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# Facilitating Students' Intellectual Growth in Information Literacy Teaching

**Gabrielle K. W. Wong,**  
Guest Columnist

*Correspondence concerning this column should be addressed to **Lisa O'Connor**, Assistant Professor, School of Library and Information Science, University of Kentucky, Lexington, KY 40506.*

**Gabrielle K. W. Wong** is Reference Librarian, The Hong Kong University of Science and Technology Library.

To graduate as self-guided, motivated lifelong learners, university students must become information literate. Teaching information literacy (IL) skills has long been a core role of librarians. As information and communication technology evolves, the focus of IL teaching changes with it. When information first became digital, librarians focused on computer- and database-searching skills. With the advancement of the web, the information environment has become much more complex, even overwhelming, thus the focus of IL needs to shift to conceptual understanding and critical thinking. Teaching IL effectively at a cognitive level requires librarians to understand and consider the stages of students' intellectual development. In addition, well-designed IL interventions can facilitate students' intellectual development.

This column describes the development of an instructional session aimed at enhancing students' IL skills by using socioeconomic data. It explicitly considers the current stages of students' intellectual development and focuses on promoting intellectual maturation in the context of information use.

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## CONCEPTUAL APPROACH IN INFORMATION LITERACY TEACHING

With rapid changes in the current global and information-intensive society, institutions of higher education face the challenge of developing attributes of their graduates beyond subject knowledge. The development of twenty-first-century skills, which include critical thinking, problem solving, communication, and creativity has become an important goal.<sup>1</sup>

IL is essential to helping students to become critical thinkers and lifelong learners. McCormick wrote in 1983 that "one of the values of formal education is to help us continue our education throughout life, and library education can play a vital role in that process, especially education which teaches us to question."<sup>2</sup> Traditionally, a considerable portion of library teaching has focused on mechanical search skills. However, librarians understand the necessity to enrich instructional programs beyond the tool-based approach. IL promotes learning through reflective thinking; it encompasses the conceptual understanding of information creation, dissemination, and use. Gibson contrasts the mechanical, tool-based approach to library skills and the approach that develops critical thinking:

skills must be linked to concepts and taught in context; learners should develop the ability to move from parts

to wholes; and the librarian should become a guide who helps students develop appropriate mental models for understanding new and complex information systems and environments.<sup>3</sup>

With information so abundantly available, taking a conceptual approach in IL teaching becomes more imperative. The challenges for information users have shifted from search skills to information evaluation and use. Herro writes that “the ‘magic’ of computer-generated information and students’ quick acceptance of its validity call for a particular emphasis on applying critical thinking in library research.”<sup>4</sup> Librarians must develop effective instruction programs to help students navigate the information world wisely, select information sensibly, and use it responsibly.

Librarians report many good practices of IL teaching with a strong focus on concepts and reflective thinking. Examples include the following:

- a first-year biology course at Napier University in Scotland that encouraged students to explore and reflect on the processes of finding and using information;<sup>5</sup>
- a third-year course in the teacher education program at Chicago’s North Park College that incorporated debate into the library session, which required students to search for information from multiple points of view;<sup>6</sup>
- an English composition course that taught students how to distinguish scholarship from propaganda;<sup>7</sup>
- an activity in source analysis used in an international business class at Arizona State University East;<sup>8</sup> and
- a lifelong values-based syllabus for teaching IL and critical thinking that was incorporated into the orientation course at San Diego State University.<sup>9</sup>

## INTELLECTUAL DEVELOPMENT OF UNIVERSITY STUDENTS

Closely related to critical thinking, IL involves the ability of individuals to consciously assess their information needs and purposes and control their information strategies. How readily students attain cognitive skills like these depends on their beliefs about the nature of knowledge and learning. Librarians, who often are under the constraints of limited time and availability to students, tend to ignore the impact of these beliefs and fail to realize how quickly they can change as students mature through their relatively young scholarly lives. Jackson examines research findings on the cognitive development of college students by pioneers of the field, including Perry, King and Kitchener, and Baxter Magolda. Jackson reviews the developmental stages discovered by these researchers and gives suggestions of what librarians can do to address students’ learning at different stages. She reiterates that librarians “should understand how levels of cognitive development, or reflective judgment, can have an enormous impact on students’ ability to learn the skills that fulfill the goals of information literacy.”<sup>10</sup>

## Stages of Intellectual Development

Kurfiss provides a practical overview of intellectual development.<sup>11</sup> She integrates developmental stages into four levels:

*Level 1: Dualism, knowledge as facts.* Students believe that knowledge is a collection of discrete facts; therefore learning is simply a matter of acquiring information delivered by professors, who are viewed as the authority of right answers.

*Level 2: Multiplicity, knowledge as opinion.* Students realize that conflicting opinions, theories, and points of view are inevitable features of knowledge. Without understanding the reasons behind the different perspectives, they attribute them to personal opinions, all of which they treat as equal.

*Level 3: Relativism, knowledge as reason.* Students recognize that not all opinions are equal; points of view should be backed up by good logic and evidence. They learn the importance of evaluating an issue by weighing multiple factors.

*Level 4: Commitment in relativism, knowledge as commitment.* Individuals take a position and make commitments of what they choose to do or believe. They are committed to nurturing ideas and developing themselves intellectually.

Research indicates that students entering universities are dualistic or early multiplistic. By the time they graduate, they are able to deal with differing points of view, but still have difficulty relating evidence to argument.<sup>12</sup>

Being aware of students’ developmental stages helps librarians to look at IL from student perspectives. For example, students that are reluctant to explore different information types probably are still at the dualistic level. Students that do not have the patience to evaluate information sources do not have an attitude problem, they lack understanding of the complex nature of knowledge. Librarians can play a key role in helping students progress to higher stages of intellectual development through IL instruction, both in the classroom and through the reference interaction. In particular, IL teaching should consider students’ intellectual stages for effective reception, and at the same time target instruction to facilitate their progress to higher stages.

## Cognitive Skills Defined in Bloom’s Taxonomy

Librarians should also be aware of how cognitive tasks relate to intellectual development. For this purpose, the set of cognitive skills defined by Bloom in his *Taxonomy of Educational Objectives* is a useful instrument.<sup>13</sup> Bloom defined six major classes of skills within the cognitive domain: knowledge/remembering, comprehension, application, analysis, synthesis, and evaluation. Bloom’s hierarchy cannot be mapped linearly to Kurfiss’s intellectual development levels; nevertheless, students at level 1 and level 2 naturally rely more on the “lower-order” cognitive skills when learning. They may find it hard to exercise those “higher-order” thinking skills, which

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## INFORMATION LITERACY AND INSTRUCTION

become more proficient only as students advance to higher development levels.

To help students grow intellectually, librarians can infuse their teaching with elements of critical thinking by designing intervention that facilitates the use of higher-order thinking skills.

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### LIBRARY CLASS FOR SOCIOECONOMIC DATA

#### The Course and the Students

The Library at the Hong Kong University of Science and Technology (HKUST) offers a one-credit course on IL under the general education free-elective framework. The course consists of a one-hour session every week during one semester.

Undergraduate programs at HKUST are provided by three schools: the School of Science, the School of Engineering, and the Business School. Most students have stronger academic exposure in scientific and technical aspects than arts, humanities, and social sciences. Students are most likely at level 1 of Kurfiss's intellectual development levels.

A team of librarians teach the IL course. In the spring 2010 semester, the author was the instructor of two sessions: one on applying critical thinking in information evaluation, another on the use of socioeconomic data. The following sections elaborate on the latter.

#### Teaching Objectives

The instructor delineated these teaching objectives to guide her focus of class content:

- Introduce students to the rich varieties of socioeconomic data fulfilling different information needs.
- Guide students in discovering how socioeconomic data are shaped by definitions and collection methods.
- Help students understand the nature of socioeconomic data by comparing with scientific data with which they are more familiar;
- Guide students in exploring aspects of data evaluation and use.
- Help students understand data-collection methods and dissemination channels so they can devise effective strategies to locate different types of socioeconomic data.

#### Intended Learning Outcomes

Following the move toward outcome-based teaching at HKUST, librarians specify intended learning outcomes for almost all library classes. They clearly communicate intended outcomes to students at the beginning of the courses or classes; in most cases, the outcomes also guide the assessment of teaching.

After the class on socioeconomic data, students were expected to be able to

- describe what socioeconomic data are about;
- describe the differences between socioeconomic and scientific data;
- craft workable strategies to access various socioeconomic data; and
- evaluate data quality on the basis of reliability and authority.

#### Intellectual Skills Consideration

The class was composed of a mixture of lecture and activity sections. The lecture sections aimed to provide either background knowledge for the activities or to consolidate what students had learned in the activities.

The activities were carefully planned so that the intellectual skills required progressed from low to high along Bloom's hierarchy. When the author went through a mental rehearsal, she attempted to take a student's point of view to receive the activities. She projected what background information and guidance a student at the dualistic level would need in order to achieve the intending learning through the activities. This is a crucial exercise for instructors preparing active teaching lessons.

At the same time, the activities facilitated students' intellectual development by leading them to exercise the higher-order thinking skills. Using their understanding of scientific data as a stepping-stone, the session led them to the concept that socioeconomic data that measure and describe human activities can be defined and interpreted in multiple ways. The understanding that data (and knowledge) does not necessarily have objectively "accurate" value (like physical constants) challenged students' dualistic worldviews. The appreciation of multiplicity boosted students to reach the next level in intellectual development.

#### The Lecture Sections and Activities

##### *Understanding Socioeconomic Data (Lecture)*

The instructor introduced socioeconomic data as an important type of information source. To demonstrate the power of data, she used the visualization software GapMinder to show how data could help us understand the world.<sup>14</sup>

##### *Meet Socioeconomic Data (Activity)*

Remembering and comprehension were the main cognitive skills involved in this activity. The purpose was to help students to appreciate the wide range of data under the socioeconomic umbrella.

The instructor gave students a few sources of socioeconomic data, such as the CIA World Factbook, Nation Master, statistics of Hong Kong Exchanges and Clearing, and Hong Kong universities statistics.<sup>15</sup> Each student selected one data set from any of the sites; the class as a whole therefore gathered a variety of data. The instructor then guided students to

categorize them into major classes, such as social condition, economics, transportation, and demographics.

### *Features of Socioeconomic Data (Lecture)*

In this section, the instructor explained the concept of aggregation, longitudinal data, and cross-sectional data. She used examples to illustrate the importance of clear definitions. By contrasting these definitions with the definitions used in scientific data, the students could recognize the difference between the nature of socioeconomic and scientific data.

### *Data Definition (Activity)*

Application and synthesis were the major cognitive skills involved in this activity. The purpose was to help students realize how socioeconomic data could have different definitions, and what implications different definitions may have.

Students, working in groups of four to five, proposed possible definitions of "literacy rate." When the groups shared their suggestions, they saw that socioeconomic data can be defined in different ways, and many of them were equally reasonable. The instructor then guided them to explore the implications of different definitions. The concept led them to recognize the importance of documentation accompanying socioeconomic data.

### *Collection Methods and Agencies (Lecture)*

This short lecture section aimed to consolidate students' understanding of data collection and creation. It covered different data-collection channels, including surveys, administrative records, and research in academic and private institutions.

### *Collection, Reliability and Authority (Activity)*

The cognitive skills involved in this activity included analysis and synthesis. The purpose was to let students simulate the process of data collection and to help them to comprehend the complexity of data-quality issues.

Students revisited the results of the previous activity on data definition. Each group proposed a reasonable collection method for the literacy rate they defined. During the process, students discovered how data definitions affect collection methods. The instructor then guided a discussion on how the collection method and agencies affect the reliability and authority of the data. This led to the next activity on data evaluation and use.

### *Evaluation and Use (Activity)*

The cognitive skills involved in this activity included evaluation and analysis. The purpose of this activity was to explore with students through discussion the issues of data evaluation and use.

At this point, students already understood that it does not make sense to ask if a sample of socioeconomic data are "accurate." The instructor guided students to answer these questions:

- Which types of collection agencies are more authoritative (governments, nongovernmental organizations (NGOs), universities, and research agencies)?
- What factors determine the reliability of data?
- How do the levels and types of aggregation affect the data quality and potential use?
- Why are some data free to the public while some require substantial fees?
- Compared to scientific data, why is documentation more important for socioeconomic data users?
- Is socioeconomic data reproducible?

### *Locating Socioeconomic Data (Lecture)*

This last section explained the information infrastructure for socioeconomic data so students would be able to design effective data-search strategies. It covered how data moves from collection to dissemination, and it defined primary sources (the collector) and secondary sources (publishers). The instructor introduced major databases available via the web and through library subscription, and she pointed students to existing online library subject guides.

### *Reflection on the Learning Experience (Activity)*

The major cognitive skill involved in this final phase was evaluation. The activity encouraged students to review and reflect on the learning in the session. A web forum was used to allow students to share and discuss their thoughts.

## **Class Evaluation**

Although the reflection activity was not meant to be an assessment tool, students' replies revealed whether their perception of the lesson matched the instructor's planning and expectation. Nineteen students out of twenty-five posted their reflection to the online course forum. In the description of what they learned, a number of students explicitly used the verbs "analyze" and "evaluate." For instance, one student wrote "I learnt how to have a critical mind to analyze [the reliability of] data"; another wrote "we have to carefully study the data to evaluate its reliability, coverage and sources." Many specified the understanding that socioeconomic data had no absolute accuracy similar to scientific data.

As expected, some students received the session better than others, and some engaged themselves in the activities more than others. Generally, the teaching objectives were achieved; however, additional time for instruction would have been beneficial. The instructor had to halt discussion because of time limitations, and could not allocate any time for hands-on searching in section 8, in which databases were

introduced. The teaching objectives would have been better achieved in a ninety-minute session. In active learning, students need more time to discuss and to think.

### Transfer of Learning

Perkins explains the three stages of learning process as acquiring skills, making the skills automatic, and transferring the skills to other contexts of application.<sup>16</sup> To facilitate the intellectual development of students, the intervention should provide for all three stages. In the class for socioeconomic data, students acquired the conceptual skills and knowledge of data collection, use, and seeking. Practices in finding a variety of data from different sources would have helped make the skills automatic. The instruction could have used such practices in class if time allowed, or in the form of after class assignments. To facilitate transfer, the course project could encourage or require the use of socioeconomic data. Moreover, if students could apply the skills in other courses during the same or subsequent semesters, then they would have better opportunities to consolidate further skills transfer.

### CONCLUSION

The practice of effective pedagogy means that “higher education institutions should develop learning experiences and student development interventions that are appropriately aimed at the target audience’s cognitive stage or at helping students move to the next stage.”<sup>17</sup> Library teaching is a core element of students’ learning during their university lives. Librarians are in good positions to contribute to students’ intellectual progress. In IL teaching, librarians should work toward designing interventions that can solicit cognitive skills matching and enhancing students’ development levels.

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