

Educational supplementary bibliographic relationships from FRBR point of view: A Canadian Case Study¹

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Abstract

Purpose: One of the aims of library catalogs is to clearly represent the relationships existing between two or more bibliographic entities, enabling users to make sense of these relationships. Educational bibliographic relationships are the relationships between an educational work, such as a textbook, and its related works. The main interest of this study was to understand the nature of the supplementary work-to-work bibliographic relationships among educational works and the constitution of educational bibliographic families in the Canadian context using AMICUS (the Canadian national catalog). A thorough understanding of educational bibliographic relationships is required for understanding the Functional Requirements for Bibliographic Records (FRBR) supplementary relationships.

Design/methodology/approach: We studied the extent and size of educational bibliographic relationships in the bibliographic universe found in the AMICUS catalog. This is an empirical investigation into the nature and extent of educational work-to-work bibliographic relationships by examining title of works, notes and added entries in bibliographic records. The study was carried out between September 1st 2010 and December 22nd 2010 and examines educational bibliographic relationships between Canadian 2009 publications in each class of the Dewey Decimal Classification (DDC). In other words, this study poses two main questions: What is the structure of educational supplementary bibliographic relationships in Canadian publications? Do significant differences exist across the ten DDC classes?

Findings: Results show that 595 works of the 2009 bibliographic records in the AMICUS catalog contain an educational supplementary bibliographic relationship. Of the Canadian publications with an educational supplementary work-to-work bibliographic relationship that were studied, the rates of educational bibliographic relationships were relatively high in the fields of Science (27%), Technology (22%), Social Sciences (20%), and Language (19%). The results of this study suggest a set of guidelines for the establishment and maintenance of educational bibliographic relationships.

Originality/value: This is the first research to examine the educational bibliographic relationships, as supplementary relationships.

Keywords: Functional Requirements for Bibliographic, Records (FRBR), Bibliographic relationships, Cataloging, Canada

1. Introduction

Library catalogs should enable unambiguous display of bibliographic relationships among entities and should make it possible for users to easily find and collocate related works by offering clear pathways to records representing these works. Navigation should be possible among all the related entities.

¹ It is a sequel to a previous paper entitled “Analysis of work-to-work bibliographic relationships through FRBR: A Canadian perspective”, *Cataloging & Classification Quarterly*, 50 (5–7), 2012.

In our study an “educational bibliographic relationship” is defined as the relationship that exists between an educational work (such as textbooks, teachers' guides, student manuals and study guides) and another work that is based on this first work, in which the original has been explained, described or supplemented in some way. An educational bibliographic family is a set of related works that are derived from a common progenitor. One of the main characteristics of educational works is that there often exists a complex network of bibliographic relationships among them. Bibliographic control of educational bibliographic families can greatly enhance the user's ability to navigate this bibliographic universe, especially in academic and school libraries. Users of these libraries should have the possibility to identify for instance all teachers' guides and student manuals available for a given work and to infer associations with other related works. Anecdotal evidence supports the notion that users are generally interested in any guide of a work.

Educational bibliographic relationships can exist between dependent or independent works written by the same or different author(s). Educational bibliographic relationships may be accompanying or supplementary relationships. “An accompanying relationship is that between an entity and another that accompanies it or is intended to accompany it” (see FRAD 5.3.6 in IFLA 2009a, 41). FRBR tables 5.1 (p. 65), 5.4 (p. 72), and 5.6 (p. 75) include two relationship types that are normally accompanying: “supplement and complement” (IFLA, 2009b; Maxwell, 2008, 97). Educational bibliographic relationships are supplementary when one entity is predominant and the other is subordinate, such as the relationship between a work and its teacher's guide or solutions manual. For example, Arthur Campbell et al. developed a solutions manual to *Contract Theory* written by Patrick Bolton, Mathias Dewatripont, and Arthur Campbell. Although the main work and the solutions manual are physically separated, they share an accompanying relationship because Campbell's work was intended to accompany Bolton's (see Fig. 1).

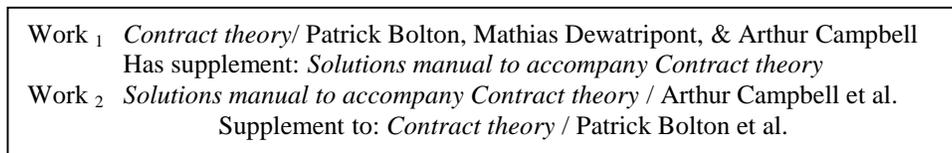


Fig. 1. Independent supplementary relationship between two works.

Educational bibliographic relationships are supplementary relationships, any of which may be dependent (published with the primary work) or independent (published separately from the primary work). Educational works, especially academic textbooks, frequently exhibit supplementary relationships. Educational works with accompanying relationships to each other may also have a whole-part or part-to-part relationship with an aggregate work they are a part of. Accompanying educational materials often consist of an expansion of themes and concepts presented in the accompanied work, and thus may be considered as amplified of the work.

In many cases of educational bibliographic relationships, the two works are independent of each other. Entities with supplementary accompanying relationships can also be dependent. A teacher's guide published with a primary text is an example of such a relationship. Other examples are solutions manuals or answer keys. The primary text and the “answer key” can be considered separate works. Educational entities have an accompanying relationship, and in most cases, “guides” and “manuals” are considered supplementary to the primary text, though not always. However, a work that has an educational bibliographic relationship with another work

can be classified as a new work under a conventional bibliographical relationship (e.g., teacher's guide and study guide).

It is possible for an entity to have many related supplementary relationships. McMurry's Organic Chemistry has had several study guides and student solutions manuals over the years. All these have a supplementary relationship with McMurry's Organic Chemistry, and they have a shared characteristic relationship to each other (the shared characteristic being their relationship to the original work McMurry's Organic Chemistry). In an entity-relationship database, their relationship would be expressed by linkages to what they have in common, the text of McMurry's Organic Chemistry. The data recorded to reflect work-to-work relationships should enable the user to find all works that relate to a particular work.

2. Research questions

Knowledge about the prevalence, size, subject-orientedness, country and language dependency, and other features of bibliographic relationships and families is essential for the proper design of information retrieval systems. The main objective of this study is to investigate the frequency and extent of the educational bibliographic relationships in the Canadian context. The present study examines educational bibliographic families within the context of the FRBR work-to-work relationships.

This study seeks to address the following questions:

1. How frequently do educational supplementary bibliographic relationships appear?
2. What proportion of works in the AMICUS catalog are members of educational bibliographic families (i.e., exhibit educational supplementary bibliographic relationships)?
3. Can bibliographic characteristics (e.g., discipline and sub-discipline, i.e., DDC class and subclass) be associated with the existence or the extent of educational bibliographic relationships?

3. Materials and methods

To complete the present study, a two-fold experiment was conducted which consisted of (1) retrieving a set of records representing works that are part of a work-to-work relationship, and (2) analyzing these records to identify those that are supplementary relationship involving educational material, and looking at their distribution over DDC main classes and subclasses.

At the early stages of the study, we obtained the bibliographic information of works published in Canada and cataloged by the Library and Archives Canada in 2009. We tried to extract the bibliographic relationships' data automatically via MarcEdit; but we found that the number of works with bibliographic relationships were very limited and did not represent the total number of bibliographic relationships. So we also decided to collect data via keyword searching. On the other hand, our primary analysis showed that in many cases, Canadian authors and publishers did not clearly represent the relationship of a work to the previous works by adding the attributes of the supplement, complement, succeeding work, adaptation, transformation, ..., to the title page or copyright page of the publication. For example, teacher's guide, student manual, answer key, workbook, and so forth. Thus, catalogers were not necessarily able to identify and designate all the bibliographic relationships between two works at the CIP (cataloguing in publication) stage. Therefore, one of the first steps taken in this study was creating a list of English and French keywords representing educational work-to-work bibliographic relationships, mentioned in table 5.1 of the FRBR Final Report. The data were collected using the "advanced search" interface of

the AMICUS catalog (the Canadian national catalog, www.nlc-bnc.ca/amicus/) using the “any keywords” search key (i.e., any word in the record) in bibliographic records. Searches were limited to monographs published in Canada in 2009. The searches were carried out during the last four months of 2010.

An exhaustive list of English and French keywords was constructed to perform the searches.² Searches were conducted with the singular and plural forms of the selected keywords, with and without apostrophe s ('s). Keyword searching was used based upon a simple assumption that there are key terms representing bibliographic relationships in bibliographic records which may be helpful in identifying and understanding relationships between different bibliographic entities (Arastoopoor & Fattahi, 2010). These terms are generally scattered all over the bibliographic records, especially in titles, statements of responsibility, and note fields.

The retrieved bibliographic records were used as the data for the analysis of educational bibliographic relationships. Each retrieved bibliographic record was manually analyzed with the intention to ascertain that the work described was part of an educational bibliographic relationship or relationships. In some cases, searching in WorldCat, Amazon and Google Books was required to determine whether two or more works were related or not; only in a few cases, was it not clear whether all members of a bibliographic family had been found. If there were two or more expressions of the same work (in print, electronic, sound recording, video recording, etc.), only one of them was counted in the total number of works. If evidence of a work-level relationship was found, the record was retained in the final list.

Finally, we measured the distribution of educational bibliographic relationships among Dewey (DDC) classes. The output of this process resulted in several tables with columns for the number of bibliographic relationships and the DDC classes. For records missing DDC numbers (MARC field 082), we conducted retrospective searches and used the number assigned to previous editions if available. Otherwise, other reliable sources, such as national bibliographies, were used.

As mentioned in Arsenault and Noruzi (2012), the total number of monographs published in Canada during 2009 was 28,633 and the total number of records containing a work-to-work bibliographic relationship was 1261. Out of these, 742 works had a supplementary relationship. A close examination of supplementary materials reveals that 595 (80%) were teacher's guides and students' manuals. In other words, 47% of all Canadian works with a bibliographic relationship (nearly half of them) were educational material, which is the main reason why we focused on the educational supplementary relationships in the present study.

² **English keywords:** activity book, administrator guide, answer book, answer key, educator guide, educator's companion, e-solutions manual, exercise manual, instructor guide, instructor manual, instructor's resource, lab manual, laboratory manual, literature book, parent guide, solutions manual, student book, student CD, student data CD, student ebook, student e-book, student guide, student laboratory, student manual, student solutions manual, student version, student workbook, students book, students guide, study guide, study version, teacher book, teacher edition, teacher guide, teacher kit, teacher manual, teacher resource, teacher resource guide, teacher resource manual, teacher toolkit, teacher workbook, teachers book, teacher's companion, teacher's edition, teacher's guide, teacher's resource, teacher's toolkit, teaching book, teaching guide, workbook

French keywords: cahier d'exercice, cahier d'activités, cahier d'apprentissage, cahier de l'élève, cahier de savoirs, cahier des exercices, cahier d'exercices, cahier exercice, corrigé des exercices, fichier de l'élève, guide d'enseignement, guide d'apprentissage, guide de l'étudiant, guide des étudiants, guide pédagogique, kit d'enseignement, livre d'activités, livre d'exercices, manuel d'enseignement, manuel d'apprentissage, manuel de lecture, manuel de l'élève, manuel de l'étudiant, manuel des solutions, manuel du maître, recueil d'activités, recueil de solutions, solutionnaire.

4. Results

Table 1 shows the distribution of educational work-to-work bibliographic relationships in each main class of the DDC. Table 1 clearly shows that the majority of educational bibliographic relationships are in the Science (27%), Technology (22%), Social Sciences (20%), and Language (19%) classes. By themselves, these four classes contain almost 90% of educational all the bibliographic relationships found in AMICUS.

Table 1. Distribution of educational bibliographic relationships in each class of DDC.

| DDC Class | Number of bibliographic relationships | Percent |
|-----------------------------|---------------------------------------|---------|
| 000 Generalities | 6 | 1 |
| 100 Philosophy & psychology | 13 | 2 |
| 200 Religion | 19 | 3 |
| 300 Social Sciences | 119 | 20 |
| 400 Language | 111 | 19 |
| 500 Science | 162 | 27 |
| 600 Technology | 131 | 22 |
| 700 Arts & recreation | 5 | 1 |
| 800 Literature | 15 | 3 |
| 900 History & geography | 14 | 2 |
| Total | 595 | 100 |

While Table 1 shows the distribution of educational bibliographic relationships in the main classes of the DDC, Table 2 presents a finer distribution within DDC subclasses. Table 2 shows that educational work-to-work relationships are unevenly distributed among DDC classes and subclasses. Mathematics (83), Education (65), French and related languages (64), Management and public relations (51), English & Old English languages (44), and Engineering (42) are the disciplines with the highest number of educational bibliographic relationships. In the Language class, French and English, the official languages of Canada, account for 97% of educational bibliographic relationships, proof to the fact that bibliographic relationship in the Language class is unsurprisingly country-dependent.

Table 2. Distribution of educational bibliographic relationships in each subclass of DDC.

| DDC Class | Subclass | Number of bibliographic relationships | Percent |
|------------------|---|---------------------------------------|---------|
| 000 Generalities | 000 Computer science, knowledge & systems | 4 | 67 |
| | 010 Bibliographies | 1 | 16.5 |
| | 020 Library & information sciences | - | - |
| | 030 Encyclopedias & books of facts | - | - |
| | 040 [Unassigned] | - | - |
| | 050 Magazines, journals & serials | - | - |
| | 060 Associations, organizations & museums | - | - |
| | 070 News media, journalism & publishing | 1 | 16.5 |
| | 080 Quotations | - | - |
| | 090 Manuscripts & rare books | - | - |

| | | | |
|-----------------------------|--|----|-----|
| 100 Philosophy & psychology | 100 Philosophy | - | - |
| | 110 Metaphysics | - | - |
| | 120 Epistemology | - | - |
| | 130 Parapsychology & occultism | - | - |
| | 140 Philosophical schools of thought | - | - |
| | 150 Psychology | 12 | 92 |
| | 160 Logic | - | - |
| | 170 Ethics | 1 | 8 |
| | 180 Ancient, medieval & eastern philosophy | - | - |
| | 190 Modern western philosophy | - | - |
| 200 Religion | 200 Religion | 16 | 84 |
| | 210 Philosophy & theory of religion | - | - |
| | 220 The Bible | 1 | 5.5 |
| | 230 Christianity & Christian theology | 1 | 5.5 |
| | 240 Christian practice & observance | - | - |
| | 250 Christian pastoral practice & religious orders | - | - |
| | 260 Christian organization, social work & worship | 1 | 5 |
| | 270 History of Christianity | - | - |
| | 280 Christian denominations | - | - |
| | 290 Other religions | - | - |
| 300 Social Sciences | 300 Social sciences, sociology & anthropology | 9 | 7 |
| | 310 Statistics | - | - |
| | 320 Political science | 7 | 6 |
| | 330 Economics | 26 | 22 |
| | 340 Law | 2 | 2 |
| | 350 Public administration & military science | - | - |
| | 360 Social problems & social services | 10 | 8 |
| | 370 Education | 65 | 55 |
| | 380 Commerce, communications & transportation | - | - |
| | 390 Customs, etiquette & folklore | - | - |
| 400 Language | 400 Language | - | - |
| | 410 Linguistics | 1 | 1 |
| | 420 English & Old English languages | 44 | 39 |
| | 430 German & related languages | - | - |
| | 440 French & related languages | 64 | 58 |
| | 450 Italian, Romanian & related languages | - | - |
| | 460 Spanish & Portuguese languages | 2 | 2 |
| | 470 Latin & Italic languages | - | - |
| | 480 Classical & modern Greek languages | - | - |
| | 490 Other languages | - | - |
| 500 Science | 500 Science | 44 | 27 |
| | 510 Mathematics | 83 | 51 |
| | 520 Astronomy | 1 | 1 |
| | 530 Physics | 15 | 9 |
| | 540 Chemistry | 15 | 9 |
| | 550 Earth sciences & geology | - | - |
| | 560 Fossils & prehistoric life | - | - |
| | 570 Life sciences; biology | 3 | 2 |
| | 580 Plants (Botany) | 1 | 1 |
| | 590 Animals (Zoology) | - | - |

| | | | |
|-------------------------|---|-----|----|
| 600 Technology | 600 Technology | - | - |
| | 610 Medicine & health | 24 | 18 |
| | 620 Engineering | 42 | 32 |
| | 630 Agriculture | 4 | 3 |
| | 640 Home & family management | 4 | 3 |
| | 650 Management & public relations | 51 | 39 |
| | 660 Chemical engineering | - | - |
| | 670 Manufacturing | - | - |
| | 680 Manufacture for specific uses | - | - |
| | 690 Building & construction | 6 | 5 |
| 700 Arts & recreation | 700 Arts | 2 | 40 |
| | 710 Landscaping & area planning | - | - |
| | 720 Architecture | - | - |
| | 730 Sculpture, ceramics & metalwork | - | - |
| | 740 Drawing & decorative arts | - | - |
| | 750 Painting | - | - |
| | 760 Graphic arts | - | - |
| | 770 Photography & computer art | - | - |
| | 780 Music | - | - |
| | 790 Sports, games & entertainment | 3 | 60 |
| 800 Literature | 800 Literature, rhetoric & criticism | 8 | 53 |
| | 810 American literature in English | 2 | 13 |
| | 820 English & Old English literatures | 4 | 27 |
| | 830 German & related literatures | - | - |
| | 840 French & related literatures | 1 | 7 |
| | 850 Italian, Romanian & related literatures | - | - |
| | 860 Spanish & Portuguese literatures | - | - |
| | 870 Latin & Italic literatures | - | - |
| | 880 Classical & modern Greek literatures | - | - |
| | 890 Other literatures | - | - |
| 900 History & geography | 900 History | 5 | 36 |
| | 910 Geography & travel | 5 | 36 |
| | 920 Biography & genealogy | - | - |
| | 930 History of ancient world (to ca. 499) | - | - |
| | 940 History of Europe | 1 | 7 |
| | 950 History of Asia | - | - |
| | 960 History of Africa | - | - |
| | 970 History of North America | 3 | 21 |
| | 980 History of South America | - | - |
| | 990 History of other areas | - | - |
| Total | | 595 | |

* All unlisted subclasses had a score of zero.

5. Cataloging rules and educational bibliographic relationships

From the cataloging rules point of view, the educational bibliographic relationships can be studied from two perspectives: static AACR2/MARC records and relational RDA records, implementation scenario 1 (JSC, 2006).

5.1. Static records

In the catalog, we assemble the members of an educational bibliographic family through the use of coordinated and standardized access points (Smiraglia & Leazer, 1999). From what we

have observed, educational bibliographic relationships are often not explicit in current AACR2 records. Asserting the existence of an educational bibliographic relationship usually requires manual comparison of bibliographic records. Catalog records for works with educational bibliographic relationships may be linked by a related-work added entry (author + work title), a note, or both. Educational bibliographic relationships are also sometimes not recorded at all and the relationship is simply implicit solely from the title and statement of responsibility area.

The note by itself, although sometimes explicit, is clearly not a useful linking device in an automated environment. General notes such as “supplement to ...” “has supplement: ...” do not lend themselves to automated linking between records. While notes can be fairly successful at showing the educational bibliographic relationship between members of educational family, the nature of the educational bibliographic relationship is not unfortunately coded in specific MARC fields.

Supplementary relationships can be recorded in MARC fields 770 and 772 and the nature of the relationship can be made specific through the use of subfield ‡i. However, previous research revealed that the fields of the “linking entry” bloc (fields 76X–78X) are seldom used, albeit for serial titles, “[t]hus even if these fields can be mapped to the FRBR model, they will be of little use when actually creating a ‘FRBR-ized’ catalog” (Mayernik, 2010, 47–48).

The added entry technique works fairly well, although the nature of the relationship is not necessarily always specified. This controlled form may have a “relationship designator” or code added to specify the type of the relationship. Without a relationship designator or code it is impossible for an information system and sometimes difficult for a human to determine the type of the supplementary relationship. But whether the records actually contain such supplementary linkages will depend on the cataloging policies and practices in effect when such record sets come into existence (Maxwell, 2008, 110–11).

5.2. Relational structure

In an FRBR record set, educational bibliographic relationships that appear at the work level would be shown by linkage of records for supplementary works, for example with a “supplement to ...” and “has supplement: ...” relationship link between the related works. Educational bibliographic relationships are not dealt with extensively in FRBR but a few explicitly educational bibliographic relationships are found in the FRBR relationship tables. Certain instances of the relationship type “supplement” (in table 5.1 of FRBR Final Report) have an educational bibliographic relationship with the related work, teacher's guide for example.

An FRBR record set could have educational supplementary linkages at the work level that would allow users to move from one work to another. Such supplementary linkage might also allow meaningful catalog displays such as the following when, for example, a user searches for McMurry's Organic Chemistry (Fig. 2):

As the relational structure relies more heavily on relationships between records, it is important that the nature of these relationships be recorded precisely and explicitly with appropriate machine codes (relationship designators) and additional textual information for the end user if required.

A relationship designator is a designator that indicates the nature of the relationship. RDA 24.5.1.3 instructs catalogers to “Record an appropriate term from the list in appendix J (RDA, 2008) to indicate explicitly the nature of the relationship.” RDA has two relationship designators, which can be used to represent educational bibliographic relationships in bibliographic records: ‘guide’ and ‘supplement’. RDA appendix J defines ‘guide’ as “A work that guides a user through

the use of the predominant work, using notes, learning and study aids, exercises, problems, questions and answers, instructor or student materials, etc.” According to this definition, catalogers should use ‘guide’ as the main relationship designator to represent educational bibliographic relationships.

Furthermore, RDA instructs catalogers to “Record information elaborating on or clarifying the relationship between a work represented by a preferred access point and a related work, as necessary” (RDA 25.2.1.3): “Record an appropriate term [...] to indicate explicitly the nature of the relationship.” Use of MARC fields 770 and 772 along with subfield ‡4 for relationship coding and subfield ‡i textual explanation of the nature of the relationship should therefore be encouraged in the creation of new RDA records.

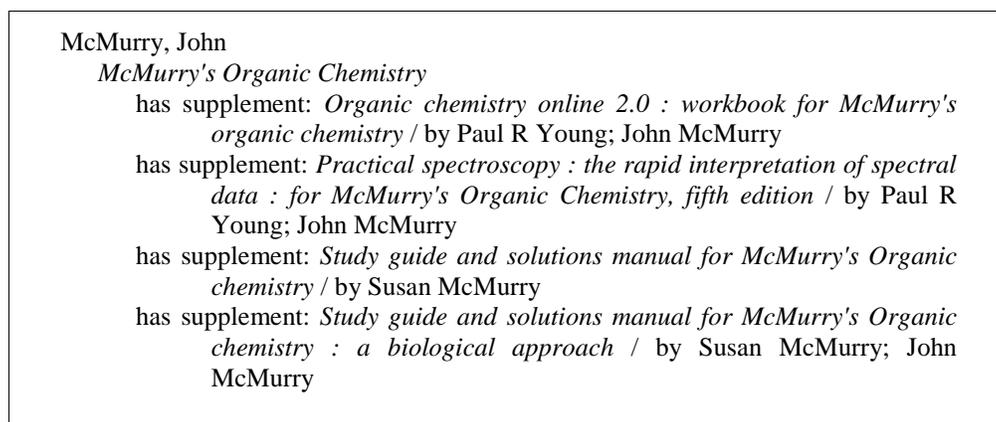


Fig. 2. A relational display between works.

6. Discussion

As observed in the current study educational materials are often part of the work to work bibliographic relationships. In a relational model it is important to link related works with explicit codes and notes to clarify the nature of these relationships.

The supplementary relationship is worthy of special attention. Supplementary educational materials in the present study were mostly identified as teacher's guides and educational works. It appears to be either the author's or publisher's decision whether or not to include these materials within the work, as an accompanying material, or have them appear separately, as a supplementary material. Therefore, it is difficult to predict the appearance of this type of supplementary material. In fact, educational bibliographic relationships include “intra- and inter-textual relationships” (Green, 2001, 8).

Educational bibliographic relationships are accompanying relationships in some way. Tillett (1987) concluded that 39.44% of accompanying relationships are in the sciences. The results of this study confirm the findings of Tillett (1987) that the sciences have a high rate of educational bibliographic relationships. It is worth noting that a teacher's guide may be a supplement, an accompanying work and be a sequel and share characteristics. Tillett's taxonomy of bibliographic relationships' categories is not mutually exclusive and exhaustive.

Smiraglia and Leazer (1999) have shown that textbooks appear to be more derivative in nature with 60% of the works exhibiting derivation. While the authors concluded that “discipline, form, and genre all fail to demonstrate any influence on derivation of works,” the present study shows that educational bibliographic relationships are influenced discipline. For example, technical books in Science and Technology seem to require more teachers' guide than

in the Arts. It is also shown that the distribution of bibliographic relationships in some DDC classes, Language for example, is country-dependent.

Academic textbooks may tend to have more educational supplementary relationships. However, this assumption is not yet supported by data and needs more research to confirm or disprove. The main problems of studies on bibliographic relationships are identifying citations for the related work and the lack of an automated mechanism to identify the type of relationship.

While this case study focused on work-to-work bibliographic relationships between Canadian educational publications, offering a somewhat unique and different perspective, a comparative analysis with other countries is needed to generalize the results from this study. However, like all case studies, the generalization of a case study is crucial for its usability.

7. Conclusion

This study has focused on educational bibliographic relationships, the association between two or more works, providing a framework and acting as a model for future studies. When comparing the total number of educational bibliographic relationships in each class of DDC, it was found that the Science, Technology, Social Sciences, and Language classes account for nearly 90% of educational bibliographic relationships which clearly shows that certain DDC classes are more prone than others to contain educational bibliographic relationships.

Cross-reference is needed for educational bibliographic relationships. A two-way cross-reference between bibliographic relationships is needed. For example, “supplement to” + “has supplement”, “guide to” + “has guide”, etc. Automatic linking of educational works based on bibliographic relationships would be particularly useful in academic library catalogs. We need to design information systems that would guide users in searching, identifying, and browsing educational works that are linked together by explicitly expressed relationships. The system must be able to link educational related works, to show how these works are intra and inter related explicitly, and how these are related to other similar works in bibliographic databases, especially in academic and school library catalogs in order to offer clear pathways for the discovery of bibliographic resources.

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