Research Question 2.3

Do co-citations and bibliographic couplings occur frequently in ID research articles?

Expectations. I believed network analysis would show a high number of occurrences of co-citation and bibliographic coupling. As defined in Chapter 1, co-citation occurs when two documents are cited together by other documents. Bibliographic coupling exists when two works cite a third work. The expectations of frequent occurrences of co-citation and bibliographic coupling were not supported by the data. Network analysis shows that a core group of authors appears to be responsible for practically all instances

of co-citation (Figure 6) and bibliographic coupling (Figure 7) among the ID articles selected for this study.

Figure 6

Network of Co-citations between Articles Selected for the Study, 2001-2020

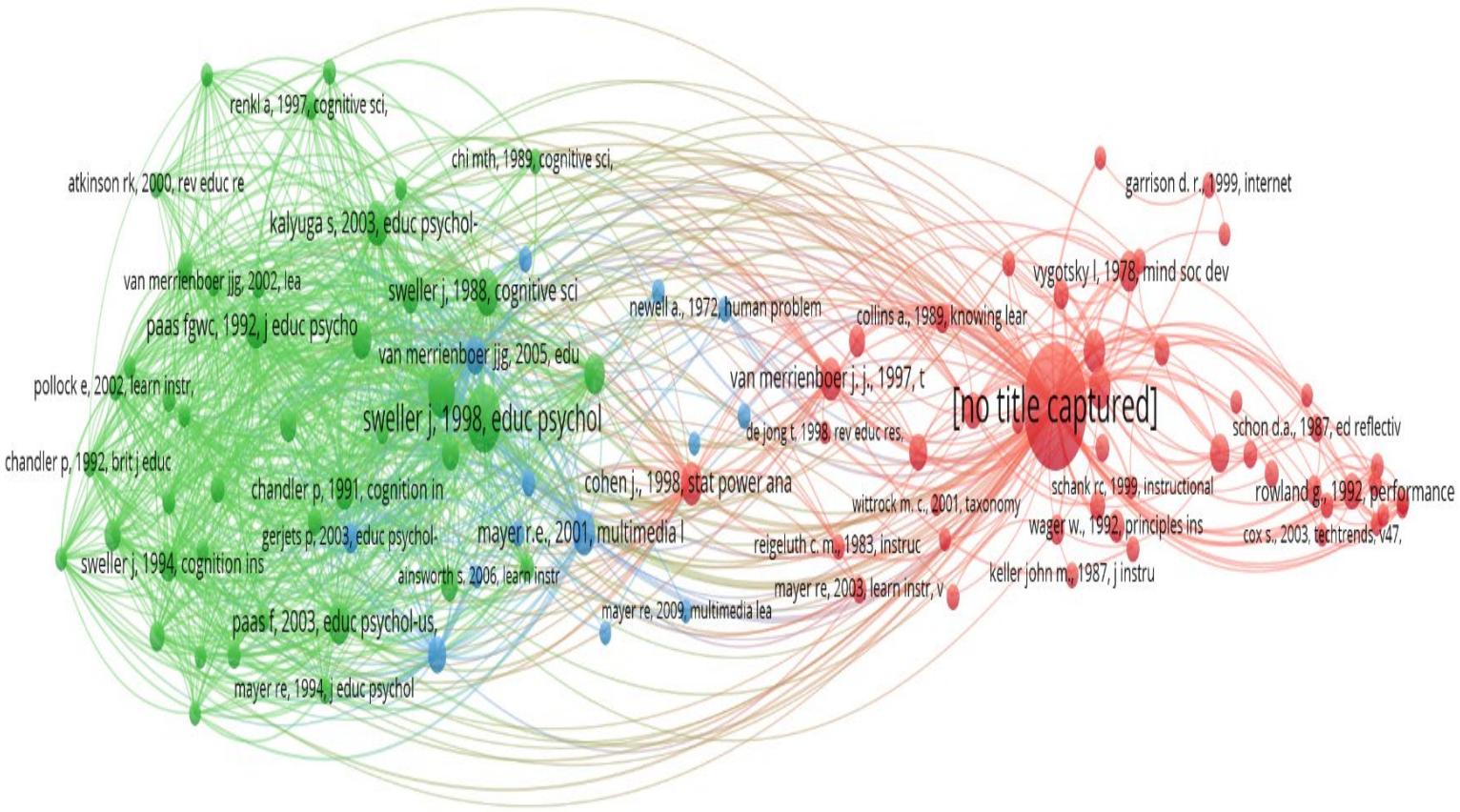
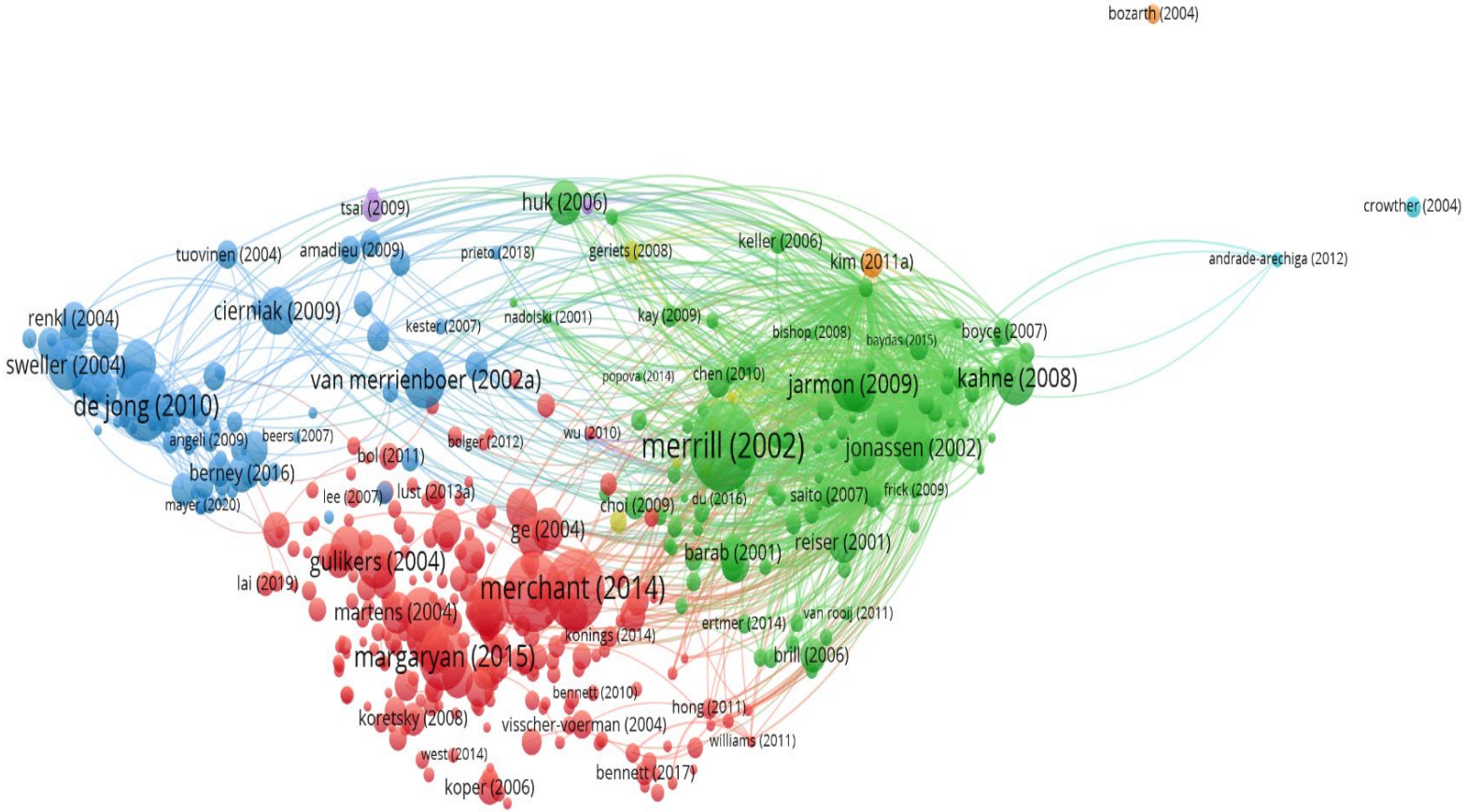


Figure 7

Network of Bibliographic Coupling in Journals Selected for the Study, 2001-2020



General Research Question 3

What structure(s) of the ID field may be identified through network analysis and mapping?

Research Question 3.1

Does bibliometric analysis show any connections between authors?

I expected that there is an increasing amount of collaboration and co-authorship in the ID field. I further expected that these connections are fairly stable, with co-authorship repeatedly occurring among the same authors and within the same countries.

A graphic network which illustrates collaboration and co-authorship are depicted in a network graphic of the publication relationship among authors (Figure 8). Numerous instances of co-authorship are evident between individual authors who are often in the same country, but few instances of multi-national collaboration or co-authorship are reflected in Appendix G. However, when co-authorship is viewed through network analysis of collaboration between countries (Figure 9), a more informative picture of multinational co-authorship emerges. Nine clusters of co-authorship are evident. A different color represents each cluster. The predominant country in each cluster, based on number of articles, are the United States, the Netherlands, Taiwan, Turkey, Australia, Canada, the United Kingdom, South Korea, and Italy. The size of a node indicates the number of articles published by that country's authors. The relative distance between nodes reflects the number of instances of co-authorship between countries. The relative thickness, or weight, of the links represents the strength of co-authorship between countries. For example, Austria has co-authored articles with the United Kingdom, Finland, and the Netherlands.

Figure 8

Network of Co-authorship of Articles Selected for the Study, 2001-2020

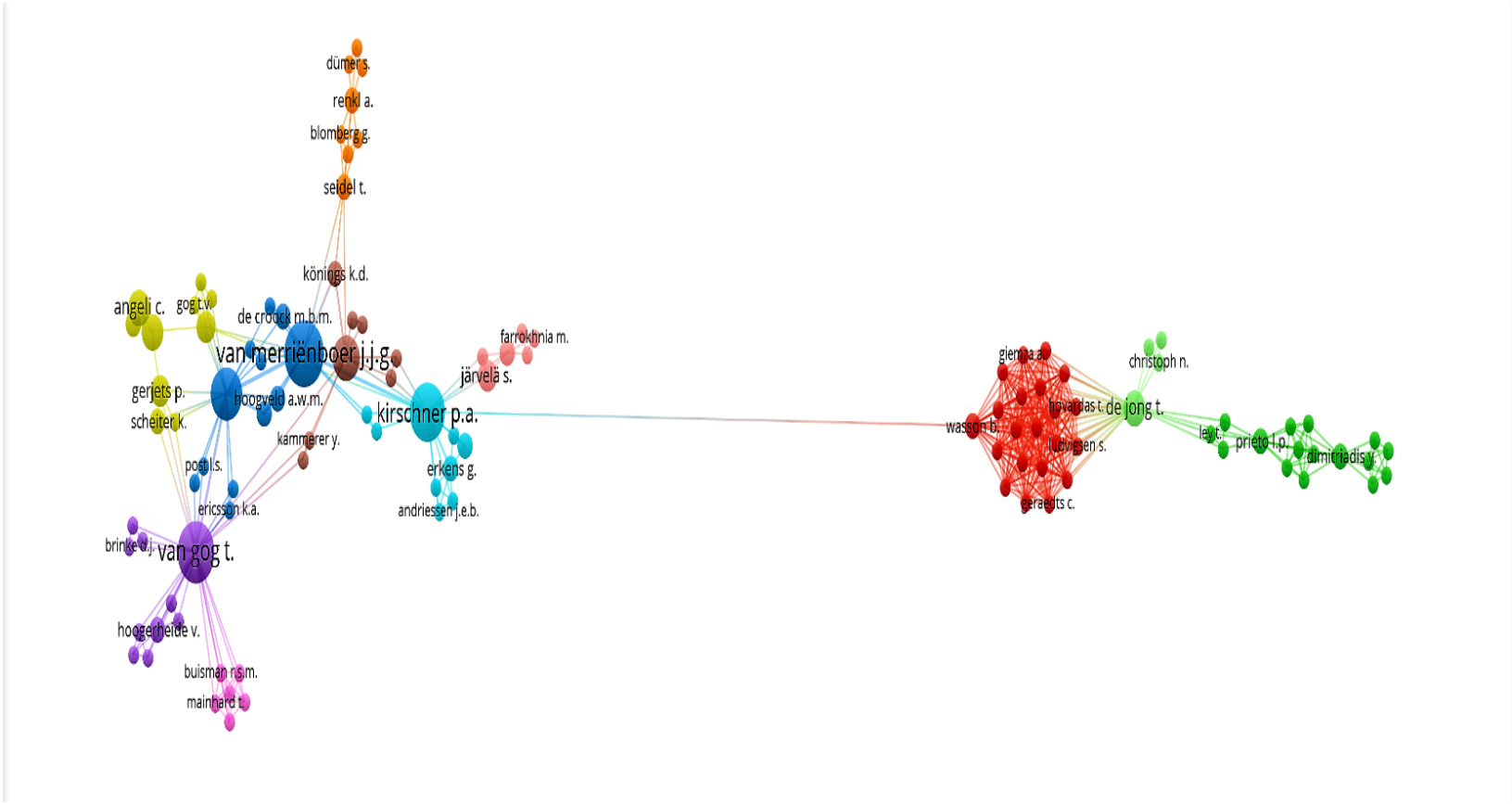
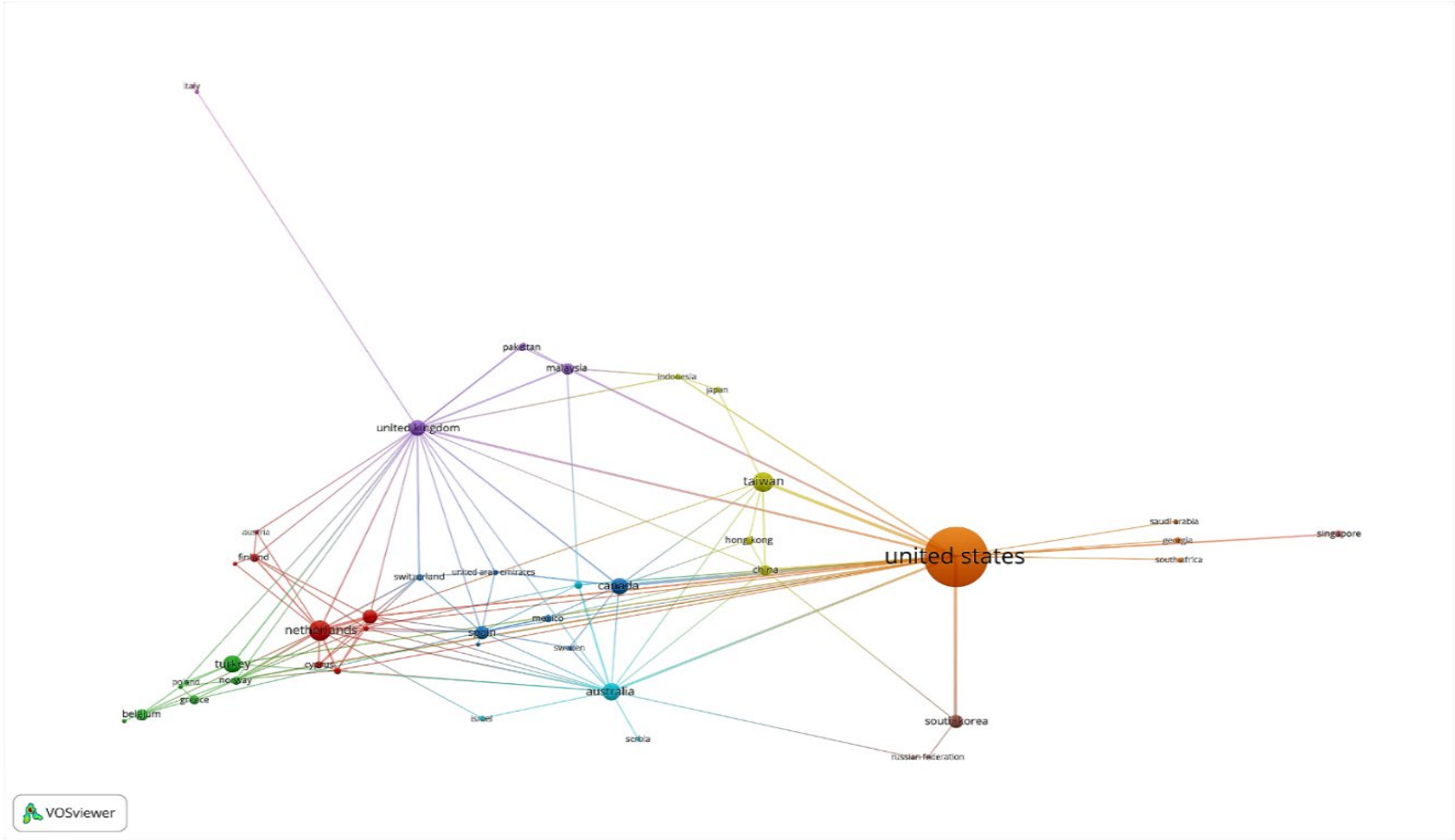


Figure 9

Authorship by Country of ID Articles in Journals Selected for the Study, 2001 - 2020



General Research Question 4

How have the trends in ID topics changed from 2001 to 2020?

Research Question 4.1

What topics were most often published about in 2001, and in 2020?

The hypothesis was that the range of keywords would be broader in 2001 than in 2020. For 2001, expected frequent keywords were cognitivism, constructivism, technology, Internet, ADDIE, objectives, and learning. These keywords were expected based on the researcher's reading of ID articles. It was expected that the most frequent keywords in 2020 would include online learning/E-learning, distance learning, social media, social presence, technology, and complex learning. These keywords were anticipated due to changes in how schools delivered instruction due to the COVID pandemic. In 2001, frequent keywords were various forms of cognitive or cognitivism (cognitive apprenticeship, cognitive load, cognitive maps, cognitivism) (Appendix E). These keywords occurred far less frequently in articles published by 2020. Keywords containing the word, learning, also declined in frequency from 2001 to 2020. These terms included electronic learning, learning by design, learning community, learning environments, learning objects, learning orientations, learning outcomes, learning theories, personalized learning, and social and cognitive processes in learning (Appendix E).

In 2020, frequent keywords not often noted in 2001 include authentic learning, game-based learning, higher education, human performance, mixed methods, mobile technology, learning, and devices, MOOCs, motivation, and multimedia design principles (Appendix E).

General Research Question 5

Are any differences in coverage and accuracy evidenced between the WoS, Scopus, and GS databases?

Research Question 5.1

Are WoS, Scopus, and GS similar in terms of accuracy and coverage?

Based on the review of the literature, the expectation for this study was that GS would exceed WoS and Scopus in spelling and punctuation errors, but also in the number of pertinent articles retrieved in the study's bibliometric searches.

Compared to Scopus and Web of Science, Google Scholar was found to be much less precise in searching and retrieving articles. GS's search parameters were also limited. For example, a search for a specific word or term can be carried out only in the title or in the entire document, including references. This results in retrieval of numerous irrelevant articles In contrast, Scopus and Web of Science can perform a keyword search in title, abstract, or author-supplied keywords. Additionally, a search in Google Scholar cannot be limited to articles only, so it additionally retrieves documents from books, dissertations and theses, as well as journal articles. In other words, Google Scholar searches are broad and unfocused, in contrast to the flexibility provided in Scopus and Web of Science to limit search areas.

Data used to determine most prolific authors were provided from the analysis of the WoS and differs somewhat from the counts provided by Scopus. The findings differ greatly from GS. This indicates differences in accuracy among the three databases.
I also examined author counts in the Scopus database to see if results were consistent with those reported by Web of Science. The databases were analyzed separately in order

to determine if they differed in accuracy and coverage. Several differences were noted. Article counts from Scopus identified Tracey as the most prolific author, with 11 articles and ranking first. Kirschner, ranking second, was credited with 10 articles. Elen and Ertmer had 9 articles each, similar to Web of Science's report. Paas was shown with 8, van Gog with 7, and van Merriënboer with 5.

To determine coverage the three databases were compared in terms of the number of relevant articles retrieved (Appendix F). For 2001 – 2020, Scopus indexed 973 ID articles from the journals selected for this study. WoS indexed 853 articles for the same period. In contrast, GS indexed 8069 articles (Appendix F).

The three databases in this study differ in their journal coverage. Of the approximately 160 journals selected for inclusion in this study (Appendix C) Scopus indexes 63 journals, and WoS indexes 65. Google Scholar far exceeds the other two databases in terms of journal coverage, with 102 journals (Appendix G).

As described under General Research Question 5, Google Scholar searches are less precise and focused that those conducted with Scopus or Web of Science.

General Research Question 6

What differences will be identified between findings in the study in comparison to the impact factors published in the Journal Impact Report?

Research Question 6.1

How will the citation numbers found in this study compare to the published Journal Impact Factors?

Expectations. Journal Impact Factors were expected to be higher and more accurate than the journal citation numbers found in this study.

Because Elsevier produces both the Web of Science database and the Journal Impact Factors, I obtained citation numbers from Scopus. Bibliometric data for 60 journals were examined to compare the number of citations according to Scopus and the Journal Impact Factor (calculated by Elsevier and accessed via the WoS database). Of these 60 titles, the Journal Impact Factor was not posted, or had not been established, for 26 journals, resulting in 34 journals for the comparison. The number of articles retrieved ranged from 2 to 138, and the number of articles cited ranged from 1 to 134. *Educational Technology Research and* Development ranked highest in both number of articles (138) and number of articles cited (138). *TechTrends* was the second highest in both categories, 104 and 91. JIF values ranged from 0.771 (*Journal of Baltic Science Education*) to 8.538 (*Computers and Education)* (Appendix K). *Computers and Education* had 4400 citations to articles retrieved for this study, closely followed by 4398 for *Educational Technology Research and Development*. JIF values were 8.538 for *Computers and Education* and 3.565 for *Educational Technology Research and Development*.

Chapter Summary

Chapter IV gave an overview of the study, provided the results from analyses for the research questions and hypotheses, and described the study's research findings. Details of the results from data analyses based on the six Research Questions and each corresponding hypothesis were presented.

Chapter V discusses the research findings by research question. It also explores recommendations and implications of the findings. Finally, limitations are identified, and recommendations for future research are offered.

CHAPTER V

DISCUSSION

This chapter begins with a discussion of the major findings. It is followed by limitations of the study and ends with recommendations for future research.

Discussion of Findings

The main themes during the 20 years covered by the study tend to reflect the interests, innovations, and problems in the instructional design field at any given time. For example, in the past year, numerous articles having the keywords e-learning, remote learning, motivation, or engagement were published as schools transitioned from face-to-face classes to distance learning. However, this may be an anomaly due to the pandemic. In the top tier of keywords (200 or more occurrences), after instructional design, the keywords technology and educational technology ranked second in number, followed by E-learning/elearning/online learning. Different technological tools have been the main themes during the 20 years covered by the study, as new hardware and software have become available. These were among the most frequent themes in the reviewed literature. In the second tier of keywords (40 to 150 occurrences), a broad variety of ID-related themes appear. These include problem-solving, higher education, cognitive load, motivation, collaborative learning, learning environments, and cognitivism.

The most prolific authors were van Merriënboer (21 articles), Paas (20), Kirschner (13), van Gog (13), Elen (9), Ertmer (7), Renkl (5), and Sweller (3). These data were provided from the WoS analysis. Paas is the only author who ranked high on the lists of both number of citations and number of articles. The most cited authors tended not to be the most prolific authors. A notable example of this was the highest cited author, David Merrill. He is identified as author of only three articles that match the criteria for this study, but he is credited with 904 citations. Most of these citations are to one article, "First Principles of Instruction."

The journals which published the most ID articles were *Educational Technology Research and Development* and *Computers in Education*. The journals which were cited the highest number of times were also *Educational Technology Research and Development* and *Computers in Education*. The most prolific journals and most cited journals were the same, which differs from the pattern of most prolific and most cited authors..

Authors in 61 countries published articles matching this study's criteria. The United States far exceeded any other country by number of articles published, with 422. This was followed by the Netherlands (85), Taiwan (67), Germany (46), and Australia (40).

Relationships among authors, academic publications, and references may be identified through citation analysis. The citation analyses showed that a core group of authors frequently cite the same authors repeatedly. This finding was not surprising, assuming that authors' research interests often focus on a specific topic or limited group of topics. Also found were co-citation, or two documents being cited together by other

documents, as well as bibliographic coupling, which is two works citing a third work. These are common occurrences among a core group of authors in ID research articles.

The bibliometric analysis showed connections between authors. Review of authorship and network analysis indicates that co-authorship among the same group of authors occurs repeatedly. Network mapping (Figure 5) shows the United States as the most predominant country in co-authorship, with numerous links to other countries. The Netherlands is the second strongest, followed by Australia.

The ID topic trends changed from 2001 to 2020. In 2001, it appears that topics focused on the mechanics of instructional design and by 2020, the focus shifted toward technology and instructional delivery systems. Fewer keywords were frequently cited in 2020 than in 2001.

The three databases of Web of Science, Scopus, and Google Scholar had differences in coverage and accuracy for the journals selected for this study. There was a vast difference in coverage, with Google Scholar including 102 journals, compared to 65 for WoS and 63 for Scopus. Google Scholar also contained more errors in author names and punctuation than the other two databases. Further, Google Scholar retrieved duplicate articles and others not relevant to the search terms more often than the other two databases. Web of Science and Scopus both were found to contain some inaccurate information, but not on the same scale as Google Scholar. Overall, the most frequent errors related to author names, for example, Tamara van Gog's name listed alternately as van Gog T and Gog T v.

The citation numbers per journal from Scopus found in this study were compared to the Journal Impact Factors published by the Web of Science. There appears to be no

correlation between the two measures. There is little basis for comparison, with the sample for this study being selected for a specific keyword over a 20-year period. In contrast, the Journal Impact Factor uses a more complex calculation than a simple citation count. It is calculated as the number of citations a journal receives in a year, divided by the number of articles published in the journal in the past two years (Elsevier, n.d.).

Limitations of the Study

There were limitations to the study. First was the potential for human error when working with large amounts of data. Although the greatest care was taken to ensure accuracy, errors in data collection and interpretation could have occurred due to the sheer volume of bibliometric data. The variations in data within the same database, for instance, with hyphenated names, may contribute to errors.

Another possible limitation is using keywords to categorize scholarly articles. Keywords, even those supplied by authors, may not accurately describe the topic of a publication. Different authors may select different keywords to describe similar articles. Additionally, without reading the article, it is not known if the keyword was written about in a positive or negative light.

The inherent nature of bibliometric and network analysis also created a limitation. Bibliometrics and network analysis are less standardized than experimental research and hypothesis testing, which leave the findings more subjective and open to interpretation.

Information provided by databases is continually changing. A citation count, for example, may be updated daily or even hour to hour. The counts and rankings stated in

this study occurred at a specific moment in time but may have changed markedly soon afterwards.

An unanticipated limitation of this study was my loss of access to the Scopus database during data analysis. The Marx Library's subscription was cancelled by the university without notice to students at large. Therefore, I could no longer access the raw data and analyses I had saved in my Scopus student account.

Recommendations for Future Research

Future research that applies bibliometric techniques to ID publications would be useful in creating a state of the field snapshot of the emerging trends and dominant individuals, journals, articles, and topics. Future research could also be targeted to specific topics in the field to gauge their impact. For example, adding an additional keyword representing a specific ID topic to the present study could be used to demonstrate how that topic is impacting the ID field in terms of journals, researchers, and institutions.

To minimize the possibility of human error, it is recommended to have a collaborator replicate the data collection, analyses, and interpretation of bibliometric studies.

Another potential area for research is to examine the bibliometric keywords of ID articles using both 'instructional design' and 'learning design.' Learning design is a term often used in Europe and may be considered as synonymous to instructional design. An additional option is to focus on a given university to generate a picture of scholarship and publishing in instructional design at that institution. This approach could expand to comparing several universities as far as their research activities in instructional design.

Conclusions

The purpose of this study was to determine the impact of specific scholars, institutions, and countries on the ID field, to investigate whether trends were evident through bibliometric data. Additionally, it was also to compare coverage and accuracy related to instructional design articles in three databases: Web of Science, Scopus, and Google Scholar. Results of the study indicated that scholarly publishing in ID is dynamic with new authors and keywords showing growth in the field. There was a steadily growing rate of publication and citation related to the field. At the same time, certain topics, authors, journals, and countries predominate in ID publication. As previously discussed flagship journals tend to publish articles which receive the most citations over time. Analysis of keywords reveals that the most published about topics change in response to shifting concerns, innovations, or focuses in instruction.

A major finding from comparing the coverage and accuracy of the three databases was that Google Scholar was still not in a position to supplant the scholarly citation databases of Web of Science and Scopus. This conclusion was based on using all three extensively for search and analysis. Web of Science and Scopus both provide features which facilitate and optimize scholarly inquiry and research. Google Scholar countered this with voluminous results which went far beyond the retrievals of the traditional scholarly databases. Additional time was required by the researcher to cull non-relevant and duplicated items from Google Scholar search results. Although Google Scholar is useful for a broad, unstructured approach to finding scholarly literature, it is not an alternative to Web of Science or Scopus. In contrast, Web of Science and Scopus offer accuracy, precision, and analytical tools for targeted scholarly research.

The results from the study indicate that ID is an active, dynamic field of scholarly research with a growing number of researchers anchored by several predominant journals and scholars.

Chapter Summary

Chapter V provided a summary of this study. The results of the study were also summarized and limitations of the study were presented.

The findings from this study add to the small but growing area of research using a bibliometric approach. Recommendations for further research were provided. This study has demonstrated that bibliometric research can provide advantageous information about the scholarly state of instructional design.

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APPENDICES

Appendix A

ID Journal List from Ritzhaupt et al. (2012) and

Perkins and Lowenthal (2016) Compilations

American Journal of Distance Education, The
Asian Journal on Education and Learning
Association of the Advancement of Computing in Education Journal
Australasian Journal of Educational Technology
British Journal of Educational Technology
Canadian Journal of Learning and Technology
Cognition and Instruction
Computers and Composition Online
Computers & Education
Computers in Education Journal
Computers in Human Behavior
Computers in the Schools
Contemporary Educational Psychology
Contemporary Issues in Technology and Teacher Education
Distance Education: An International Journal
Education and Information Technologies
Educational Media International
Educational Technology & Society
Educational Technology Research and Development
EDUCAUSE Quarterly Review
eLearning Papers
Electronic Journal for the Integration of Technology in Education
Electronic Journal of E-Learning
European Journal of Open and Distance Learning
First Monday

Human-Computer Interaction
IEEE Transactions on Learning Technologies
Informing Science: The International Journal of an Emerging Transdiscipline
Innovate: Journal of Online Education
Instructional Science
International Journal of Artificial Intelligence in Education
Interdisciplinary Journal of e-Learning and Learning Objects
International Journal of Designs for Learning
International Journal of Educational Research and Technology
International Journal of Instructional Media
International Journal of Instructional Technology and Distance Learning
International Journal on E-Learning
International Review of Research in Open and Distance Learning
Internet and Higher Education
Journal of Asynchronous Learning Networks
Journal of Computer Assisted Learning
Journal of Computer-Mediated Communication
Journal of Computing in Higher Education
Journal of Digital Learning in Teacher Education (formerly JCTE)
Journal of Distance Education
Journal of Educational Computing Research
Journal of Educational Multimedia and Hypermedia
Journal of Educational Technology and Society
Journal of Educational Technology Systems
Journal of Educators Online
Journal of Information Technology Education
Journal of Instruction Delivery Systems
Journal of Instructional Science and Technology
Journal of Interactive Instruction Development
Journal of Interactive Learning Research
Journal of Interactive Media in Education
Journal of Interactive Online Learning
Journal of Online Learning and Teaching
Journal of Research on Technology in Education
Journal of Technology and Teacher Education
Journal of Technology Education
Journal of Technology, Learning, and Assessment
Kairos

Learning, Media, and Technology
Memory and Cognition
Online Journal of Distance Learning Administration
Performance Improvement Journal
Performance Improvement Quarterly
Quarterly Review of Distance Education
Research in Learning Technology
TechTrends
THE Journal: Transforming Education through Technology
Turkish Journal of Educational Technology
Turkish Online Journal of Distance Education
Turkish Online Journal of Educational Technology

Appendix B

Comprehensive List of ID Journals for Bibliometric Study

AACE Journal: International Forum on Information Technology in Education
Academic Exchange Quarterly
ACM Journals
American Educational Research Journal (AERJ)
Assessment in Education: Principles, Policy and Practice
Australian Educational Researcher
American Journal of Distance Education, The
Asian Journal on Education and Learning
Asynchronous Learning Networks (ALN)
Australasian Journal of Educational Technology
Australian Journal of Educational Technology (AJET)
Behavior Research Methods, Instruments, and Computers
British Journal of Educational Technology (BJET)
CALICO Journal
Campus Technology
Canadian Journal of Distance Education (CADE)
Canadian Journal of Learning and Technology
Canadian Journal of Science, Mathematics & Technology Education
Chronicle of Higher Education
Closing the Gap
Cognition & Instruction
Computer Applications in Engineering Education
Computer Assisted Language Learning (UK)
Computer Science Education (UK)
Computers & Education
Computers & Composition: An International Journal for Teachers of Writing
Computers & the Humanities
Computers in Education Journal
Computers in Human Behavior
Computers in the Schools
Converge Magazine
Contemporary Educational Psychology
Contemporary Educational Technology
Contemporary Issues in Technology and Teacher Education (CITE)
Current Cites
Current Issues in Education
CyberPsychology & Behavior
Design & Technology Education: an International Journal (UK)
Digital Creativity
Distance Education

Education, Communication & Information (ECI)
Education & Computing
Education & Information Technologies
Education Week
e-Journal of Instructional Science and Technology (e-JIST) (Australia; merged with Australasian Journal of Educational Technology)
Educational Insights
Educational & Training Technology International
Educational Communication & Technology Now Educational Technology
eLearn Magazine
eLearning Papers
E-Learning
E-Learning Digest
Educational Media International
Educational Researcher
Educational Technology: The Magazine for Managers of Change in Education
Educational Technology Magazine
Educational Technology Research and Development (ETR&D)
Educational Technology Review
Educational Technology & Society (ETS)
Educause Review
Electronic Journal for the Integration of Technology in Education (EJITE)
Educational Technology & Society
Electronic Journal of eLearning (EJEL)
European Journal of Open and Distance Learning (EURODL)
Electronic Journal of Information Systems in Developing Countries
Exchanges – the Online Journal of Teaching and Learning in the California State University
First Monday
From Now On
Human-Computer Interactions
IEEE Transactions on Learning Technologies
Information Society
Information Technology, Learning, and Performance Journal
Informing Science: The International Journal of an Emerging Transdiscipline
Innovate Journal of Online Education
Innovations in Education and Teaching International
Instructional Science
Instructional Science: An International Journal of Learning and Cognition
Interactions
Interactive Educational Multimedia
Interactive Learning Environments
Interactive Multimedia Electronic Journal in Computer-enhanced Learning
Interdisciplinary Journal of e-Learning and Learning Objects

International Journal for the Scholarship of Teaching and Learning (IJ-SoTL)
International Journal of Artificial Intelligence in Education
International Journal of Computer-Supported Collaborative Learning
International Journal of Continuing Engineering Education and Life-Long Learning (IJCEELLL)
International Journal of Design for Learning (IJDL)
International Journal of Education and Development using ICT (IJEDICT)
International Journal of Educational Research and Technology
International Journal of Educational Technology (IJET)
International Journal of E-learning
International Journal of Instructional Media
International Journal of Instructional Technology & Distance Learning
International Journal of Lifelong Learning
International Journal of Technology and Design Education
International Journal on E-Learning (IJEL) – Corporate, Government, Healthcare, & Higher Education
International Journal of Instructional Media (IJIM)
International Review of Research in Open and Distance Learning (IRRODL)
Internet and Higher Education, The
Journal for Research on Technology in Education (JRTE)
Journal of Applied Instructional Design
Journal of Artificial and Societies and Social Simulations (JASS)
Journal of Asynchronous Learning Networks
Journal of Baltic Science Education
Journal of Computer Assisted Learning
Journal of Computer-Mediated Communication (JCMC)
Journal of Computing in Teacher Education
Journal of Computing in Higher Education (JCHE)
Journal of Digital Learning in Teacher Education (formerly JCTE)
Journal of Distance Education
Journal of Distance Learning Administration
Journal of Educational Computing Research
Journal of Educational Multimedia and Hypermedia
Journal of Educational Technology & Society
Journal of Educational Technology Systems
Journal of Educators Online (JEO)
Journal of Effective Teaching
Journal of Higher Education Policy and Management
Journal of Information Technology Education (JITE)
Journal of Information Technology for Teacher Education
Journal of Instruction Delivery Systems (JIDS)
Journal of Instructional Development (JID)
Journal of Instructional Science and Technology
Journal of Interactive Instruction Development

Journal of Interactive Media in Education (JIME)
Journal of Interactive Learning Research
Journal of Interactive Online Learning
Journal of Learning Design (JLD)
Journal of the Learning Sciences (18 month delay)
Journal of Online Learning and Teaching (JOLT)
Journal of Research on Technology in Education (JRTE)
Journal of Technology and Teacher Education
Journal of Technology Education
Journal of Technology, Learning and Assessment, The (JTLA)
Journal of Technology Studies
KAIROS
Learning and Leading with Technology
Learning, Media & Technology (formerly Journal of Educational Media)
Midwest Journal of Educational Communications and Technology (MJECT)
Multimedia Schools
Memory and Cognition
Online Journal of Distance Learning Administration
Open Learning: the journal of Open and Distance Learning
Performance Improvement Journal (PIJ)
Performance Improvement Quarterly
Quarterly Review of Distance Education
Research in Learning Technology (ALT-J)
Review of Educational Research (JSTOR)
Simulation and Gaming
Studies in Higher Education
Teaching and Learning
Technological Horizons in Education (T.H.E.)
Technology, Instruction, Cognition & Learning (TICL)
Technology and Learning
Technology, Pedagogy and Education
Technology Source, The
TECHNOS
TechTrends
THE Journal (Transforming Education through Technology)
Turkish Online Journal of Distance Education (TODL), The
Turkish Online Journal of Educational Technology

Appendix C

Most Highly Cited Authors of ID Articles in Journals Selected for the Study, 2001 - 2020

Author	Number of Citations
Merrill, D. M.	904
Dickey, M. D.	609
Brush, T. A.	578
De Jong, T.	563
Paas, F.	516
So, H.-J.	575
Park, Y.	393
Govindasamy, T.	376
Margaryan, A.	374
Bianco, M.	374
Littlejohn, A.	374

Appendix D

Number of Citations to ID Articles in Top 50 Cited Journals, 2001 – 2020

Rank	Journal	Number of Citations
1	Computers and Education	4500
2	Educational Technology Research and Development	4343
3	Instructional Science	1502
4	Computers in Human Behavior	1411
5	Education Technology and Society	1353
6	Internet and Higher Education	1175
7	British Journal of Educational Technology	768
8	TechTrends	557
9	Journal of Computing in Higher Education	490
10	Journal of Educational Computing Research	482
11	Computer Assisted Language Learning	390
12	Distance Education	370
13	Educational Media International	360
14	Performance Improvement Quarterly	343
15	Journal of Asynchronous Learning Networks	327
16	IEEE Transactions on Education	305
17	American Educational Research Journal	303
18	Interactive Learning Environments	289
19	Journal of Research on Technology in Education	267
20	Simulation and Gaming	245
21	Innovations in Education and Teaching International	238
22	Australasian Journal of Educational Technology	212
23	Journal of Interactive Online Learning	205
24	Educational Researcher	205
25	Education and Information Technologies	189
26	Turkish Online Journal of Educational Technology	186
27	Journal of Computer Assisted Learning	150
28	IEEE Transactions on Learning Technologies	140
29	Turkish Online Journal of Distance Education	119
30	Journal of the Learning Sciences	113
31	Computers in the Schools	107
32	Computer Science Education	90
33	Open Learning	86
34	Electronic Journal of e-Learning	82
35	Computers and Composition	73
36	IEEE Transactions of Professional Communication	69
37	Technology, Pedagogy and Education	68

Rank	Journal	Number of Citations
38	International Journal on E-Learning: Corporate, Government, Healthcare, and Higher Education	66
39	ACM Journal on Educational Resources in Computing	61
40	International Journal of Technology and Design Education	56
41	Contemporary Educational Psychology	54
42	Journal of Interactive Learning Research	48
43	Studies in Higher Education	45
44	International Journal of Continuing Engineering Education and Life-Long Learning	45
45	International Journal of Computer-Supported Collaborative Learning	45
46	Cognition and Instruction	44
47	Informing Science	42
48	American Journal of Distance Education	42
49	IEEE Access	40
50	Computer Applications in Engineering Education	25

Appendix E

Most Frequent Keywords in ID Articles Indexed By Scopus, 2001 and 2020

Keyword	2001	2020
Activity	X	
Adaptive learning, adaptive technology	X	X
Agricultural education	X	
APRIC	X	
Authentic learning		X
Case-based teaching, case-based learning	X	X
Cognition	X	
Co-design	X	
Cognitive apprenticeship	X	
Cognitive load, cognitive load theory		X
Cognitive maps	X	
Cognitive tools	X	
Cognitivism	X	
Collaboration	X	
Collaborative learning	X	X
Commercial education	X	
Complex teaching-learning environment	X	
Constructivism	X	
Content analysis	X	X
Continuing education	X	
Design space	X	
Didactics	X	
Distance education, distance learning	X	X
Educational robotics	X	
Educational technology	X	X
Effects of web-infused environments	X	
e-learning	X	X
Electronic learning	X	
Entity	X	
Epistemology	X	
Evaluation	X	
Explanatory interaction	X	
Exploration task	X	
Expository interaction	X	
Formative assessment, formative feedback	X	X
Game-based learning		X
Graduate degrees, graduate education, graduate learning	X	X
Grounded theory	X	
Higher education		X

Keyword	2001	2020
In-depth processing	X	
Information technology	X	
Instructional component	X	
Instructional design, instructional design and development, instructional systems design	X	X
Instructional design for educational technology	X	
Instructional design model	X	
Instructional design science	X	
Instructional methods	X	
Instructional technology	X	X
Instructional theory	X	X
Integration	X	
Interaction with online tools	X	
Interactive learning environments	X	X
Internet	X	
K-12, K-12 education		X
Knowledge component	X	
Knowledge object	X	
Learning	X	X
Learning by design	X	
Learning community	X	
Learning content management system, Blackboard, Canvas	X	X
Learning environments	X	
Learning objects	X	
Learning orientations	X	
Learning outcomes	X	
Learning theories	X	
Mental models	X	
Mixed-methods		X
Mobile technology, mobile learning, mobile devices		X
Model theory	X	
MOOCs		X
Motivation		X
Multimedia-based learning	X	
Multimedia design principles		X
Multimedia research		X
Multisectoral partnerships	X	
Navigation	X	
Nonverbal interaction	X	
Objectivism	X	
Online course development, design	X	X
Online education	X	X

Keyword	2001	2020
Online learning	X	X
Online programs	X	X
Participation	X	X
Pedagogy	X	
Perceptions of web-infused learning and instruction	X	
Personalized learning	X	
Philosophy of education	X	
Problem based learning	X	X
Procedural interaction	X	
Process	X	
Professional development, teacher training, Quality Matters	X	X
Property	X	
Psychology of learning	X	
Quality of content	X	
Shifts in pedagogical learning approaches	X	
Situatedness	X	
Social and cognitive processes in learning	X	
Social interaction	X	
Statistical model	X	
Structural learning theory	X	
Student and faculty support	X	
Student learning environments	X	X
Student-centered	X	
Summative assessment	X	
Task analysis	X	
Technological tools	X	
Verbal interaction	X	
Virtual enterprise	X	
Web-based instruction	X	
Web-based programs	X	

Appendix F

Number of ID Articles in Selected Instructional Design Journals Indexed per Year by Three Databases, 2001-2020

Year	Scopus	Web of Science	Google Scholar
2020	93	115	542
2019	80	95	434
2018	62	70	472
2017	68	67	425
2016	71	48	440
2015	53	39	428
2014	54	35	393
2013	60	37	433
2012	58	48	468
2011	50	44	423
2010	50	42	446
2009	51	51	429
2008	44	27	433
2007	31	27	412
2006	32	31	391
2005	20	12	410
2004	27	23	327
2003	21	9	292
2002	19	12	222
2001	29	21	249
Total	973	853	8069

Appendix G

Journals Indexed by Three Databases

Journal Title	Web of Science	Scopus	Google Scholar
AACE Journal: International Forum on Information Technology in Education			
Academic Exchange Quarterly			X
ACM Journal on Educational Resources in Computing	X	X	X
ACM Transactions on Computing Education	X	X	X
American Educational Research Journal (AERJ)	X	X	X
American Journal of Distance Education	X	X	X
Asian Journal on Education and Learning			
Asynchronous Learning Networks (ALN)			
Assessment in Education: Principles, Policy and Practice	X	X	X
Australasian Journal of Educational Technology	X	X	X
Australian Educational Researcher			
Australian Journal of Educational Technology (AJET)			
Behavior Research Methods, Instruments, and Computers			X
British Journal of Educational Technology (BJET)	X	X	X
CALICO Journal	X	X	X
Campus Technology			X
Canadian Journal of Distance Education (CADE)			
Canadian Journal of Learning and Technology	X	X	X
Canadian Journal of Science, Mathematics & Technology Education	X	X	X
Chronicle of Higher Education			X
Closing the Gap			
Cognition & Instruction	X	X	X
Computer Applications in Engineering Education	X	X	X
Computer Assisted Language Learning (UK)	X	X	X
Computer Science Education (UK)	X	X	X
Computers & Composition: An International Journal for Teachers of Writing	X	X	X
Computers & Education	X	X	X
Computers & the Humanities			X
Computers in Education Journal	X	X	X
Computers in Human Behavior	X	X	X
Computers in the Schools	X	X	X
Converge Magazine			

Journal Title	Web of Science	Scopus	Google Scholar
Contemporary Educational Psychology	X	X	X
Contemporary Educational Technology	X	X	X
Contemporary Issues in Technology and Teacher Education (CITE)			X
Current Issues in Education	X	X	X
Current Cites			
CyberPsychology & Behavior			
Design & Technology Education: an International Journal (UK)			X
Digital Creativity			X
Distance Education	X	X	X
Education & Computing			
Education & Information Technologies	X	X	X
Education, Communication, & Information (ECI)			
Education Week			X
Educational & Training Technology International			
Educational Communication & Technology Now Educational Technology			
Educational Insights			
Educational Media International	X	X	X
Educational Researcher	X	X	X
Educational Technology: The Magazine for Managers of Change in Education			
Educational Technology & Society (ETS)	X	X	X
Educational Technology Magazine			
Educational Technology Research and Development (ETR&D)	X	X	X
Educational Technology Review			X
Educause Review			X
e-Journal of Instructional Science and Technology (e-JIST) (Australia; merged with Australasian Journal of Educational Technology)			X
eLearn Magazine			X
E-Learning			
E-Learning Digest			
eLearning Papers			X
Electronic Journal for the Integration of Technology in Education (EJITE)			
Electronic Journal of eLearning (EJEL)	X	X	
Electronic Journal of Information Systems in Developing Countries			

Journal Title	Web of Science	Scopus	Google Scholar
European Journal of Open and Distance Learning (EURODL)			X
Exchanges – the Online Journal of Teaching and Learning in the California State University			
First Monday	X	X	X
From Now On			
Human-Computer Interactions			
IEEE Access	X	X	X
IEEE Transactions on Education	X	X	X
IEEE Transactions on Learning Technologies	X	X	X
IEEE Transactions on Professional Communication	X		X
Information Society			
Information Technology, Learning, and Performance Journal			X
Informing Science: The International Journal of an Emerging Transdiscipline	X	X	
Innovate Journal of Online Education			X
Innovations in Education and Teaching International	X	X	X
Instructional Science	X	X	
Instructional Science: An International Journal of Learning and Cognition			
Interactions			X
Interactive Educational Multimedia			X
Interactive Learning Environments	X	X	
Interactive Multimedia Electronic Journal in Computer-enhanced Learning			
Interdisciplinary Journal of e-Learning and Learning Objects			X
International Journal for the Scholarship of Teaching and Learning (IJ-SoTL)			
International Journal of Artificial Intelligence in Education	X	X	X
International Journal of Computer-Supported Collaborative Learning	X	X	
International Journal of Continuing Engineering Education and Life-Long Learning (IJCEELLL)	X	X	
International Journal of Design for Learning (IJDL)			
International Journal of Education and Development using ICT (IJEDICT)			X
International Journal of Educational Research and Technology			X

Journal Title	Web of Science	Scopus	Google Scholar
International Journal of Educational Technology (IJET)			X
International Journal of E-learning			
International Journal of Instructional Media			X
International Journal of Instructional Technology & Distance Learning			X
International Journal of Lifelong Learning			
International Journal of Technology and Design Education	X	X	X
International Journal on E-Learning (IJEL) – Corporate, Government, Healthcare, & Higher Education	X	X	
International Review of Research in Open and Distance Learning (IRRODL)			
Internet and Higher Education, The	X	X	X
Journal for Research on Technology in Education (JRTE)			
Journal of Applied Instructional Design			X
Journal of Artificial Societies and Social Simulation (JASS)			
Journal of Asynchronous Learning Networks	X	X	X
Journal of Baltic Science Education	X	X	X
Journal of Computer Assisted Learning	X	X	X
Journal of Computer-Mediated Communication (JCMC)			
Journal of Computing in Higher Education (JCHE)	X	X	
Journal of Computing in Teacher Education			X
Journal of Digital Learning in Teacher Education (formerly JCTE)	X	X	X
Journal of Distance Education			
Journal of Distance Learning Administration			
Journal of Educational Computing Research	X	X	
Journal of Educational Multimedia and Hypermedia	X	X	X
Journal of Educational Technology & Society			
Journal of Educational Technology Systems			X
Journal of Educators Online (JEO)	X	X	X
Journal of Effective Teaching			
Journal of Higher Education Policy and Management			X
Journal of Information Technology Education (JITE)			X
Journal of Information Technology for Teacher Education			
Journal of Instruction Delivery Systems (JIDS)			X
Journal of Instructional Development (JID)			
Journal of Instructional Science and Technology			

Journal Title	Web of Science	Scopus	Google Scholar
Journal of Interactive Instruction Development			X
Journal of Interactive Learning Research	X	X	X
Journal of Interactive Media in Education (JIME)			X
Journal of Interactive Online Learning			X
Journal of Learning Design (JLD)			X
Journal of Online Learning and Teaching (JOLT)			X
Journal of Research on Technology in Education (JRTE)	X	X	
Journal of Technology and Teacher Education			X
Journal of Technology Education			X
Journal of Technology, Learning and Assessment, The (JTLA)			X
Journal of Technology Studies			X
Journal of the Learning Sciences (18 month delay)	X	X	X
KAIROS			
Learning and Leading with Technology			X
Learning, Media & Technology (formerly Journal of Educational Media)			X
Memory and Cognition			
Midwest Journal of Educational Communications and Technology (MJECT)			
Multimedia Schools			X
Online Journal of Distance Learning Administration			X
Open Learning: the Journal of Open and Distance Learning	X	X	X
Performance Improvement Journal (PIJ)			
Performance Improvement Quarterly	X	X	X
Quarterly Review of Distance Education			X
Research in Learning Technology (ALT-J)	X	X	X
Review of Educational Research (JSTOR)	X		X
Simulation and Gaming	X	X	X
Studies in Higher Education	X	X	X
Teaching and Learning			
Technological Horizons in Education (T.H.E.)			
Technology and Learning			
Technology, Instruction, Cognition & Learning (TICL)			X
Technology, Pedagogy and Education	X	X	X
Technology Source, The			X
TECHNOS			
TechTrends	X	X	X
THE Journal (Transforming Education through Technology)			

Journal Title	Web of Science	Scopus	Google Scholar
Turkish Online Journal of Distance Education (TODL), The	X	X	X
Turkish Online Journal of Educational Technology	X	X	X

Appendix H

Comparison Of Scopus Citation Numbers and Journal Impact Factors

Journal Name	# of Articles Retrieved and Cited	Number Range of Citations per Article	Total # of Citations to Articles in Study	Journal Impact Factor (JIF)
Computers in Education Journal	2/0	0-0	0	NF
Canadian Journal of Learning and Technology	2/1	0-1	1	NF
Journal of Educational Multimedia and Hypermedia	2/1	0-1	1	NF
First Monday	2/2	1-9	2	NF
Contemporary Educational Technology	3/2	0-2	4	NF
Journal of Baltic Science Education	2/1	0-4	4	1.182
ACM Transactions on Computing Education	2/2	1-7	8	1.526
Assessment in Education: Principles, Policy & Practice	1/1	9-9	9	2.656
International Journal of Continuing Engineering Education and Life-Long Learning	7/2	0-7	11	NF
CALICO Journal	3/2	0-10	13	No JIF
Computer Applications in Engineering Education	6/5	0-9	25	1.532
IEEE Access	5/4	0-27	40	3.367
American Journal of Distance Education	3/2	0-38	42	No Jif
Informing Science	3/3	13-15	42	NF
Cognition and Instruction	4/4	3-27	44	3.216
International Journal of Computer-Supported Collaborative Learning	3/3	10-23	45	NF
Studies in Higher Education	4/4	1-35	45	4.379
Journal of Interactive Learning Research	7/6	0-20	48	NF
Contemporary Educational Psychology	5/5	2-19	54	4.277

Journal Name	# of Articles Retrieved and Cited	Number Range of Citations per Article	Total # of Citations to Articles in Study	Journal Impact Factor (JIF)
International Journal of Technology and Design Education	8/6	0-32	56	2.177
Computer Science Education	6/6	2-26	58	No JIF
ACM Journal on Educational Research in Computing	3/3	1-55	61	NF
International Journal on E-Learning: Corporate, Government, Healthcare, and Higher Education	19/16	0-14	66	NF
Technology, Pedagogy and Education	7/6	0-34	68	NF
IEEE Transactions on Professional Communication	6/6	1-28	69	0.771
Computers and Composition	4/4	8-40	73	NF
Electronic Journal of e-Learning	8/7	0-37	82	No JIF
Open Learning	7/7	4-47	86	No JIF
Computers in the Schools	14/12	0-32	107	No JIF
Journal of the Learning Sciences	2/2	8-105	113	5.171
Turkish Online Journal of Distance Education	24/21	0-23	119	No JIF
IEEE Transactions on Learning Technologies	7/7	5-67	140	3.720
Journal of Computer Assisted Learning	10/10	2-39	150	3.862
Turkish Online Journal of Educational Technology	28/18	0-41	186	0.956
Education and Information Technologies	17/17	2-41	189	2.917
Educational Researcher	3/3	8-175	205	4.854
Journal of Interactive Online Learning	10/9	0-83	205	NF
Innovations in Education and Teaching International	9/8	0-136	238	1.949
Interactive Learning Environments	22/19	0-62	289	3.928
American Educational Research Journal	3/3	3-271	303	4.811

Journal Name	# of Articles Retrieved and Cited	Number Range of Citations per Article	Total # of Citations to Articles in Study	Journal Impact Factor (JIF)
IEEE Transactions on Education	15/13	0-123	307	2.116
Journal of Asynchronous Learning Networks	16/16	2-99	327	NF
Performance Improvement Quarterly	21/20	0-177	343	No JIF
Educational Media International	16/13	0-133	360	No JIF
Distance Education	11/11	5-113	370	2.952
Computer-Assisted Language Learning	8/8	6-290	390	4.789
Simulation and Gaming	9/9	5-239	484	No JIF
Journal of Computing in Higher Education	35/35	1-167	490	2.627
Journal of Educational Computing Research	23/21	0-124	492	3.088
Journal of Research on Technology in Education	13/13	2-297	564	2.043
TechTrends	104/91	0-51	587	NF
Internet and Higher Education	19/19	6-376	1178	7.178
Education, Technology & Society	54/53	0-149	1353	3.522
British Journal of Educational Technology	48/47	0-161	1354	4.929
Computers in Human Behavior	42/42	1-334	1411	6.829
Educational Technology Research and Development	138/134	0-832	4398	3.565
Computers and Education	60/59	0-604	4400	8.538

BIOGRAPHICAL SKETCH

Rebecca L. Wheeler was born in Bessemer, Alabama, 15 miles from where her Hosmer ancestors settled in the early 1800s. Earning a full Honors Scholarship, she attended the University of Alabama in Birmingham. She graduated with a BA in Psychology in 1979. She was elected to Phi Kappa Phi and awarded the Most Outstanding Psychology Student Award in that same year.

Her career was in federal civil service, starting with the Social Security Administration in Birmingham, Alabama, and later as a Human Resources Specialist in the Civilian Personnel Office at Keesler Air Force Base in Biloxi, Mississippi. While working at the Air Force, she earned certification as a Master Naturalist and volunteered extensively in environmental education and community projects.

Later, she pursued a graduate degree in Library and Information Science at the University of Southern Mississippi, graduating in 2006, and began managing the Lucedale-George County Public Library in 2007. In 2014, she began her doctoral studies in Instructional Design and Development.at the University of South Alabama and earned her PhD in 2022. She continues to live in Lucedale, Mississippi, and enjoys spending time with family, friends, and pets as well as environmental projects and genealogy research.