

How does web-based collaborative learning impact information literacy development?

Keywords

Information literacy, information behavior, collaborative learning, web-based collaboration tools

Abstract

This qualitative study documents evidence of first year undergraduate students' collaboration processes and information literacy learning while completing research assignments in groups during a semester-long course. Focus group interviews and artifacts collected in the web-based tool Evernote allowed us to conduct an in-depth analysis of students' collaborative behavior in terms of their actions, feelings, and thoughts during information seeking behavior (Kuhlthau, 2004), and of the potential of collaboration for fostering information literacy development.

Our analysis revealed that certain conditions should be present to facilitate information literacy learning through collaboration: 1) Technology that enables real-time interaction and both active and passive sharing; 2) Meshing of students' interests through the assignment framing; and 3) Students' acceptance of the collaboration technology as a worthwhile tool.

In addition, multiple factors determined the extent of the information literacy learning developed through the collaborative assignment tasks, including group dynamics, prompts for students to teach each other information skills, encouragement of students to share exemplars of notes or written assignments, exposure to different points of view, and time management.

Introduction

Collaborative practices in creating and sharing information are ubiquitous in the workforce (Hansen & Widén, 2017) as well as in the university environment, where they can be positioned as a high-impact learning practice (Parramore, 2019). Studies in the field of information behavior have documented that group interaction and collaboration affect how people use information to complete tasks in comparison with working in isolation (e.g., Shah, 2014). However, generally, previous studies do not discuss the

outcomes of information behavior—such as knowledge acquisition or skill development—nor assess the results of utilizing information. Thus, there is still much work to be done on understanding the connections between collaborative learning and how students come to develop abilities and practices in identifying information needs, and finding, evaluating, and using information for academic assignments. The current study combines perspectives from the fields of information literacy (IL) and information behavior (IB) to explore and interpret the IL learning that took place when undergraduate university students completed a collaborative research assignment.

More specifically, this study addresses the following research questions:

- 1) How did information literacy development manifest during the study participants' collaborative learning process?
- 2) How can web-based collaborative tools support students in developing information literacy?

Overall, the study provides detailed evidence of how students performed research assignments in a collaborative environment, which is then connected to an analysis of their learning in multiple dimensions of IL. The results of the study can be used to inform the effective use of collaborative technology in supporting IL development.

A note on the context

This study was conducted at a university in Japan. Quotations and research notes from study participants used in this article have been translated into English by one of the authors and verified by a bilingual accredited translator who was not involved in the research study.

As in other countries, the concept of IL has been discussed in Japanese academic literature for many years (Shinohara & Horoiwa, 2021). However, the importance of IL is ever more significant in the current information rich environment. University students need to have lifelong learning skills to find solutions for complex questions and social issues (Japan Universities Association for Computer Education, 2015). In order to develop these skills, students need to practice continuously throughout their studies. In North American professional discourse and institutional practices, there is often an emphasis on the importance of assigning independent work to students to scaffold IL development in areas such as identifying research topics, and finding, evaluating, and using information. However, IL in Japan is discussed differently than in North America (e.g., Nozue, 2009; Ono, 2017; Sakai et al., 2017), with the concept often conflated with writing skills, media literacy, and information technology skills. In addition, university curricula less frequently include independent research assignments. Rote learning and “sage on the stage” teaching practices tend to be the dominant model in education at all levels, including university. The result of this is that Japanese students overall tend not to develop strong IL through their university studies. This is corroborated by studies of Japanese international students in North America, which reveal differing academic expectations and educational practices in Japan (e.g., Hughes, 2013).

Overall, the theoretical and practical IL landscape in Japan is quite varied. While some scholars and educators in Japan have embraced conceptualizations of IL as a set of practices as in the Framework for Information Literacy (Association of College and Research Libraries, 2016), there is often an institutional view that centers technology skill development rather than deeper understandings of the social context of information. This is evident in initiatives that focus on measurement of skills such as the widely-used “Information Literacy Survey for Upper Secondary Students” (Shinohara & Horoiwa, 2021), or focus on basic understanding and operation of computers and networks, and information retrieval skills as in the annual survey to all Japanese universities (Ministry of Education, Culture, Sports, Science and Technology, 2022). Iio (2019) suggests that Japanese universities first adopt and embed standards such as the Information Literacy Standards for Higher Education by the Japan Association of National University

Libraries and then expand them to reflect on recent conceptualizations of IL including the notion of threshold concepts.

Literature Review

This study conceptualizes information literacy according to the Framework for Information Literacy for Higher Education (Association of College and Research Libraries, 2016, hereafter known as the Framework), which is one of the most widely-used conceptualizations of IL amongst academic librarians. The Framework acknowledges that IL learning in higher education entails a dynamic transition from novice to expert learners in the context of specific disciplines. This learning involves the synthesis of different abilities, such as how information is created, valued, contextualized, and shared in specific academic contexts, and how information can be discovered and used effectively. The Framework is both 1) a conceptualization of the information landscape in its social context that learners are aiming to understand, and 2) a pedagogical structure for how to come to achieve these understandings (Foasberg, 2015).

In contrast, research in the field of IB often takes a descriptive approach to investigating how people engage with and make sense of information, usually in particular contexts. It does not begin with the starting point of assessing the attainment of ways of thinking about information, but rather seeks to understand phenomena in individuals' or groups' information interactions.

This study seeks to build on previous research in both the IL and IB fields of inquiry to investigate collaborative learning through the use of technology.

Collaborative learning and information literacy

Skills in collaboration—that is, learners working together toward an end product or shared knowledge (Barkley et al., 2014)—are frequently mentioned at least tangentially in discourse related to IL. For example, the introduction to the Framework states that the document draws on the concept of metaliteracy, one dimension of which is collaboration abilities. It defines metaliteracy as “an overarching set of abilities in which students are consumers and creators of information who can participate successfully in collaborative spaces.” However, the knowledge practices and dispositions articulated in the Framework’s six frames are highly individual, and no further mention is made of collaborative practices and *how* they are connected to IL development.

The concept of metaliteracy is developed in detail in Mackey and Jacobsen’s seminal work *Metaliteracy: Reinventing information literacy to empower learners* (2014), with collaboration included as one of the core dimensions of the metaliteracy model (p. 23, Figure 1.1), and as one of the learning objectives in the metaliteracy framework: “Share information and collaborate in a variety of participatory environments” (p. 86). Significantly, Mackey and Jacobsen’s characterization of collaboration in the metaliteracy framework does not only include “deliberate” synchronous, direct collaboration, but also more amorphous, asynchronous forms of the collaboration found in “Web 2.0” participative knowledge creation, where content creators may not know each other or directly communicate, but the nonetheless share knowledge and create together.

In other research founded in an IL perspective, a connection has been suggested between collaborative learning practices and IL development. For example, Lee and Kim (2014) examined LIS students’ knowledge acquisition over the course of a collaborative assignment with information seeking tasks. While this study contributed the idea of measuring the learning outcomes that result from collaborative information seeking, it assessed subject-based knowledge rather than IL specifically. Rapchak (2018) assessed students’ learning cognition—specifically their metacognitive and social metacognitive

awareness—while completing a semester-long collaborative assignment in which they collected and evaluated sources to answer a research question. The study compared face-to-face vs. asynchronous online learning, finding that the online IL course was not able to socially regulate the group's learning as well as the face-to-face version of the course. Although metacognition is an underpinning element for IL development, this study did not focus on students' use of collaborative technologies nor other evidence of information skill development. Finally, Nierenberg et al. (2021) found that there is a low correlation between students' *knowledge* of IL and their *actual* behavior (i.e., their use of IL skills), suggesting that both need to be investigated.

Overall, the role of collaborative learning is underdeveloped in the literature on IL skills acquisition and assessment in comparison with investigations of individual/solitary learning. While several studies have examined IL learning outcomes that can result from assignments that require students to work collaboratively (e.g., Buckley & Doyle, 2016; Cranney et al., 2008; Niedbala & Fogleman, 2010; Rapchak, 2018; Shen, 2018; Sinno & Jarsonk, 2018; Sormunen et al., 2013), most of these studies do not include an analysis of the actual mechanics of the collaborative behavior. An exception is Loo (2013), who documented some factors that are essential to facilitating group work in an IL context, including building a team spirit, establishing roles, and allowing time for co-exploration of information. Students' IL was observed by the instructor during and after a one-shot instruction session, with a few examples of student interactions suggesting a correlation between successful group work and IL skill development. Blau et al. (2020) conducted a similar study to examine digital literacy skills (*not* IL) developed through collaborative learning. It was found that university students perceived that collaborative learning enabled by technology promoted their digital skills development as well as abilities like self-regulation. It was noted, though, that the study participants rarely recorded reflections on their learning in the area of "information thinking" specifically ("advanced searching, sorting, and evaluating the reliability of the information," p. 6) in comparison with other digital literacy skills.

Working from the standpoint that learning is a social, constructivist process, Walton et al. (2007) measured students' IL knowledge using a pre- and post-test design as well as through analysis of students' collaborative discussion board output and qualitative interviews. From this analysis, they proposed a model for collaborative online learning that lays out a cycle of student work, invitations to collaborate, instructor inventions, and reflection prompts designed to scaffold IL learning. They argued that the "process of iteration" led to effective learning, where students each contributed their thoughts to a collaborative knowledge building exercise. The students in the study did not engage in a collaborative information seeking task but rather worked on specific aspects of IL, such as evaluating information.

Bridging information literacy and collaborative information seeking

Within IB research, collaborative information seeking is an emerging subfield that seeks to investigate behaviors and influencing factors when groups of individuals work together to complete information-based tasks (Shah, 2012, 2014). However, while theories of information-seeking behavior as developed and applied in these studies are descriptive of users' processes, they do not focus on evaluating the holistic outcomes of people's interactions with information, as information seeking is only one aspect of the larger scope of IL.

There are a number of dimensions through which collaborative learning can be understood and assessed, including measurement of knowledge construction, learning outcomes, social interaction, the visibility of work happening in the collaborative space, and how demographic factors influence communication, and emotional experiences (Granikov et al., 2021; Koh & Lim, 2012; Wu et al., 2018).

Specifically in the area of information seeking, Kuhlthau's influential Information Search Process (ISP) model (2004) has been applied in several publications to make sense of the outcomes of collaborative

information-seeking behavior (e.g., Hyldegård, 2006, 2009; Kim & Lee, 2014; Leeder & Shah, 2016; Saleh & Large, 2011; Shah, 2012, 2015; Shah & González-Ibáñez, 2010; van Aalst et al., 2007; Walton & Hepworth, 2011).

The ISP presents a model of how individuals seek information in order to complete tasks that require them to find information and construct knowledge from this information. The model incorporates not only behaviors / actions but also learners' thoughts and feelings ("cognitive" and "affective" dimensions). Because the ISP is an idealized model of the search process, it goes beyond being descriptive by evaluating the cognitive outcomes of IB, and has been widely applied in IB research, including collaborative contexts. For example, Kim and Lee (2014) used the ISP as a theoretical framework in documenting students' knowledge construction and experiences of the information search process while completing a semester-long group project (with both individual and group components). That study provides evidence of students' cognitive processes, concluding that while students developed shared understandings of their project, they completed the information-seeking aspects of the project individually. However, the growth in knowledge that resulted from the assignment completion experience is not directly described in terms of IL.

Similarly, several studies (Hyldegård, 2006, 2009; Leeder & Shah, 2016; van Aalst et al., 2007) have investigated group-based information-seeking tasks in academic settings, ultimately concluding that the ISP model as conceived for explaining individual behavior and emotions does not fully capture the collaborative experience, where contextual and social factors, such as the dynamic of a shared goal and desire to support team members, affect the experience beyond the search process itself. In particular, Leeder and Shah (2016) provide detailed evidence of undergraduate students' collaborative processes when undertaking a focused library research task, documenting both their information search behavior and their "affective" reflections on the group experience, finding that collaborative information seeking does not necessarily lead to better outcomes in terms of students' search skill development and experiences and arguing that careful scaffolding of "library research assignments" is necessary to address students' challenges.

Finally, Walton and Hepworth (2011) draw on the ISP model in documenting students' behavior and especially their cognitive transformations that resulted from an "information literacy intervention": a collaborative assignment in a blended face-to-face and virtual environment. It was found that the use of an online social network learning was particularly effective in supporting students in reaching the higher levels of cognition required to critically evaluate information (which is one dimension of IL).

Summary

The relationship between the disparate theoretical realms of IL and IB has been widely discussed in the field of information science (e.g., Ibenne et al., 2017; Ishimura & Bartlett, 2009; Julien & Williamson, 2011; Limberg et al., 2008; Limberg & Sundin, Olof, 2006; Nettet, 2014; Shenton & Hay-Gibson, 2012). While these publications pre-date or do not include the ACRL Framework (2016), they address ways in which IB's description of behavioral phenomena can be connected to the *outcomes* of that behavior in relation to theoretical conceptions of IL, whether that be expressed as standard skills (ACRL, 2000) or "threshold concepts" for learning (ACRL, 2016). The research that stems from the IL perspective typically does not analyze behavioral evidence or factors that influence information behavior, while the IB subfield of collaborative information seeking often does not discuss *learning* from an IL perspective. The goal of the current study is to contribute to the literature related to collaborative information practices by analyzing the relationship between students' development of IL in the context of a collaborative learning experience. In other words, we are analyzing the outcomes of the collaborative assignment completion process through a lens of IL development. Therefore, this study focuses on collaborative learning experiences related to IL in multiple dimensions holistically (as suggested by Nierenberg et al.,

2021), not simply information seeking, as well as the IB personal and situational factors that determine the IL outcomes.

Methodology

Context

The purpose of this study is to understand students' IL development in a collaborative environment. In order to investigate the details of students' behavior, this study was conducted at a private university in the Tokyo region with approximately 8,000 students where one of the authors was a full-time faculty member in the Faculty of Environmental Studies. The data collection was carried out over two academic years in a required, semester-long research skills course for first-year students with an enrolment of approximately 80 students per semester. Most students did not have previous experience with independent research assignments. The class sessions were face-to-face, but the group work was primarily carried out virtually via the web-based tool Evernote as explained below.

Participant selection

All students in the course were required to complete the research assignment discussed in the study, but participation in the focus groups was optional, with students providing informed written consent to participate. Students were informed that their participation or lack thereof had no effect on their grade, and they could withdraw at any time. All students were expected to use Evernote to carry out their group work, but their data was analyzed for this study only if they consented.

Participants' tasks

The assignment that formed the basis for the study consisted of a research essay of 3,500-4,000 Japanese characters (approximately equivalent to 7,000-8,000 words in English) containing a title, introduction, main body, conclusion, appropriate references, and a reflection on the research and writing process. Students were provided with a list of broad topics (see Appendix) and assigned to a group. As a group, they selected a broad topic as a starting point, and then each was required to narrow their focus to an area of interest, find relevant information, and write the essay individually. In addition, each group collaborated on giving a class presentation that synthesized their different sub-topics.

To scaffold the essay and group presentation tasks, students were given short weekly "mini-assignments" that broke down parts of the process, such as generating search keywords, listing search tools, and summarizing sources. These mini-assignments always incorporated a reflection prompt for students to consider what worked and what did not. Students posted the tasks in Evernote so that others in their group could provide feedback. Thus, each week, students were asked to record and share their actions (that is, their information behavior), and then reflect on their own work and that of others.

Finally, students were asked to present brief progress reports in class based on their notes in Evernote, and the instructor provided feedback to each group, constituting another opportunity for students to get formative feedback during the process.

Data collection and analysis

Data for the study were collected through:

- 1) Notes and comments that students recorded in Evernote
- 2) Semi-structured focus group interviews

The cloud-based web service Evernote can be described as a virtual scrapbook for capturing images, files (e.g., PDFs), text notes/memos, and screen captures of web pages. Students were provided with Evernote Business accounts and designated space to share within their groups with large file storage capacity. They were asked to record their research related activities (i.e., behaviors, decisions, and reflections) during the assignment process. For example, they recorded resources that they found, notes on their topic selection, search strategies, reflections on difficulties faced, sources of help consulted, questions, notes about their learning, and so on. They were also directed to monitor their group members' notes and provide feedback throughout the assignment completion process.

At the end of the semester, focus groups were conducted to elicit evidence of students' experiences in-depth, following the recommendation of Krueger and Casey (2015). Students who consented took part in semi-structured focus group interviews with their assignment groups. Group interviews were conducted with 8 groups of students (a total of 24 students, 3-5 per group) in Year 1 of the study and 7 groups (27 students, 3-5 per group) in Year 2.

The focus group audio recordings and transcripts were transferred to the qualitative data analysis software, Atlas.ti and coded using a grounded theory approach (Charmaz, 2006). The students' notes and files in Evernote were also analyzed to triangulate their focus group data in terms of their behaviors and learning reflections. The excerpts included here were translated into English by one of the authors and verified by a bilingual accredited translator who was not involved in the research study.

Kuhlthau's (2004) notable model, *Information Search Process* (ISP) is used to frame this study as in other studies that have sought to bridge IL and IB methods. The model states that those who successfully complete research assignments tend to follow similar steps. In this way, the model can be interpreted as "ideal" behavior, or in other words, IL. The ISP stages served as a guide to the data analysis, but themes were also identified from the focus groups in a grounded manner, open to students' behavior as observed in the study.

In addition to providing a reference point for data analysis, the assignment design used in the study took the ISP into account, with the instructor keeping the entire process in mind. Recognizing that students experience uncertainty at the beginning of the research process, the assignment was broken down to guide students through the ISP stages (i.e., consulting background sources, refining a topic, etc.). Prompts for reflection and feedback were built in throughout as suggested by Walton, et al. (2007). Finally, the importance of articulating an "invitation" to participate in collaborative online learning (Salmon, 2013) was addressed in the structured nature of the weekly mini-assignments.

Finally, in tandem with the ISP, evidence of IL learning was identified when students showed evidence of transformations, or progress toward IL Framework threshold concepts (ACRL, 2016) in their behavior, affect, and cognition, per Mezirow's "learning as transformation" theory (2000).

Findings & Discussion

The following sections describe the evidence collected of students' collaborative behavior and its connection to IL learning during the assignment completion process.

The students in this study collaborated primarily by:

1. sharing information,
2. reflecting on or evaluating the relevance or value of other students' contributions, and
3. engaging in collaborative conversations that moved them forward to completing their end goal.

It is posited that students' collaborations, as enabled by Evernote, supported their use of "higher order thinking skills" that made possible transformations in thinking about IL (as argued by Walton & Hepworth, 2011, p. 61).

1. The nature of collaboration

Evernote enabled students to share their notes any time and collaborate both synchronously (real-time) and asynchronously. In addition, it was discovered that students collaborated both "passively" and "actively."

1.1 Passive collaboration

Passive collaboration occurred when students looked at other group members' notes without directly communicating with them. For example, one student described this experience as feeling "easy." He was able to look at shared notes whenever he wanted to see other members' progress. Another student also commented that it would have been ideal to meet in person to discuss the project, but in the case of schedule conflicts, the student could still be aware of the group's progress when others posted notes.

Passive collaboration included checking other groups' notes in addition to students' own group. Evernote has a feature called "Context," which displays potentially relevant notes to what the user is currently viewing—which in this case, included notes from all groups in the course. One student happened to find the feature and had serendipitous experiences:

"When I was looking at my notes on Evernote on my computer, links to other notes appear. I didn't know whose information it is, but relevant content simply showed up. So I sometimes looked at them. . . Notes just showed up. So oh, I took a look at them. I thought that was a great feature that allowed me to and move onto [relevant notes] naturally, not intentionally."

In this case, the nature of the technology itself made possible collaborative learning opportunities that would not have otherwise existed.

Overall, passive collaboration was connected to the activity of confirming the students' direction in their own task and checking to see how other students were doing in working toward their shared goal. This was a "hidden" collaborative activity that would not have been evident without students' disclosures in the group interviews.

1.2 Active collaboration

In contrast, *active* collaboration was characterized by multidirectional interactions among group members—in other words, when they were truly working together. This entailed their sharing of information *plus* feedback, as opposed to passive collaboration where students "took" information but didn't "give back" feedback or further ideas. In active collaboration, there were give-and-take exchanges, where students provided and responded to feedback. For example, some students reported that they used Evernote to exchange ideas about information they had found and shared their information seeking techniques. In several groups, when students needed quick opinions from other members, they sent messages via LINE (a popular messaging service in Japan) to ask for comments and feedback. In these cases, they looked at Evernote first, but used instant messaging for more direct conversations. By using both platforms together, time and distance did not hinder collaboration. They could look at the same documents together and discuss them in real time. This genuine collaboration and interaction led to deeper learning where students could co-create and learn from each other, as detailed in the next section.

2. Information literacy development

This study conceptualizes students' learning transformations (per Mezirow, 2000) in information *behavior* and information *literacy* as happening in tandem. The next section discusses key areas of students' IL learning in terms of the three dimensions of Kuhlthau's ISP (2004), with examples for each dimension:

1. Behavior (actions)
2. Cognition (thoughts)
3. Affect (emotions)

When we analyzed the study findings in relation to the ISP, we found that the dimensions were intertwined and difficult to separate into discrete components. Nevertheless, examples of each of the three dimensions were observed in all of the focus group discussions. Overall, we found that when students collaborated in an *active* way, transformations took place in all three dimensions of IL (behavior, cognition, and affect).

2.1 Collaboration and the behavior dimension

Most participants had not been required to conduct information searches for academic assignments previously. Since finding information is an iterative process, sharing search keywords in notes in Evernote was a good learning opportunity to emphasize that searching is "strategic exploration" (Association of College & Research Libraries, 2016). Students were able to obtain search "hints" from each other when they had difficulties in identifying search keywords and retrieving relevant information. By sharing notes in Evernote, students did not have to explicitly ask each other for information, but they could imitate the models that other students provided. For example, Figure 1 is a snippet of a student's note. This student listed 3 variations of search keywords used to find information about desertification. Other students in the group simply looked at the note for inspiration and improved their own search behavior from his example, even though there was no explicit description, instruction, or reflection associated with the note.

Figure 1. Search keywords in a note - a student's own note

砂漠化の原因と砂漠化をどのようにして食い止めるか

- 検索キーワード1 : desertification
 - Tragedy of the Commons Revisited Grazing, Land Degradation and Desertification on Multi-Use, Public Lands of Nevada * PAYNE William A.A. PAYNE William / University of Nevada Ren
 - 検索した場所 : CiNii
- 検索ワード2 : desertification
 - World Atlas of Desertification
 - Nick J. Middleton, David S. Thomas
 - 検索した場所 : Google Scholar
- :: ● 検索キーワード3 : 乾燥 対策 砂漠
 - 砂漠化対策としての緑化と"砂地産業"寧夏における取り組みを事例に
 - 黄勝澤 / 社団法人 海外林業コンサルタンツ協会
 - 検索した場所 : CiNii

Figure 1. Translation

Topic: The causes of desertification and how can they be controlled?

- Search keywords 1: desertification
 - Tragedy of the Commons Revisited Grazing, Land Degradation and Desertification on Multi-Use, Public Lands of Nevada * PAYNE William A.A. PAYNE William / University of Nevada Ren
 - Search location: CiNii

- Search keywords 2: desertification
 - World Atlas of Desertification
Nick J. Middleton, David S. Thomas
 - Search location: Google Scholar
- Search keywords 3: dry [space] countermeasures [space] desert
 - Tree planting as an anti - desertification measure and the sandy area development industry :
An action in Ningxia as an example / HUANG Shengze
 - Search location: CiNii

Note that the student came up with a way of documenting his search by himself. The requirement to share information with others prompted students to think about the logical arrangement of their sources. Several students reported modifying their search behaviors, search tool selection, and organization strategies to imitate what they perceived as good practices.

In another example, in Figure 2, a student summarized and shared what she found using a table layout. In columns, she wrote the titles of sources, where she found them, and when she consulted them.

Again, she came up with the idea of arranging the sources in a well-formatted organization method making good use of Evernote. She explained that the need to share with others made her consciously consider how best to organize information visually, rather than just providing links without context.

Figure 2. Documenting sources - a student's own note

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資料名	情報源	閲覧日
開発協力白書（東京、外務省 2016.3-）		6/7
テキスト国際開発論：貧困をなくすミレニアム開発目標へのアプローチ （勝間靖編著 ミネルヴァ書房出版 2012.3.）		6/7
文明のサイエンス：人文・社会科学と古典的教養 （慶應義塾大学編 慶應義塾大学出版会 2011.7.）		6/7
特集戦後日本の思想を通してみる現代 （「アソシエ」編集委員会編 御茶の水書房 2004.2.）（季刊アソシエ「季刊アソシエ」編集委員会第12号）		6/12
戦中戦後の女性：日本女性の歴史 （坪田五雄編 暁教育図書出版 1983）（日本発見人物シリーズ）		6/13
日本ユニセフ協会webサイトより	https://www.unicef.or.jp/about_unicef/about_act01_03.html	6/12

Figure 2. Translation

Source titles	Source	Date consulted
White Paper on Development Cooperation (Tokyo,	The local library and the	6/7

Ministry of Foreign Affairs, 2016.3-)	university library	
Introduction to international development: Theory and practice of the Millennium Development Goals (KATSUMA, Yasushi Minerva Shobo, 2012.3)		6/7
Science of civilization: Humanities and social science literacy (Keio University Ed. Keio University Press, 2011.7)		6/7
Special feature: Through post-war Japan ideology (Associé Editorial Board, Associé Quarterly, Ochanomizu Shobō Publishing, 2004.2)		6/12
Women during and post-war: History of Japanese women (TSUBOTA, Itsuo. Ed., Akatsuki Kyōiku Toshō, 1983)		6/13
The Japan Committee for UNICEF website	https://www.unicef.or.jp/about_unicef/about_act01_03.html	6/12

This student explained that when she was in elementary school, she often went to a local public library and used the reference service, and she continues to do so occasionally. She decided to use it for this assignment as well to broaden her information-gathering, showing exceptional effort in finding and organizing her sources. Other students in the group learned about a wider range of information sources from her example, which helped to make the connection between their topics and the use of reliable sources, as evidenced by the comments they made on her content summaries in Evernote.

2.2 Collaboration and the cognition dimension

Active collaboration led to notable changes in the cognitive dimension for some students. One spark for these changes was a mini-assignment where students were required to post in Evernote on the following points:

1. What was your initial topic?
2. What is your revised topic (this week)?
3. What are your revised search keywords?
4. What are the differences in your findings from last week?
5. Group members' reflections

Figure 3 shows a snippet of one student's post for this task, with her revised topic and keywords, reflections, and group members' reflections in relation to their own topics and the group's collaboration.

Figure 3. Search keywords and reflection

3. 検索キーワード (ver. 2)

- (1) 「水不足 子供 格差」
「飲料水 JICA」
- (2) 「日本 男女格差 脱出」
「日本 戦後 格差」
「日本の水不足 歴史」

4. #2 & #3 の、先週との違い

女性だけでなく、子供も水不足による格差の被害を被っていることを知り、男性：女性と子供 という構図を知ることができた
日本も線中や戦後のライフラインの危機があり、軍人として駆り出されたのは男性で、女性と子供が、働きながらも家の水や食料の不足に耐え忍んでいた史実がある

5. グループメンバーからのフィードバック内容

私も発展途上国の女性と子供と男性の格差がきになりました。調べていく中で水運びなど女性や子供が楽に出来るものが開発されていることは分かったけど普及していない現状を目の当たりにしました。

日本だけではなく、他国にも視点を向けて見たらいいと思います。

私は水不足に注目せずに、水の安全性について着目したので、水不足について深く調べていたので、驚きました。

Figure 3. Translation

Topic: How is access to water related to gender inequality?

3. Search keywords (ver. 2)

- (1) water shortage [space] children [space] gaps
drinking water [space] JICA
- (2) Japan [space] gender gaps [space] escape
Japan [space] postwar [space] gaps
water shortage in Japan [space] history

4. #2 & #3 Differences from last week

I discovered that not only women but also children are suffering from gaps caused by water shortages, so I learned about the divisions of men vs. women and children. During and after the Pacific War, Japan also experienced crises in lifelines. Historical evidences showed that men were served as military personnel, while women and children worked and suffered from water and food shortages.

5. Feedback from other group members

Student 1

I am also interested in gaps between women and children and men in developing countries. As I searched for information, I learned that there are different solutions that were developed which reduces the workload of women and children carrying water. However, I found out that they are not available widely.

Student 2

I personally think that it will be a good idea to investigate different countries in addition to Japan.

Student 3

I am focusing on water safety as a research topic instead of water shortages. I was very struck by how you investigated water shortage issues in depth.

This example shows how a shared experience of reflecting on one student's thoughts prompted others in the group to make connections to their own topics and process. This evidence of students' thought process

shows that they underwent a transformation in their thinking about topic scope and keywords through practice, reflection, explaining their ideas to others, and reflecting on feedback. Compared with Figure 1, where the information sharing is passive, this example shows more evidence of learning—that is, changes in their thinking and behavior when the group interaction is more dynamic.

In a third example, a student described changes in his thinking about the group’s topic through collaboration in the early topic-selection stage of the ISP. The student had not yet determined the direction of his paper, but after looking at other group members’ notes, he was able to find his path. He described how useful the experience was:

There are a fair number of occasions where I was surprised by the diverse perspectives that other members have. Like ‘Oh [student name] is looking at this direction. I hadn’t thought about that. He is thinking of ways to reduce CO₂ emissions without sacrificing economic activities.’ This is a different way of thinking to me. This really helped to develop my thinking. Evernote has codified information, so I was able to know others’ thoughts by looking at each comment in addition to sharing information myself.

In typical circumstances, students are not able to “read each other’s minds” or have insights into what others are thinking without directly asking. However, Evernote, as used in this course, prompted students to make their own thoughts explicit and share them with others to make cognitive processes during the assignment task more visible.

2.3 Collaboration and the affective dimension

Several students described moments where they did not know where to start with writing their essays, felt very uncertain, or felt stuck. Looking at other students’ notes was helpful to allay their confusion and help them find their way. This included looking at others’ outlines and actual writing excerpts. For example, one student reported that he obtained ideas about where to start by looking at classmates’ notes in Evernote:

“I didn’t know what to write at the beginning, but I looked at my other 2 group members’ notes. This helped me to think ‘Oh, this is how to do it.’”

Some students also discussed how collaboration through Evernote helped them develop a sense of confidence in their direction or a feeling of relief that is typical in the ISP during the information collection stage (Kuhlthau, 2004, p. 45). When the students shared their compilations of resources with each other and provided feedback, some reported feeling more confidence.

Looking at “samples” from others was effective to give apprehensive students a clearer picture of what their final product might look like. Another student pointed out that looking at other members’ writing was useful to him to improve his own writing. Also, feedback from other group members reduced his lack of confidence related to his own writing:

“ As I was using Evernote, I could see other members’ notes. I had selected the same essay topic, but we were completely different. Even though it’s the same topic, our writings were different. Because of this, I was able to benefit from the tool. Other members also gave me feedbacks on what I had written. By doing this, my anxiety toward my essay writing process was reduced and my writing could be improved.”

Affective elements were also clearly impacted by the collaborative spirit that some groups described, as discussed in section 3 below.

2.4 Summary of information literacy development

Overall, our analysis shows that greater collaboration within the group allowed students to move beyond behavioral learning to deeper emotional and cognitive experiences. IL development does not occur only in one dimension, but rather in layers. Therefore, collaboration is a way for students to deepen the blending of these layers—that is, to undergo transformations in multiple dimensions of learning. To optimize the potential for learning, it is important to ensure that collaboration opportunities are connected to cognition and affect, not just behavior, taking into account the social dimensions of IL learning (Yu & Zhao, 2021).

3. Collaboration factors

3.1 Collaboration factors facilitating information literacy development

As in other studies of collaborative IB (e.g., Yue & He, 2018), this study identified various factors that influenced the groups' collaboration outcomes, and consequently their IL learning. We found that more active group communication and collaboration were connected to higher motivation, which in turn fueled transformations in all three dimensions of behavior, cognition, and affect.

Good relationships among group members were a key factor for success in group work and IL learning (a finding also noted in Hyldegård, 2009 and Loo, 2013), and this was often reinforced by in-person interactions as well as virtual. However, students did not necessarily have to have pre-existing friendships in order to work well together. For example, students in one group reported that they formed a group together because they happened to sit close by in the classroom but did not know each other previously. Through weekly mini-assignments and collaboration, they were gradually guided to create a collaborative “atmosphere,” showing how a bond among members could be formed. As a result, the collaboration facilitated what Walton and Hepworth (2011) call the “social constructivist aspect of becoming information literate” (p. 462), wherein learning happens via peer-to-peer exchanges.

Another example of the importance of group dynamics was seen in a group formed among friends. They already had positive relationships, but they reported that commitment was also an important element for successful group work. The researcher conducting the focus group asked about the strong collaborative activity reported by the group. One student explained:

“We were getting along well with each other from the start. Also, doing group work really touched our hearts, and we thought that we should help each other. It’s not good if only ‘I’ am successful. It’s about ‘us’ succeeding together.”

Their commitment to the team led them to check their progress via Evernote frequently (more frequently than other groups reported) and shape their essays collaboratively.

Another group also mentioned that the sense of helping each other provided motivation:

“N: I think collaboration was a really big part. Yes, relatively speaking, we collaborated with each other. In the weekly assignments, each group member added comments on the others’ notes. We frequently commented like ‘This part is great’, ‘This part will be useful’.

M: I guess I didn’t have knowledge [on the topic], so I thought I could post whatever [anything possibly about the topic].

N: It’s a good learning opportunity for each other. I shared my findings not only for me but also

for other group members. Since we had the final presentation as a group, I was thinking that I should share information actively.

T: I knew that we would need to make a presentation. I thought it would be good to share what we were searching now.”

In many groups, peer pressure facilitated the process of group work, ensuring that every member was able to be successful in completing their assignments. One student mentioned how his motivation increased when he felt the need to catch up with other members.

“Two of the other members, especially [student name], understood how to use Evernote and completed weekly tasks faster. I am the kind of person to leave tasks until later. I started thinking like ‘I need to work on the tasks soon.’ But whenever I check Evernote, if other members have already completed them, my motivation goes up like ‘Oh crap, I have to do it now’.”

Overall, team dynamics and social pressures appeared to have been a motivating factor for some students, and this was connected to the degree of collaboration within the group. That is, if the group had a more active collaboration practice in general, the group members expressed a desire to improve their work and keep pace with the group, compared with their mindset during individual work of “only I care.”

3.2 Collaboration factors that limited opportunities for information literacy development

As found by Leeder and Shah (2016), the outcomes of the groups’ attempts at collaboration were not always positive. This study discovered that simply directing students to use Evernote did not guarantee that collaboration took place. In some cases, using the tool hindered their capability to work together. Three main factors found that hindered students’ collaboration and consequently, their opportunities to develop IL were:

- a) Opposition to sharing information
- b) Closeness of sub-topics among group members
- c) Time pressures

Even though the assignment was designed for collaboration, some students were reluctant to do so online. One student explained why she purposefully did not share information on the online service.

“This was a reason why I didn’t make use of Evernote . . . If we put files in Evernote, students in other groups could see them . . . I was not sure how to phrase this, but I was afraid that someone might steal it [our files and progress]. I felt that Evernote shares too much, so there were a few occasions that I intentionally did not use it.”

As her comment shows, she feared that other students might “steal” her group’s work. As a result, when they had to submit weekly progress reports on Evernote, her group did not share notes until the last minute.

As found by Walton (2013) and Hinchliffe et al (2018), some students expressed skepticism about the utility of working together and of getting others’ feedback. Some felt that although this *could* have been a learning experience for improving their IL, time pressures and a desire to finish quickly led them to focus more on their own work instead of collaboration. Others were unsure about how much they could really learn from or contribute to others’ learning, particularly when their chosen sub-topics did not end up being closely related. Students who had the fastest pace in starting their process and moving through the stages also tended to collaborate less as they felt they had already moved on by the time others started

sharing.

A perceived academic skill gap among students affected their attitude about the collaboration for some. If the gaps were perceived to be large, some students who felt they were more skilled did not see the point of working with others and had a perception of being held back. These students did only the minimum requirement of adding sources to Evernote but didn't interact.

However, others who felt more uncertainty in approaching the assignment were more willing to work together and felt that they could learn from others. It is notable here that perception rather than objective skills was most important. For example, the student who ended up receiving the highest grade in the class said that she felt uncertain at the beginning of the assignment process and therefore could see the importance of sharing, receiving feedback, and working together to improve as much as possible. There was also a perception among some individuals that sharing was beneficial for the group overall and their own final grade.

Each group selected the same broad topic, which meant that students were working in the same direction within the group. However, it was discovered that this was not sufficient to encourage collaboration. Some students reported that they did not collaborate after selecting sub-topics. For example, one group was focusing on environmental issues and animals, but they chose bluefin tuna, Sumatran tigers, Japanese giant salamanders, and frogs as their sub-topics.

“In terms of collaboration, each member of our group worked individually. It sounds really selfish, but we didn't collaborate, or, this might sound bad, but I was doing it alone. Of course, we worked together for weekly Evernote assignments. However, since each member had different animals [as a paper topic], we started to realize that we could not consolidate them for the final PowerPoint presentation. . . After that, we discussed and started to add elements to connect different animals.”

“Since I needed to post my comments on other members' notes, I did look at them and learned how they did their research . . . Since each topic was different, I couldn't recall a time when it was very useful. It's more like, I just looked to check how each member was doing.”

Group members' schedules often conflicted, which limited face-to-face meeting opportunities. For some groups, this also meant that their practice of online collaboration was also limited, and thus their chance to learn from each other.

A time lag in posting information was another barrier. Students could share information any time. However, if sharing did not happen with the right timing, it was difficult to collaborate. For example, one student described why he was not able to see other members' notes.

“I tend to post my notes earlier. I didn't see others' much. . . . I thought [student name] was the first person to post notes . . . When I posted my notes, other members had not posted yet except [student name]. That's why I only looked at notes created by [student name].”

Summary

Overall, this study documented that multiple factors impacted the extent of the IL learning through the collaborative assignment tasks, including group dynamics, prompts for students to teach each other information skills, encouragement of students to share exemplars of notes or written assignments,

exposure to different points of view, and time management.

Conclusion

This study investigated how collaboration can be embedded in IL instruction. It documented evidence of what collaboration means and what it can look like in the context of IL, and the potential of collaboration for fostering IL development. The study provides evidence of students' *process*, rather than their end products, which is often invisible to librarians and other course instructors—and transparency invites collaboration (Mackey, 2011).

Our in-depth analysis of students' behavior and reflections in their own words has revealed that three aspects were foundational prerequisites to learning through collaboration:

- Technology that enabled real-time interaction and both active and passive sharing (use of which is itself a metaliteracy skill per Mackey & Jacobson, 2014)
- Meshing of students' topic selection and interests
- Comfort with sharing via the platform (e.g., no fear that others would “steal”)

In addition, multiple factors determined the degree of IL development through the collaborative assignment tasks:

- Group dynamics, commitment, and peer-pressure
- Intentional assignment scaffolding
- Prompts or encouragement to teach each other IL skills including search techniques, narrowing their focus, and evaluating information
- Prompts or encouragement to share exemplars of notes or written assignments
- Exposure to different points of view
- Time management

Those groups that had more active collaboration tended to learn more from each other in terms of how to find, use, and evaluate information. In the affective dimension, anxiety was reduced for many students because the struggles of the early stages were made more visible—and therefore less isolating—through group work, allowing students to think, “I’m not the only one.” They could get immediate feedback without feeling vulnerable (e.g., asking the instructor). Even passive collaboration lessened the feelings of uncertainty. In the area of information behavior, the students who discussed more actively were likewise able to guide each other when it came to search strategies and organization of information. In the cognitive dimension, collaboration affected students in areas such as topic refinement, selection of search tools, and overall sense-making in the research process.

This study has confirmed that the structure of the collaboration has to be carefully crafted to optimize the potential for collaborative learning. This includes the importance of assignment design, the emphasis of certain IL learning outcomes, and instructor intervention (Sormunen et al., 2013; Walton et al., 2007), and potentially including an element of peer review where students comment on or critique each other (Zazzau, 2009).

Educators need to operationalize the IL development and manipulate the factors in order for students to be able to develop their IL learning, taking into account the holistic nature of the process as described in the ISP. It is clear that just because a collaborative assignment is given to students, it does not mean that they will necessarily develop IL skills, knowledge, or practices. Multiple dimensions of the task, environment, and social structure need to be addressed in order for the assignment to be successful in

facilitating and supporting IL development. Student groups who reported effective management of multiple dimensions likewise felt (from their perspective) that they developed IL skills through the assignment.

Limitations

This study collected data from a small group of students in a single course over multiple years. A larger scale study in the future would have the potential to generate insights that could be generalizable to other contexts. In addition, the participants' commentary on their thought processes and motivation is by its nature subjective. Finally, there were gaps in the quantity and quality of data collected from each participant, as the degree of their use of Evernote was voluntary.

Nevertheless, the deep investigation into the students' lived experiences with the research process in a natural environment produced indications of the mechanisms that underlie their development of IL skills in a collaborative context. The next step in this research is to design IL assignments and curriculum that attempt to control for variables that can affect students' learning experiences in each of these dimensions to better support their IL learning processes.

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APPENDIX

Broad topics (Data collection Year 2)

- a) What is the role of international relationships and intergovernmental organizations in solving the problem of food security?
- b) How to reduce environmental problems caused by dams
- c) The causes of desertification and how can they be controlled
- d) How can renewable energy help the natural environment of underdeveloped countries?
- e) What are the threats to biodiversity in today's world, and why are they significant?
- f) What is the role of an individual in conserving energy and water resources?
- g) What is the future of the Paris Agreement?
- h) What is the connection between environmental conservation and poverty reduction?
- i) What are human-caused earthquakes and how can they be reduced?
- j) How is access to water related to gender inequality?

Broad topics (Data collection Year 1)

- a) What is the role of international relationships and intergovernmental organizations in solving the problem of food security?
- b) How to reduce environmental problems caused by dams
- c) The causes of desertification and how can they be controlled
- d) How can renewable energy help the natural environment of underdeveloped countries?
- e) What are the threats to biodiversity in today's world, and why are they significant?
- f) What is the role of an individual in conserving energy and water resources?
- g) What is the future of the Paris Agreement?
- h) What is the connection between environmental conservation and poverty reduction?
- i) What are human-caused earthquakes and how can they be reduced?
- j) How is access to water related to gender inequality?
- k) What is the future of acid rain reduction in Japan?

Data collection Year 1	Group topics
Group 1	How can renewable energy help the natural environment of underdeveloped countries?
Group 2	What are the threats to biodiversity in today's world, and why are they significant?
Group 3	What are the threats to biodiversity in today's world, and why are they significant?
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Group 5	The causes of desertification and

Data collection Year 2	Group topics
Group 9	The causes of desertification and how can they be controlled?
Group 10	What are human-caused earthquakes and how can they be reduced?
Group 11	How is access to water related to gender inequality?
Group 12	How can renewable energy help the natural environment of underdeveloped countries?
Group 13	The causes of desertification and how can

	how can they be controlled
Group 6	What are the threats to biodiversity in today's world, and why are they significant?
Group 7	What is the role of an individual in conserving energy and water resources?
Group 8	What is the future of acid rain reduction in Japan?

	they be controlled?
Group 14	The causes of desertification and how can they be controlled?
Group 15	What are human-caused earthquakes and how can they be reduced?