






# BookReach-UI: A Book-Curation Interface for School Librarians to Support Inquiry Learning

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**Abstract.** As a way of collaborating with teachers, school librarians select books that are useful for inquiry-based or exploratory learning classes. Although this method of teaching-material curation has gained importance as teachers aim to adopt more inquiry learning, it has not been well supported by existing tools, resources, and systems designed for librarians. In Asia, especially, the development of school librarianship is not well institutionalised either, and significant practical experience is required to select the books useful for given inquiry classes. To enable even less experienced school librarians to easily curate appropriate books, we developed a graphical user interface that directly shows the candidate books that are topically relevant to the inquiry-based class' subject, by making use of decimal classification classes assigned to books. This interface, BookReach-UI, naturally follows the standard workflow of teaching-material curation described in prior studies. We evaluated its usability by asking school librarians to curate books for mock inquiry classes via BookReach-UI. The results of this preliminary experiment showed substantially high levels of satisfaction and adoption.

**Keywords:** School library · Exploratory learning · Units of teaching · Book curation · Decimal classification system

## 1 Introduction

Because one of the major missions of school libraries is to collaborate with teachers [5], it is expected that school librarians can select or 'curate'<sup>1</sup> a set of books that would be useful for classes, especially those classes involving student-driven inquiries. Teachers worldwide are paying increasing attention to such

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<sup>1</sup> This paper simply refers to the term 'curation' as a creative activity of reorganising items for a certain use-case, generalised from the classical definition in museology.

*inquiry-based learning* [7, 8, 16], wherein “learners are motivated to find out about something that interests them by asking authentic questions, investigating multiple and diverse sources to find answers, making sense of the information to construct new understandings, drawing conclusions and forming opinions based on the evidence, and sharing their new understandings with others” [14, p. 51]. In response to this situation, the American Association of School Librarians declared that qualified school librarians should foster inquiry-based learning [1]. Curating books as teaching materials for inquiry-based learning, or *teaching-material curation*, has recently garnered greater importance in school librarianship.

Nonetheless, selecting appropriate books for inquiry-based learning classes can be difficult, especially if the school librarian is unfamiliar with the class subject in question. In Asian countries and regions, such as Singapore, Hong Kong, and Japan, the available human resources of professional school librarians are not sufficient given the larger number of students and professional training and development for school librarianship is less institutionalised by governments [9]. Because teaching-material curation requires expert knowledge and skills with practical experience [12], external support is required, especially for less-experienced school librarians.

School librarians often use Open Public Access Catalog (OPAC) systems for their work, ranging from managing the collections of their school libraries to teaching-material curation. OPAC systems in general, however, are designed for fine-grained search based on bibliographic fields to locate books on library shelves. With respect to teaching-material curation, school librarians need to translate the units of teaching (or curriculum units)<sup>2</sup> targeted in the given inquiry-based class into bibliographic field-based search queries, wherein the ‘units’ basically correspond to the goals or themes of the textbook chapters (e.g. “investigate the characteristics of your local towns and people” from geography and “living things and environments” from biology). Thus, for instance, a book entitled *Professor, a Chipmunk is Biting the Head of a Snake!* may not be retrieved via OPAC’s book title search using obvious queries for the unit of ‘animal ecology’.

We propose **BookReach-UI**, a graphical user interface (UI) that helps school librarians with their teaching-material curation for inquiry-based learning classes. Based on the findings of related work, we implemented an optimal workflow to curate books into this UI, wherein selecting textbook chapters directly shows topically relevant books. We evaluated the usability by asking school librarians to curate books for a mock class with BookReach-UI, the results of which showed reasonably high satisfaction with the system.

## 2 Related Work

### 2.1 Teaching-Material Curation by School Librarians

Although teaching-material curation is a fundamental mission of school librarians, few studies have examined the actual practices of teaching-material

<sup>2</sup> In this paper, the term ‘unit’ always mean a unit (or module) of teaching defined in the school curricula or textbooks.

curation. Some prior work revealed the detailed characteristics of teaching-material curation in Japanese school libraries. Miyata et al. [12] investigated teaching-material curation in Japan, which have been voluntarily stored in an online database named “The practice-case database of school libraries for teachers”.<sup>3</sup> One of the notable findings of this study is that Nippon Decimal Classification (NDC)<sup>4</sup> classes assigned to the curated books generally corresponded to class subjects (e.g. science, mathematics, and national language).

To examine the book selection criteria in teaching-material curation directly, Asaishi et al. [2] conducted semi-structured interviews with two school librarians regarding a teaching-material curation task for a mock science class, and they were asked to do the curation test in advance of the interviews. That study reported the following procedure, which can be regarded as the standard workflow of teaching-material curation: (1) search for candidate books that contain some keywords of the curriculum unit (e.g. the term ‘science’ and some scientist names) in their titles or summaries, wherein they have generated these keywords by themselves; and (2) manually filter out books that are outdated or are substantially too difficult for the target students by referring to book covers.

## 2.2 Support Tools for School Librarians

Only a few tools dedicated to school librarians are currently available. In fact, searching system-oriented journals in the library and information science domain (e.g. *Library Hi Tech* and *Code4Lib Journal*) for keywords such as ‘school library’ and ‘teaching support’ does not return relevant research, at the time of this writing.

LibGuides [4] is a commercial content-management software dedicated for creating ‘pathfinders’, in which librarians can curate website links and library collections useful for students investigating a certain topic. It is popular among academic (university) libraries in the US and is versatile enough to publish curated book lists for arbitrary purposes. However, no automation feature for teaching-material curation was implemented in this software.

In Japan, a book database specialised for school libraries named ‘TOOLi-S’ is provided by a bookseller for libraries, TRC Library Service, Inc.,<sup>5</sup> which enables school librarians to purchase books relevant to major curriculum units in elementary school textbooks. Another related database is “the practice-case database of school libraries for teachers”, as mentioned earlier, managed by Tokyo Gakugei University. It stores practice cases of teaching-material curation by Japanese school librarians, aiming to encourage teachers to make use of school libraries for teaching classes, rather than just for book loans for students. As of July 2021, approximately 400 cases had been voluntarily submitted by school librarians and organised manually by the university. However, these curation cases do not exhaustively cover all the typical curriculum units adopted in Japanese schools. Although the database enables the filtering of cases by school type and subject, curated books are not searchable across cases.

<sup>3</sup> <http://www.u-gakugei.ac.jp/~schoolib/>.

<sup>4</sup> NDC is a Japanese adaptation of Dewey Decimal Classification (DDC).

<sup>5</sup> <https://www.trc.co.jp/school/tooli.s.html>.

### 3 Proposed User Interface: BookReach-UI

To support school librarians in their teaching-material curation, we propose BookReach-UI, an alternative graphical UI that compensates for what the current general-purpose OPAC systems do not provide well. This UI is primarily intended to assist a school librarian in selecting relevant books available in the school library and inter-library loan (ILL)-partnered libraries in response to a request from a teacher who plans an inquiry-based learning class. We first summarise the UI requirements and then elaborate on its implemented features.

#### 3.1 Overall Design

To design the book-curation UI, we examined the standard workflow of teaching-material curation as reported by Asaishi et al. [2] (see Sect. 2.2), which allowed us to derive the following two notable points:

- (i) The judgement on which book is relevant to the class relies on how much school librarians understand the class content
- (ii) Book covers help determining the relevance of the book to the class

Point (i) can be derived because school librarians may find it difficult to select class-relevant books if they are not familiar with the class subject. For example, a school librarian who know less about physics cannot construct specific search queries such as theories in physics and physicists. This can be compensated for by successful collaboration between teachers and school librarians, although not many schools have yet established this collaboration [10, 13, 15].

Point (ii) means that book covers include relevant content information pertaining to its targeted readers (e.g. children's books are likely to have more graphical covers) and the type of book (e.g. certain book series have iconic cover designs). This has been traditionally achieved by browsing physical shelves, while standard OPAC systems may require several more operations to show the book covers of a search result.

Considering these points, we designed the following features as essential:

- (a) to support finding relevant books to the class subject even if the school-librarian user does not know the subject well
- (b) to display book covers of a book collection so that users can perceive books as if they were browsing shelves

Whereas achieving Feature (b) is trivial given a database that provides book covers, there are several approaches to realise Feature (a). As a simple but effective solution based on Miyata et al. [12] (see Sect. 2.1), we utilised decimal classification systems (such as DDC and NDC), which label books with decimal-numbered classes of subjects, to bridge the gap between textbook chapters (or units of teaching) and books. That is, by using a pre-defined map between textbook chapters and their topically corresponding decimal classes (i.e. a *unit-to-decimal map*), we can provide relevant candidate books by selecting textbook chapters targeted in the inquiry-based class. This map enables the following workflow, which fits the typical teaching-material curation well:

1. Select a textbook used in the inquiry-based class
2. Select the chapters (curriculum units) targeted in the inquiry-based class
3. (The candidates of books relevant to the class subject, retrieved via the unit-to-decimal map, are displayed along with their book covers)
4. Select as many useful books as the user chooses
5. (Selected books are automatically organised into a shareable list)

We implemented this workflow in our UI, as shown and annotated in Fig. 1.

### 3.2 Detailed Features

Following the use-case workflow above, we elaborate on the detailed features of the BookReach-UI. After the user selected a unit of teaching from the *text-book/chapter selectors*, our implementation retrieves the candidate books for curation that are relevant to the curriculum unit using a unit-to-decimal map that we manually created by assigning the classes of NDC to Japanese textbook chapters, because we began by targeting Japanese school libraries first. When the retrieve button is clicked, the UI accesses to a database of books containing bibliographic information with cover images and NDC classes.<sup>6</sup> Suppose, hereafter, that all books displayed in the UI belong to the collections of the user’s school library or ILL-partnered libraries.

The *book browser* (middle of Fig. 1) displays the cover images of the candidate books retrieved from the database, replicating the physical browsing of bookshelves. These books are grouped by tabs of the NDC classes relevant to the curriculum unit, achieving coarse-grained filtering of the book contents. Several buttons are provided for filtering which book to display by targeted school grade,<sup>7</sup> past curation use,<sup>8</sup> library location (in the own library or ILL libraries), and full-text search for the textual contents

When a book-cover image is clicked, a modal window appears over the book browser, as shown in Fig. 2. This view provides the detailed bibliographic information of the book, such as the authors, publishers, and total number of pages. If available, it also shows the book-content summary, table of contents, and its history of past curation use. The user can select this book for curation or close the modal window by clicking the buttons at the bottom.

Selected books are automatically organised into a *curation list* below the book browser. Users can access the major bibliographic information using the cover images in this list. The systems allows users to export the listed books as a teaching-material curation list. The available export formats are printing and tab-separated value (TSV) text; the former allows school librarians to share curated books immediately with teachers, whereas the latter is reusable in office spreadsheet applications to incorporate the list into another document.

<sup>6</sup> We adopted machine-readable cataloguing (MARC) records provided by TRC Library Service Inc. (Tokyo, Japan) for the current implementation.

<sup>7</sup> The adopted MARC records include targeted school grades as a bibliographic field.

<sup>8</sup> Past curation use for each book is retrieved from “the practice-case database of school libraries for teachers” if the book is listed in any cases [12] (see Sect. 2.2).

**校種**  
校種を選択してください

小学校 中学校 高校

**教科書**  
教科書を選択してください

新しい科学1 (東京書籍)    新しい科学2 (東京書籍)    新しい科学3 (東京書籍)

新しい社会 歴史 (東京書籍)    新しい社会 地理 (東京書籍)    新しい社会 公民 (東京書籍)

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**単元・章**  
章を選択してください

単元	単元名	章
1	化学変化とイオン	第1章 水素とイオン <input type="checkbox"/>
		第2章 化学変化と電池 <input type="checkbox"/>
		第3章 酸、アルカリとイオン <input type="checkbox"/>
2	生命の連続性	第1章 生物の成長と生殖 <input type="checkbox"/>
		第2章 遺伝の規則性と遺伝子 <input type="checkbox"/>
3	運動とエネルギー	第1章 物体のいるいな運動 <input type="checkbox"/>
		第2章 力の規則性 <input type="checkbox"/>
		第3章 エネルギーと仕事 <input type="checkbox"/>
4	地球と宇宙	第1章 宇宙の広がり <input checked="" type="checkbox"/>
		第2章 地球の運動と天体の動き <input checked="" type="checkbox"/>
		第3章 月と惑星の見た方 <input checked="" type="checkbox"/>
5	地球と私たちの未来のために	第1章 自然のなかの生物 <input type="checkbox"/>
		第2章 自然環境の調査と保全 <input type="checkbox"/>
		第3章 自然の恵みと反省 <input type="checkbox"/>
		第4章 科学技術と人間 <input type="checkbox"/>

印刷 Book retrieval button

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**教材候補**

**Filtering controls**

442 天体観望 (45冊)    443 宇宙天文学 (272冊)    444 太陽物理学 (43冊)    445 恒星・衛星 (29冊)    446 月 (30冊)    +

太陽の科学

太陽の科学

太陽系大地図

HITSU THE SOLAR SYSTEM

太陽は23度?

太陽は23度?

美しい太陽のおぼなし

美しい太陽のおぼなし

みるみる理解できる太陽と惑星

みるみる理解できる太陽と惑星

日食観測ガイド

日食観測ガイド

太陽と恒星

太陽と恒星

太陽

太陽

太陽のふしぎ

太陽のふしぎ

太陽

太陽

一億年の地球

一億年の地球

太陽と月の星ものがたり

太陽と月の星ものがたり

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**図書リスト**

**Bibliographic information**

タイトル	著者	出版年	出版社	NDC
すばる望遠鏡の宇宙	海野原博司・宮下博洋監修	2007年	岩波書店	442
太陽は23度?	日江丹波二朗著	2009年	岩波書店	444
デジタルカメラによる月の撮り方	月の撮り方研究会編	2011年	誠文堂新光社	442
天体の位置と運動	福海康夫編	2017年	日本評論社	442
天文マチュアのための天体スケッチ入門	安海陽著	1995年	誠文堂新光社	442

印刷    タブ別切りファイルで出力

Export buttons: printing and tab-separated value (TSV) text

**Textbook Selector**

Selecting a textbook to display its chapters below.

**Chapter Selector**

Lists chapters (curriculum units) of the textbook selected in Textbook Selector. Based on a chapter-to-decimal-class map, users can retrieve candidate books for curation that are relevant to the selected textbook chapters, which will be displayed in the next Book Browser.

**Book Browser**

Allows users to select candidate books. Clicking a book cover shows a modal view of the book's detail.

→ Tabs grouped by decimal classifications

→ Pagination of the candidate books in a tab

**Curation List**

Automatically organises the books selected in Book Browser into this table. Users can de-select books from here too.

Fig. 1. BookReach-UI overview.



Fig. 2. Modal window view of a book within the browsing-and-filtering module, providing bibliographic information and content descriptions.

## 4 Experiment

To evaluate the usability of the proposed UI, we carried out a preliminary user study that asked school librarians to use BookReach-UI for mock requests for teaching-material curation. Each of the five Japanese school librarians (elementary: 3; junior high: 2), who used OPAC systems for daily library work, curated approximately 30 books for a single subject that we assigned (geography or civics), by browsing a book database containing all books (146,914 in total) for each participant's school library and two public libraries. For each subject, we set similar curriculum units across school types (elementary or junior high) and assigned eight to ten relevant NDC classes manually in advance. After the task, we asked the librarians to score the usability of the UI with the Japanese translation [11] of the System Usability Scale (SUS) [3].

The SUS results for each librarian are shown in Table 1. The overall SUS score ranging from 0 to 100 in 2.5-point increments was calculated as follows [3]: subtracted 1 from the scores of the odd-numbered questions, subtracted the scores of the even-numbered questions from 5, summed these modified scores, and multiplied the sum by 2.5 (see the bottom row). The mean score was 69, which was reasonably high. Specifically, Questions 3 and 10 gave the highest mean scores per question, indicating that the UI was intuitive enough for the first use. We observed 126 operations (i.e. UI element clicks) per session as a school-wise median value, which may include casual trials of our UI.

**Table 1.** System Usability Scale (SUS) results of five school librarians (A–E) using BookReach-UI for the book curation task (A and D: civics; others: geography).

SUS Question		Elementary			Junior high		Mean
		A	B	C	D	E	
1	I think that I would like to use this system frequently	2	5	3	4	4	3.6
2	I found the system unnecessarily complex	2	2	2	3	1	2.0
3	I thought the system was easy to use	4	4	4	3	5	4.0
4	I think that I would need the support of a technical person to be able to use this system	1	3	2	5	1	2.4
5	I found the various functions in this system were well integrated	2	2	4	3	4	3.0
6	I thought there was too much inconsistency in this system	2	2	1	1	2	1.6
7	I would imagine that most people would learn to use this system very quickly	4	4	4	3	4	3.8
8	I found the system very cumbersome to use	1	2	3	3	2	2.2
9	I felt very confident using the system	3	4	3	3	3	3.2
10	I needed to learn a lot of things before I could get going with this system	1	2	3	1	2	1.8
<b>SUS Score</b>		<b>70</b>	<b>70</b>	<b>67.5</b>	<b>57.5</b>	<b>80</b>	<b>69</b>

## 5 Conclusion

To enhance librarian-teacher collaboration, we developed the BookReach-UI, which supports school librarians in their selection of library books for inquiry-based learning classes (teaching-material curation). Based on prior work analysing this activity, we defined two key features: (1) to show candidate books for curation that are relevant to class subjects, and (2) to display book covers as the main source to judge useful books for the class. The implemented UI allows users to browse relevant books by selecting the targeted textbook chapter (curriculum unit) via pre-defined topically corresponding decimal-classification classes. Our preliminary usability experiment showed reasonably high satisfaction with the standard measurement (SUS).

We plan to expand this experiment to a broader range of school librarians to validate and improve the UI. One limitation of the approach is the necessity to create the unit-to-decimal map manually, which can be automated in the future by textual similarity [6] between chapter names and heading terms. Our implementation may contribute to related software and services for school librarians such as curation-case databases and book-recommendation systems.



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