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Designing rich information experiences to shape learning outcomes

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Title: Designing rich information experiences to shape learning outcomes

Abstract: Students in higher education typically learn to use information as part of their course of study, which is intended to support ongoing academic, personal and professional growth. Informing the development of effective information literacy education, this research uses a phenomenographic approach to investigate the experiences of a teacher and students engaged in lessons focused on exploring language and gender topics by tracing and analyzing their evolution through scholarly discourse. The findings suggest that the way learners use information influences content-focused learning outcomes, and reveal how teachers may enact lessons that enable students to learn to use information in ways that foster a specific understanding of the topic they are investigating.

Keywords: informed learning, information literacy, pedagogy, phenomenography, variation theory

Introduction

The recognition of information literacy as an important outcome of higher education is exemplified by its inclusion in the accrediting standards of various disciplinary associations in Australia, Canada, the United Kingdom and the United States (Bradley 2013). Students in higher education typically learn to use information as part of their course of study, which is intended to support their ongoing academic, personal and professional growth. Although students have been shown to use information with more complexity and versatility when associated with learning in courses (Limberg 1999; Lupton 2008; Maybee 2006), some higher education teachers may not see this as a priority or an appropriate learning outcome (Webber and Johnston 2005; Feind 2008). Learning to use information in new ways should not compete with subject-focused learning; rather the two should be addressed as integral parts of the same experience (Bruce 2008). The study reported in this paper thus informs lesson design for information literacy within disciplinary courses.

Our investigation extends the previous research by relating an experience of teaching with experiences of learning through lessons guiding students to engage with information as part of learning about a subject. Using a phenomenographic approach, our research focused on two lessons intended to enable students to develop a nuanced understanding of a language and gender topic by analyzing how research on that topic evolved over time. We applied the *variation theory of learning* (Marton and Tsui 2004; Marton 2014), in the analysis of data collected through interviews and observations. The analysis allowed us to identify how information use and subject content were associated with critical aspects or features focused on during the lessons, and relate those to changes in the students' awareness. This is the first study investigating information literacy that uses this research approach.

Literature review

Information literacy is a concept that developed during the late twentieth century as a response to the ubiquity of information afforded by new technologies. Largely promoted by the library community, information literacy educational initiatives originally focused on enabling students to find and ensure the quality of print texts required of college-level assignments. In a 2010 survey, undergraduates from institutions across the United States reported that they did not have trouble locating textual information (Head and Eisenberg 2010b). The difficulty for these students was managing the plethora of information available, scoping projects, and even selecting appropriate topics to investigate. Another line of research indicates that there is an important difference between students who associate using information with learning and those who understand using information solely as an activity unto itself (Limberg 1999; Lupton 2008; Maybee 2006). Exemplifying this point, one study indicated that some undergraduates focused solely on finding and evaluating sources or following a previously learned information seeking process, while students who focused on learning about a topic were able to utilize both of those strategies (Maybee 2006).

Mirroring the student experience, some teachers in higher education explicitly view using information as integral to learning about their subject, while others may see learning to use information as a distinctly separate learning outcome (Webber and Johnston 2005). Despite the changing information environment, a content analysis of undergraduate assignment sheets in the US suggests that students are provided with little guidance in how to use information to complete assignments (Head and Eisenberg 2010a). The standard prompt of “collect five articles, four of them peer-reviewed” that continues to permeate undergraduate assignment sheets, does not guide or encourage students to focus on what they are learning about while they are engaging with information. Learning experiences can include lessons and exercises that guide students in how to gather, evaluate and apply the information needed to complete coursework (Bruce 2008). Learning to use information within a broader learning context is likely to encourage students to use information with more sophistication.

Informed learning is an approach to information literacy that focuses specifically on using information when learning about a subject (Bruce 2008). The types of information and how information is used to learn would be determined by the learning context itself. For instance, if a content-focused learning outcome for a course involved becoming aware of the subject from various perspectives, the coursework would focus on students using information to become aware of those perspectives. To varying degrees, teachers may be intentional about how the students in their courses use information. There is a small body of research that explores informed learning from this perspective (e.g., Maybee et al. 2013; Hughes and Bruce 2012). Our team’s investigation extends this emerging area of research by identifying a way of designing lessons that may move learners from focusing separately on using information, to experiencing learning about a subject as a specific kind of engagement with information. By revealing experiences of a teacher and students learning about a topic through intentional engagement with information, this investigation builds on prior research with the aim of informing the development of effective information literacy education. The research question guiding our study asks:

What are the qualitatively different ways that a teacher and students experience using information to learn in an undergraduate classroom?

To answer this question our team used phenomenography, a methodological approach to educational research that aims to identify experiences of learning (Marton 1986).

Methodology

Phenomenographic studies focus on revealing different experiences of the same phenomenon (Marton 1986). The findings from these studies typically show that different ways of experiencing the same phenomenon will move across a range of increasing complexity, with more sophisticated experiences going beyond, but also including, abilities present in less complex experiences (Marton and Booth 1997). A number of phenomenographic studies explore experiences of information literacy (Lupton 2008; Maybee 2006; Bruce 1997; Webber and Johnston 2005).

Insights gleaned from phenomenographic research (Marton and Booth 1997; Marton and Tsui 2004) informed the development of the variation theory of learning (Marton and Pang 1999). Variation theory suggests that learning represents an individual's change in experience, indicating an evolving awareness of features and aspects associated with an object of learning, e.g., a concept, theory or practice (Marton and Tsui 2004). For example, the object of learning in our investigation was for students to be able to write an essay making a claim about a language and gender topic by tracing its evolution through research studies. Making a *claim* is an aspect common to essays, while identifying a *sequence of research* is a feature that students needed to be aware to understand this specific type of essay.

The interactions that enable learning are referred to as *variations*, meaning that critical features and aspects are separated from the object of learning, allowing students to encounter them. There are three different types of variations that students may encounter during lessons that enable them to understand an object of learning in a new way:

- Contrast refers to when two aspects or features are separated from an object of learning and then compared to each other, for example, scholarly or popular may be features of a journal.
- Generalization is when the same aspect or feature is identified in various instances, for example, science fiction may be a feature associated with books, television shows or movies.
- Fusion happens when two or more aspects or features that have been separated are varied simultaneously, for example, the features of “online” and “journaling” are fused to form the genre of blogging. (adapted from Marton 2014)

Research setting and participants

Our research focused on two lessons in a course at a small private liberal arts college in the United States. Typically taken by third or fourth year undergraduates, the lessons were developed to enable students to explore a language and gender topic by engaging with and analyzing scholarly discourse on the topic. The teacher of the course was not familiar with the concept of informed learning, however, the course met the chief selection criterion that the students would be intentionally using information to learn subject content. Fifteen students

signed a consent form agreeing to be observed during the lessons, with five students also agreeing to be interviewed. Table 1 outlines the characteristics of the students who were interviewed. Ethical clearance to conduct the study was approved by the institution that was the site of the research as well as the researchers' home institution.

Table 1: Participant characteristics

Students interviewed N=5	
Sex	4 - Female 1 - Male
Major	1 - Educational Studies 2 - English Literature 1 - International Relations 1 - Sociology 1 - Spanish 1 - Women's Studies 2 - Writing and Rhetoric
	Note: 4 students were pursuing dual-majors
Age	All between the ages of 18 and 22

Interviews and observations

The data collection processes used in this research followed the phenomenographic methods developed to study lessons using variation theory (e.g., Rovic-Johansson 1999; Runesson 1999). This approach collects and examines data related to three perspectives of an object of learning, which include the:

- intended object of learning (the teacher's intentions for the lessons),
- enacted object of learning (what the learners are exposed to with the intent of enabling learning, e.g., lessons), and
- lived object of learning (the learners' experiences).

The teacher was interviewed before each observed lesson. The interview questions asked the teacher to describe what she intended the students to learn, how she viewed the relationship between the information practices and subject content addressed in the lesson, and what learning activities would be used. Video was used to record the teacher during the two 50 minute observed lessons; due to ethical concerns the students were only audio-recorded. The teacher was interviewed after each lesson and asked if she thought the students learned as intended. Following each lesson, interviews were conducted with five students. The interview questions asked the students to describe what they learned in the lesson, as well as what they expected to learn from completing the assignment. Phenomenography focuses on revealing different experiences, and the pool of the participants provided the necessary data to identify and relate the teacher and students' experiences of the lessons.

Analyzing transcripts

The data from the transcripts of the interviews and observations were analyzed to determine the intended, enacted and lived objects of learning for each of the two lessons. The two pre-lesson

interviews with the teacher informed the intended objects, which represents the teacher's experience. The observed lessons informed the enacted objects. The analysis process was primarily based on earlier phenomenographic studies in which variation theory was used to investigate lessons (e.g., Runesson 1999; Rovio-Johansson 1999). Outlined in Figure 1, the analysis of the lessons included six non-linear steps of an iterative process of examination that involved returning to earlier stages multiple times.

First, we familiarized ourselves with the transcripts by reading each several times. We identified the features and aspects that were focused on, and then determined the types of variations (i.e., contrast, generalization and fusion) that were intended or were being made. It should be noted that the teacher did not design her instruction with the explicit intent of making variations, rather variation is a natural part of teaching. The next step involved associating features and aspects with information use or subject content. While many features and aspects may be varied during a lesson, only some of them are necessary for students to be aware to experience the object of learning in the way intended by the teacher. The features and aspects critical for the intended learning were identified. The last step involved mapping the variations of the critical features that occurred throughout each lesson. Collectively, these variations formed a *pattern of variation*, which is a map of all the variations made during the lesson.

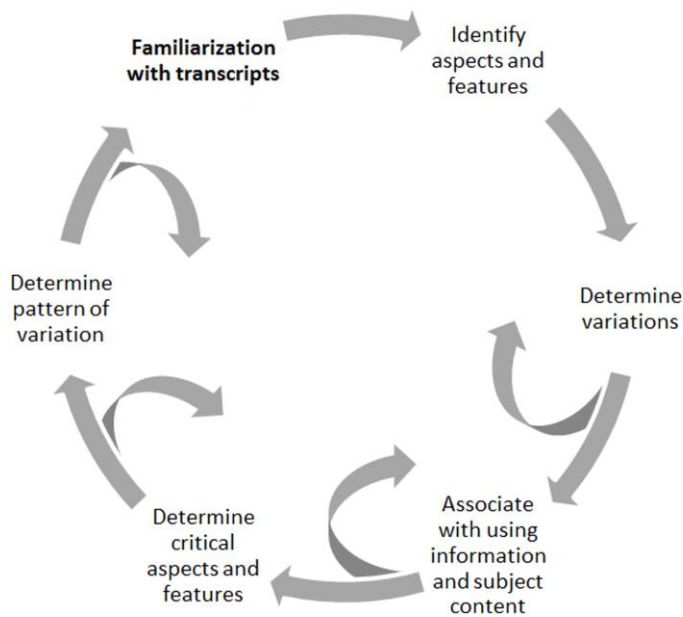


Figure 1: Analysis process for intended and enacted objects of learning

The focus of the analysis of the post-lesson interviews with the students was to determine the lived object of learning, (i.e. the students' experiences of the lessons). Similar steps were followed except that the focus was not on determining how critical features and aspects were varied, but rather to identify the ways in which the students were aware of them.

Findings

This study investigates how a teacher and students experience using information to learn in an undergraduate classroom. For each of the two lessons focused on in this research, the findings describe: 1) the experience of the teacher, revealing her intentions for the lesson to enable students to use information to learn, 2) what occurred during the enactment of the lesson, and 3) the students' experiences of the lesson.

Lesson one

In the first lesson, the teacher introduced the students to the concept of developing an understanding of a language and gender topic by investigating how the topic evolved through research studies. She also intended that students learn some techniques for reporting their new understanding of the topic in an essay. The features and aspects varied in the intended and enacted objects of learning and those that students were aware of in the lived object are outlined in Table 2.

Table 2: Overview of features and aspects in the objects of learning for the 1st lesson

Type	Information use or subject content	Label	Description	Intended	Enacted	Lived		
						New way of learning	Specific essay	Any essay
Feature	Information use	Sequence of research	Analysis identifying how a topic evolved over time through research	•	•	•	•	
Feature	Depends on context	Seminal text	Text presenting a highly original idea influencing the development of future research	•	•	•	•	•
Feature	Subject content	Themes	Themes related to the seminal text		•	•		
Aspect	Neither	Type of paper	Differentiation of papers by their purpose or structure	•	•	•	•	•
Aspect	Subject content	Thesis statement	Statement that expresses an assertion or judgment	•	•			•
Aspect	Subject content	Claim	Assertion or judgment	•	•	•		
Aspect	Subject content	Paper topic	Specific language and gender topic		•			

Intended object of learning (Teacher experience of the lesson)

The intended object of learning is the teacher's experience of the lesson. In the interview conducted prior to the first lesson, the teacher described her intentions for the enacted lesson.

This included the activities she planned for the students to engage in and what she hoped the students would learn from those activities. Overall, the teacher described three aspects (*type of paper*, *thesis statement*, and *claim*), and two features (*seminal text* and *sequence of research*) that she intended the students to become aware of through the lesson. The analysis revealed that *types of paper*, *thesis statement*, and *claim* were associated with the content of the lesson, meaning that they emphasized developing an understanding of a language and gender topic. In contrast, *sequence of research* referred to tracing scholarly development, and included searching, reading, and tracking the influence of one piece of research upon another, and therefore was associated with using information. The feature of *seminal text* could be associated with content (when it referred to the introduction of a new topic), but was primarily associated with using information (viewed as the start of a sequence of research).

The teacher planned to begin the lesson by contrasting what she considered a typical college paper, in which students gather sources that align with a student's previously determined stance on the topic, with the essay she assigned. The assigned essay focused on developing an understanding of a language and gender topic by tracing the scholarship on the topic emanating from a seminal piece of research. The teacher focused on the features of *sequence of research* and *seminal text*, by describing both as elements of the assigned essay. The teacher also fused the aspect of *thesis statement* with *sequence of research* to describe the nature of a thesis statement appropriate for the assigned paper. The aspect and feature identified through analysis have been indicated in brackets in the following quote:

Your *thesis* [*thesis statement*] is only about the logic of *the progression of these particular texts* [*sequence of research*] arranged in whatever sequence you, the author, think is best. (Teacher, 1st pre-lesson interview)

The teacher used the metaphor of the students "listening to a conversation" to describe the students' engagement with the research that evolves from a seminal work, which should lead to them "designing a judgment of their own" (*claim*). The teacher intended to spend the remaining time focusing on the two readings that were assigned for the day, an editor's introduction (Bucholtz 2004b), and a second essay where the editor discusses the subsequent contributions to the volume (Bucholtz 2004a), which consists of scholarly essays responding to a seminal text in linguistics (Lakoff and Bucholtz 2004). The students would be asked to complete an exercise where they would individually spend five minutes writing down a claim that Bucholtz made in her essays about Lakoff's work. In the discussion following the exercise, the teacher intended to convey that the claims Bucholtz made may be considered a scholarly version of what the students are intended to produce.

Enacted object of learning (The lesson)

The aspects and features of an object of learning varied by a teacher during an enacted lesson enable the students to become aware of features and aspects of the object of learning (Marton and Tsui 2004). In addition to the five critical features and aspects identified in the analysis of the pre-lesson interview with the teacher, one other aspect, *paper topic*, and one other feature, *themes*, were critical for students to become aware of in order to experience the lesson in the way the teacher intended. As with the intended object of learning, the features of *sequence of research*, and *seminal text* are associated with using information, while the other features and aspects are associated with subject content.

The primary activity in the first lesson was the teacher describing the essay project and the learning that she intended to result from it. At the beginning of the lesson, the teacher contrasted the *type of paper* (aspect) by comparing the assigned paper with the typical style of paper students would have written for other courses. Later in the session, the teacher focused on the readings that the students were assigned for that day, which were to act as a model for the assigned paper. In doing so, the teacher generalized types of essays that discussed a topic by analyzing how it evolved through research. Using the readings as examples, the teacher highlighted and separated the features of *seminal text* and *sequence of research*. The aspect of *claim* was separated when the teacher had the students identify claims that the author made in her essays about an original text. Near the end of the class session, *themes* related to a seminal text were focused on when the teacher asked the students to identify strategies used by the author for making a claim about a seminal text.

The variation of fusion is when two or more aspects or features that have been separated are focused on simultaneously (Marton and Tsui 2004). In two instances the teacher fused critical aspects associated with subject content with a feature associated with using information. The teacher asked the students to generate potential topics that they might consider for their individual essays, then offered her own topic example by fusing *paper topic* with a *sequence of research*:

...interruption, that's a classic one, because interruption was first defined as a kind of power play of men over women. ...West and Zimmer, which were researchers that I have not assigned, but which you will easily find, wrote some important essays about that, from that point-of-view, quite a long time ago. ...the whole notion went through some redefinitions, and you read Debra Tannen on overlap, and on collaborative and supportive kinds of overlap. So, you see how the topic got redefined, and then there were studies done studying that, and so on. And now we have a much more complicated understanding of interruption than we did at the beginning. (Teacher, 1st lesson observation)

The teacher also fused the aspect of *thesis statement* with the feature of *sequence of research* when describing a thesis appropriate to guide the assigned essay, which would reflect an understanding of how the topic evolved through research.

Lived object of learning (Student experience of the lesson)

The analysis of the post-lesson interviews with the students revealed their experiences of the lesson. The students were collectively aware of a total of eleven features and aspects related to the assigned essay. These included three of the aspects and three of the features identified as critical to understanding the object of learning as enacted in the classroom: *sequence of research*, *seminal text*, *types of papers*, *thesis statement*, *claim* and *themes*. However, the features and aspects were focused on differently by different students, resulting in three experiences of the lived object of learning for the first lesson:

- New Way of Learning (students experienced the lesson as presenting a way of gaining new insights about a topic by conducting research in a particular way);

- Instructions for a Specific Essay (students experienced the lesson as offering techniques for completing the assigned paper); and
- Instructions for Any Essay (students experienced the lesson as relating generic instructions about the steps involved in conducting research and writing).

The experience of A New Way of Learning aligned closely with the teacher's intentions for the lesson. These students were aware of all but two (*paper topic* and *thesis statement*) of the features and aspects identified as critical through the analysis of the intended and enacted objects of learning. The students with this experience simultaneously focused on *sequence of research* and *themes* or *claim*, and thus were focusing simultaneously on using information and subject content. For example, when answering what she expected to learn from the assignment, one student simultaneously focused on the notion of *themes* and a *sequence of research*:

...be able to sift through all that and sort of come up with something, come up with themes that connect them all, just make these connections between them.
(Amanda, 1st post-lesson interview)

The experiences of Instructions for a Specific Essay and Instructions for Any Essay primarily focused on using information, but not subject content. The students experiencing the object of learning as Instructions for a Specific Essay were primarily concerned with meeting the requirements of the assignment:

...we were looking at how Bucholtz introduced Lakoff's text, and connect it to future texts that sort of stem from it, and that's sort of what we're supposed to do with our own projects by finding a text and then finding texts that were influenced by it. (Mary Ann, 1st post-lesson interview)

These students emphasized understanding elements of the readings that were described as the model for this assignment. They were aware of the features of *sequence of research* and *seminal text*, but not aware of other critical aspects or features of the object of learning, such as *claim* or *themes*.

In the experience of Instructions for Any Essay the assigned essay was understood as being similar to, or the same as, a typical undergraduate essay. The student experiencing the lesson in this way was aware of the critical feature of *seminal text* and the critical aspects of *thesis statement*, and *type of paper*. However, these critical elements were part of an experience that included six other aspects: *research process*, *reading*, *time management*, *critique* (as part of a persuasive argument), *personal opinion*, and *organizational elements*. Related primarily to using information, the non-critical aspects may be considered generic aspects of researching and writing undergraduate essays.

Lesson Two

Between the first and second lessons, the students attended a workshop on how to track citations and were required to locate and read scholarly materials on their chosen topic to begin identifying how the research evolved over time. In the second lesson, the teacher arranged the students in small groups to critique each other's draft thesis statement to determine if each statement reflected a claim about a language and gender topic based on an analysis of how the

topic evolved through research. The features and aspects varied in the intended and enacted objects of learning, and those that students were aware of in the lived object, are outlined in Table 3.

Table 3: Overview of features and aspects in the objects of learning for the 2nd lesson

Type	Information use or subject content	Label	Description	Intended	Enacted	Lived
Feature	Information use	Sequence of research	Analysis identifying how a topic evolved over time through research	•	•	•
Aspect	Subject content	Thesis statement	Statement that expresses an assertion or judgment	•	•	•
Aspect	Subject content	Claim	Assertion or judgment	•	•	•

Intended object of learning (Teacher experience of the lesson)

The analysis of the interview conducted prior to the second lesson revealed the teacher’s experience of this lesson. The teacher indicated the need for the students to shift their awareness away from the “standard” paper and to begin to more fully understand the nature of the assigned paper. In explaining the classroom activities, the teacher implicitly described two aspects (*thesis statement*, and *claim*), and one feature (*sequence of research*) that she intended the students to become aware of through the lesson. As with the first lesson, *thesis statement*, and *claim* are associated with subject content and *sequence of research* is associated with using information.

The teacher explained that most of the lesson would involve a small group exercise in which students would give feedback to one another about their draft thesis statements. As students moved on to discuss the other students’ conclusions regarding the thesis, the aspect of *thesis statement* could be generalized, highlighting different attributes referred to by the teacher as “too broad, too general, and too fuzzy,” or not making “a clear statement of judgment.” The teacher also suggested that she might have the students rewrite their thesis statement in an effort to improve it. When asked what would be an indicator of improvement of the thesis statement, the teacher focused simultaneously on *sequence of research* and *thesis statement*:

...if they could make a sharper thesis about influence and development. That this seminal text started these ideas in motion and these scholars responded to those ideas in their...in these ways and, therefore, the sequence shows us a development over time in this specific idea. (Teacher, 2nd pre-lesson interview)

The teacher’s description of the plenary discussion that would happen after the small group work suggested that she would likely fuse the aspects of *thesis statement* and *claim* by saying to the students, “this thesis is further along than that thesis, because it offers a judgment that’s related to the assignment.”

Enacted object of learning (The lesson)

The variations that occurred throughout the second lesson were primarily forms of fusion, referring to when two or more aspects or features are focused on simultaneously (Marton and Tsui 2004). Aligning with the pre-lesson interview, the critical features and aspects varied during the second lesson included *thesis statement*, *claim* and *sequence of research*. The feature of *sequence of research* is associated with using information, while the aspects of *thesis statement* and *claim* are associated with subject content.

The teacher began the second lesson by describing what was expected of the student groups. She focused on the critical aspect of *thesis statement* when explaining to the students that they were to identify the thesis statement in the introduction written by another student in the group. She also asked the students to write down an answer to the question, “Does the thesis fulfill the assignment?” which implicitly asked the students to determine if the thesis made a *claim* about a *sequence of research*. The students began working in groups of two or three. From this point forward, the variations were not the same for all of the students, but were dependent on the features and aspects focused on and varied by the members of the group.

Three groups were observed when the teacher joined them. The discussion in Group A centered on Stephen’s questioning if Jessica’s thesis statement reflected the development of her topic over time. This brought the feature of *sequence of research* to the fore and then fused it with the critical aspect of *thesis statement*. The discussion culminated in Jessica fusing *sequence of research* and *thesis statement*, and the teacher extending this by fusing these with *claim*:

Jessica: Yeah, I mean I think this thesis would be, (inaudible) the last sentence, “As the relevant field of inquiry, scholars have made advances in the way they think about masculinity and language,” etc. But I think the thesis could be what those shifts are...

Teacher: Just what I was going to say, that you’ll work yourself to a judgment where you actually state...

In Group B, a student asked the teacher to respond to a comment on her essay proposal. In her response, the teacher contrasted a thesis statement for another type of essay with one that makes a claim about a sequence of research:

Teacher: If you’re going to give me those two options...my voice, my opinion, versus the patterns, then the answer is the patterns. ’cause this is not a personal essay, right? This is an analytic essay about a pattern...about a sequence. So, do your thesis statements so far look like that, do they look like they match the assignment?

In working with this student to identify the significance of her topic, the teacher fused *topic* and *sequence of research* by focusing first on her topic (women using expletives), then suggesting that she investigate the scholarly conversation on the topic. Next the group turned to the discussion of Amanda’s work. Amanda generalized *topic* when describing her topic to the teacher:

Amanda: ...I read an article and it had mentioned Tina Faye ...being like kind of...like a bully,...because she was...putting down women and things like that. ...I think that's...sort of saying how women are, you know, using the male... raunchy humor.

In her response, the teacher fused *topic* and *sequence of research* by telling Amanda to consider her topic in relationship to scholarly commentary on the topic:

Teacher:...reread your sequence with that in mind, and ask yourself...are they interested in the question? Does it seem to fall within their purview? I'll bet you'll find that it does at least in some ways, because it seems like such an obvious question to ask. You know, what do women gain from acting like men? Do they really gain equality? Are they thought of more positively, because men are more privileged in our culture?

During the teacher's interaction with Group B, *sequence of research* was fused with *claim*, *paper topic*, and *critical analysis*. Near the end of the class period, the teacher joined Group C and fused *sequence of research* and *thesis statement*, by asking the students if their thesis statements reflected a sequence.

Lived object of learning (Student experience of the lesson)

Following the second lesson, the students' experience aligned with the teacher's intentions for the lesson. All of the students were aware of the feature and aspects that were critical to the intended and enacted objects of learning: *sequence of research*, *thesis statement* and *claim*, and focused on one or more simultaneously. The students compared the thesis statement of the assigned paper with the thesis of a "typical" research paper. One student did so when describing his interaction with the student he worked with in the small group exercise:

...I didn't think her thesis was answering the question, because I thought it was kind of going down the more quote unquote traditional research path. (Stephen, 2nd post-lesson interview)

Each of the students focused on the *sequence of research* as an important feature of the assigned paper. Stephen suggested that he needed to "map" his "way through this kind of like academic discussion," while Amy described herself as "tracing the evolution of the change." *Sequence of research* was focused on simultaneously with *thesis statement* or *claim*. Shelly focused on *thesis statement* and *sequence of research* when describing possible thesis statements that derived from her exploration of women's humor:

...maybe our thinking about women's humor has... hasn't changed so much ...as the women's humor has changed itself...in that way, I have like two chronological things. I could trace the chronology of thinking about, you know, women's humor, but at the same time women's humor was also changing...I should...include that in my thesis too... (Shelly, 2nd post-lesson interview)

Two students also focused simultaneously on *sequence of research*, *thesis statement*, and *claim*, the feature and aspects critical to experiencing the second lesson in the way intended. One student did so when describing the thesis statement that governs the assigned paper:

...I mean you are going to stake a claim as your thesis, but you're not trying to respond directly to one claim and then back yourself up. You're supposed to comment broadly on...the broader academic discussion... (Stephen, 2nd post-lesson interview)

Discussion

Recent research suggests that in learning contexts where using information is experienced simultaneously with curricular content, participants may use information with more sophistication (Lupton 2008). In the present study, students experienced this type of simultaneity due to the intentional designs of the teacher. Findings also indicate the teacher's awareness that if students learn about language and gender issues by tracing the evolution of the topic, their learning will be qualitatively different than if they learn by searching for evidence to support pre-existing or instructor-identified views of the topic. This finding extends earlier research (Limberg 1999, Lupton 2008) by suggesting that what students learn about a topic is influenced by the way they engage with information.

Our findings also reveal a pattern of variation that may be used to enable informed learning (see Figure 2). A pattern of variation refers to the variations (separation and fusion) of features and aspects that the students encounter in the lessons. The pattern of variation determines what is possible for students to learn (Marton and Tsui, 2004). In our study, features and aspects of the object of learning were associated with information use and subject content. This association allowed us to identify how using information and subject content were varied across the two lessons. In the first lesson, using information in the form of the feature of a *sequence of research*, and various features and aspects related to subject content were separated. Indicating the fusion of using information and subject content, *sequence of research* was drawn together with the critical aspects of *thesis statement* and *paper topic*. The fused feature and aspects exposed the students to the intended object of learning, that is an understanding of a language and gender topic based on an analysis of how the topic evolved through research over time. After this lesson, some of the students experienced using information and subject content simultaneously, while others were only aware of using information.

Separated in the first lesson, the aspects of *thesis statement* and *claim* and the feature of *sequence of research* were almost exclusively fused through the activities in the second lesson. This finding aligns with variation theory, which suggests that learning is best enabled by separating features and aspects and then fusing them (Marton 2014). Fusion was accomplished by having the students work in small groups to develop a thesis statement for the assigned paper. After this lesson, all of the students experienced information use and subject content simultaneously. The findings from this research suggest that enabling students to focus simultaneously on engaging with information and subject content involves a pattern of separating and then fusing aspects or features related to both information use and subject content.

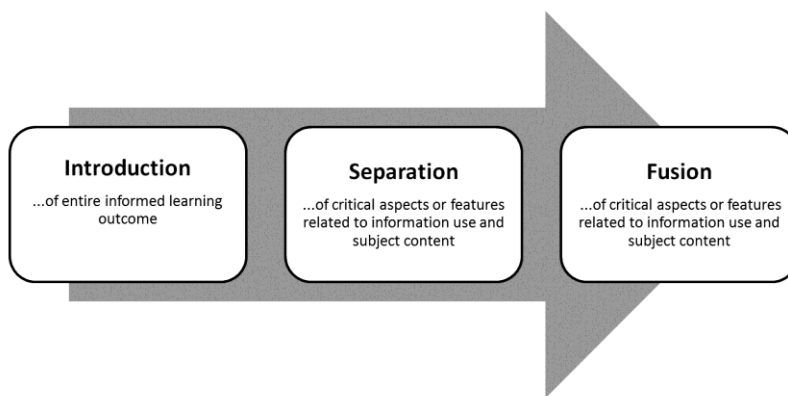


Figure 2: pattern of variation to enable informed learning

Our findings suggest that teachers should consider how content-focused learning outcomes will be shaped by the ways in which learners are asked to engage with information. To support educators in the development of informed learning lessons, it would be beneficial to develop a body of research that reflects the evolving understanding of informed learning in various educational contexts. The phenomenographic approach used in our study has been adapted for use with an approach called a *lesson study*, where groups of teachers observe and discuss ways of improving lessons (Lewis 2000). Applying variation theory as an analytical tool for use within a lesson study framework is known as *learning study* (Pang and Marton 2003). Typically involving a collaborative effort between researchers and teachers (Pang and Ling 2012), a learning study approach has been used in higher education settings (Åkerlind, McKenzie, & Lupton, 2014). The approach could be employed to study teachers and students' experiences of informed learning. Working with researchers, teachers would reflect on and identify which features and aspects critical to an object of learning are associated with information use and subject content. Researchers would observe lessons taught by different teachers and then interview students to determine which interactions enabled the students to become aware of using information to learn. Using variation theory as a guide, researchers and teachers could modify lessons until the lived experiences of that lesson aligned with the teachers' intentions for learning.

Conclusion

Although information literacy emerged strongly as a domain of research interest in the 1990s (e.g., Doyle 1992; Bruce 1997; Bruce 1998), the focus has shifted from defining it to determining how information is used to learn (Bruce 2008). Our research highlights the linkage between using information and learning about a topic and suggests a pattern of variation that may be used to enable informed learning in higher education courses. Initial research in this area, the research methods used in our investigation are applicable to the study of teaching and learning experiences of using information in diverse higher education learning contexts.

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