

## The Language of Digital Learning Objects: A Cross-disciplinary Study

**Gulnara Sadykova**

[gs2129@albany.edu](mailto:gs2129@albany.edu)

**Carla Meskill**

[cmeskill@uamail.albany.edu](mailto:cmeskill@uamail.albany.edu)

University at Albany  
Albany, NY USA

### Abstract

In order to determine the similarities and differences between disciplines in how each uses the language of teaching and learning, this study undertook linguistic analysis of 1,691 peer reviews in the MERLOT (Multimedia Educational Resources for Learning and Online Teaching) digital learning objects collection. Language concordancing software was used to identify trends particular to the sciences, the humanities and education. Findings specify the variation in word choice, sentence length, sentence structure and descriptive/analytic uses of language that emerged between the disciplines. Analyses suggest both points of convergence and divergence that can guide principles and standards for instructional design and cross-disciplinary dialogue and collaborations around teaching and learning.

**Keywords:** digital learning objects, discipline specific discourse, cross-disciplinary dialogue, language concordancing.

### Introduction

We share cultures through language. In the culture of Education, for example, there are specific ways of using language to describe teaching and learning. This language becomes further differentiated within the culture of Math Education or Music Education. In spite of such differences, a discipline-neutral discourse of teaching and learning has recently evolved from the newer field of Instructional Technology where teaching and learning are typically discussed as generic. It is the aim of this research to provide empirical evidence of real differences in how disciplines conceive of and speak about teaching and learning.

The wave of change in instructional technology often pulls together faculty from different disciplines. Faculty members from as diverse areas as Engineering and Literature find themselves in the same instructional design/technology workshops thinking and talking about teaching and learning as if these concepts were conceptually and linguistically shared. This study examines the underlying conceptual grounding that faculty from differing disciplines bring to such discussions. As this kind of interdisciplinary activity grows, the issue of common language and concepts regarding instructional practices becomes increasingly important. We believe that clarifying similarities and differences between disciplinary discourses around digital learning objects can lead to more accurate and rewarding interdisciplinary conversations regarding instructional practices overall. We view evaluation of digital learning objects as representing a unique venue for 1) examining the different discourse patterns used by different discipline communities; and 2) examining convergences and divergences around teaching and learning that both exemplify and transcend disciplinary boundaries

### *Digital Learning Objects*

The term 'digital learning object' is a relatively new one. The term describes pieces of instructional material typically found on the internet. To some, "learning objects represent a completely new conceptual model for the mass of content used in the context of learning" (Hodgins, 2002, p.1). The

development and use of this new conceptual model can be considered part of the larger effort on the part of instructional technology theorists to name discipline-independent theories of learning. Contemporary theories of instructional design, for example, include budding theories on the composition and sequencing of learning objects (Wiley, 2000), the metadata they might contain, and standards for their design (Godwin-Jones, 2004). For others, however, digital learning objects are merely additional curricular material at their disposal. A conclusive definition remains elusive as, at present, any of the following may fall under the digital learning object umbrella: lectures, lecture handouts, tests and quizzes, interactive assignments, images, slides, cases, models, virtual experiments, simulations and reference material. For our purposes, learning objects are considered to be “small, reusable chunks of instructional media” (Wiley, 2000, p.2). Digital learning objects are often cataloged in learning object repositories such as MERLOT (<http://merlot.org>) from which our data is drawn.

### *Disciplinary Discourse*

There is ample evidence of systematic variation between the language used in academic disciplines (e.g., Biber, Conrad, Reppen, Byrd, & Helt, 2002; Csomay, 2005). Indeed, the fact of distinctly different academic disciplines and their disciplinary discourses has been likened to tribalism (Bauer, 1990; Becher, 1989). What contrasts one tribe from another is the language each speaks as well as the overall essential epistemologies concerning the subject area (Table 1). The discourse choices we make – how we use language within our disciplines - match the expectations of the community in which we are accustomed to communicating (Meskill & Anthony, 2007).

Table 1. Disciplinary Differences

<b>Humanities</b>	<b>Sciences</b>
Evocative	Analytical
Social construction of knowledge	Scientific view of truths
Critical	Empirical
Evaluative	Objective
Integration	Simplification through isolation

In short, disciplinary differences are manifest in widely varying epistemologies, discipline-specific discourses, disciplinary traditions of teaching and learning, and in students’ preferred learning approaches and styles (Bradbeer, 1999). With instructional technology activities in higher education bringing these diverse groups together to address issues of teaching and learning, one might conclude that between-discipline communication would be thus constrained. How do the disciplines view and talk about their teaching practices and their students’ learning? German sociologist Karl Jaspers calls this the “creative tension” that occurs when people from differing disciplines, with different discipline-specific ways of knowing and talking come together (Jaspers, 1959).

### *Evaluating Digital Learning Objects*

Evaluating digital learning objects “helps in clarifying audiences and their values, identifying needs, considering alternative ways to meet needs (including selecting among various learning objects), conceptualizing a design, developing prototypes and actual instructional units with various combinations of learning objects, implementing and delivering the instruction, managing the learning experience, and improving the evaluation itself” (Williams, 2000, p.1). Since 1999, the MERLOT repository (<http://merlot.org>) has been collecting, curating, and subjecting to peer review tens of thousands of high quality digital learning objects from a wide range of disciplines. The peer review process consists of two faculty members within the designated discipline providing numerical ratings and prose reviews of the digital learning object. A composite review is then developed by an appropriate editorial board and posted on the MERLOT site. This process produces a written, publicly accessible review, the language of which is the focus of analysis for this study.

## Methodology

For the purposes of this study the archived texts of 1,691 MERLOT peer reviews were saved as text files and included in the corpus of one of the three focal discipline groups: Education, Humanities or Hard Sciences. The Education group is comprised of 321 texts that reviewed learning objects in education. The Humanities group includes 478 reviews in history, music and world languages. 892 reviews in biology, chemistry and physics comprise the Hard Sciences group.

Corpus-based concordancing methodologies (see Biber, Conrad & Reppen., 2002) were utilized to capture linguistic characteristics of the disciplinary discourses. The Concordance software, developed by R.J.C. Watt (<http://www.concordancesoftware.co.uk>), served as the primary data analysis tool. The quantitative analysis of data was complimented by the qualitative study of the context in which words are utilized in each of the discipline groups.

The following research questions guided the analysis of the texts under examination:

1. What are the differences and similarities in vocabulary choice of reviewers in Education, Humanities and Hard Sciences? Do disciplines differ in the frequency and contextual usage of lexicon items often found in the selected texts?
2. Do there exist any distinct variations in who is seen as performing the teaching and the learning with the learning objects being reviewed? Who is the primary agent (doer) of the instructional process – the teacher, the student, or the learning object?
3. Do disciplinary discourses differ in their syntactical organization?

Finally, through our analyses we wished to probe the larger question of how corpus-based analysis of disciplinary discourses might inform the fields of instructional design, cross-/inter-disciplinary studies, and/or other fields.

## Results

### *Most Frequent Words*

Investigating the frequency of words provides valuable insight into the language peculiarities of a given text and enables comparison with other texts (Biber, Conrad, & Reppen, 2002). For our initial analysis we first focused on the most frequent words that occur in texts composed by reviewers in Education, Humanities and the Hard Sciences. Table 2 shows the top ten most frequently used words in each disciplinary group. Here and later in the article we use “word” to refer to a *lemma*, i.e. “the base form of a word, disregarding grammatical changes such as tense and plurality” (Biber, Conrad, & Reppen, 2002, p.29). Thus in tables and discussions each word represents a word family where each member is derived from the same root.

The three disciplinary groups share 7 out of 10 words (70%) from the list of 10 most frequently used words. Each group also includes one or two words that are not frequent in the other two discipline groups (see shaded cells in Table 2 and italicized words in red ink in Figure 1). Not surprisingly, reviewers in Education often use words with the common root *educate*. Those in Humanities often talk about *languages* and *French* in particular, which could be explained by the large number of learning objects related to language learning and teaching. Reviewers in the Hard Sciences often use the word *applet* to refer to learning objects in their discipline group. Educators also use the descriptor *resource* to describe the electronic materials, while their colleagues in the Hard Sciences choose to review learning objects descriptively utilizing such words as *very* and *easy*.

Sharing individual words, however, does not mean that disciplines coincide in the whole corpus of vocabulary used. Z-tests (confidence interval  $\geq 95\%$ ,  $p < 0.05$ , 2-tailed) revealed statistically significant differences between the usage of all shared vocabulary: no word is used at the same frequency rate in all three discipline groups, though some words could be used at the same rate in two disciplines (see Figure 1). For example, word groups derived from *site*, *use* and *learn* are used at the same rate in Education and Humanities; the lemma *study* is as common in Education as in the Hard Sciences, while *inform* and *provide* showed no difference in frequency when Humanities and the Hard Sciences were compared.

Table 2. Ten Most Frequently Used Words (Lemmas) in Each Disciplinary Group

Education N=218,731	Humanities N=262,225	Hard Sciences N=436,004
Site 150 (3281)	Site 148 (3892)	Use160 (6998)
Use130 (2837)	Use 136 (3567)	Study117 (5110)
Teach 123 (2680)	Study 105 (2757)	Site 81 (3548)
Study 121 (2643)	Learn 73 (1911)	Applet 64 (2777)
Learn/learner 75 (1637)	Material 49 (1293)	Material 42 (1837)
Educate 72 (1575)	Language 48 (1271) + French 25 (665)	Provide 41 (1781)
Provide 59 (1280)	Teach 47 (1224)	Link 37 (1600)
Inform 56 (1225)	Link 45 (1175)	Learn 32 (1405)
Link 53 (1162)	Provide 44 (1166)	Very 32 (1391) + Easy 30 (1301)
Resource 50 (1088)	Inform 31 (823)	Inform 30 (1311)

Note: Frequency per 10,000 words, raw number in brackets. Shaded are cells that include words specific for a discipline group.

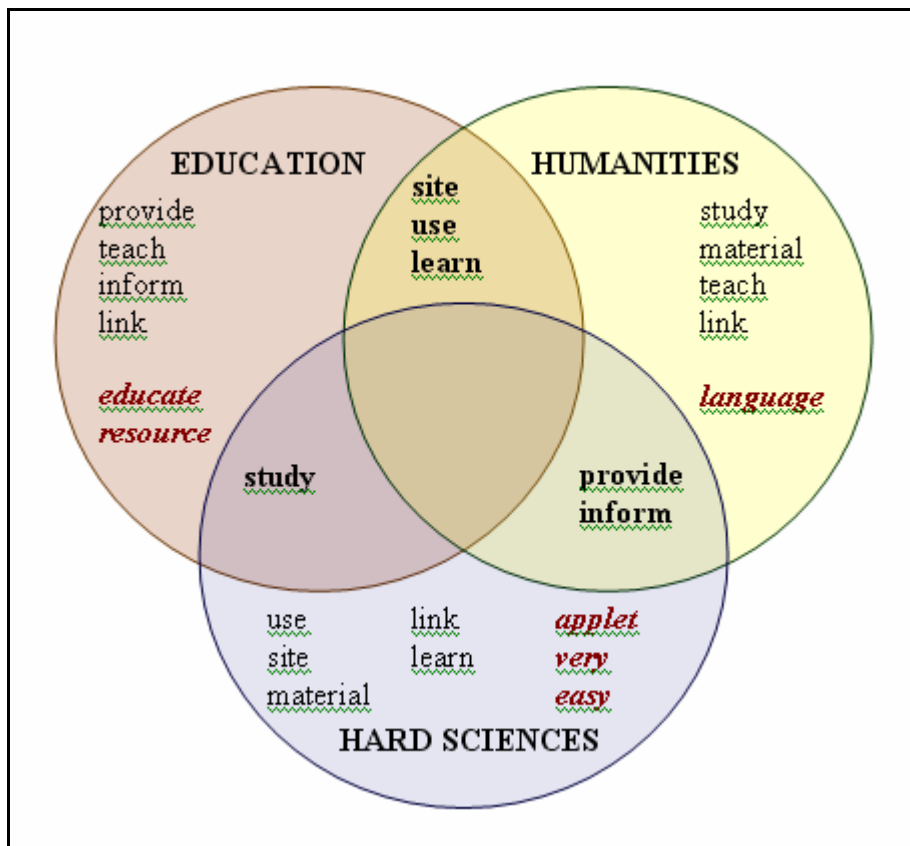


Figure 1. Most Frequently Used Words: Points of Convergence and Divergence

Thus, while disciplines may share commonly used words, when the whole body of vocabulary used in each discipline is taken into account, we see differences in frequencies. It seems that it is the genre of review, as well as the similarity of objects being analyzed, that make the top 10 list identical in 7 out of 10 instances. However, differences in disciplinary discourses surface when close statistical analysis is carried out.

### *The Not Too Surprising Category*

While the top 10 list mostly consists of words common to the three disciplines, further analysis reveals a number of words whose use is unique to the discipline. Closer examination allowed us to determine those words that we include in the Not Too Surprising category (see Table 3). As the category title indicates, this category consists of words that one would expect to find in a given discipline.

Overall, the words belonging to the Not Too Surprising category can be described as:

- a primary subject of the discipline (*education, culture, language*)
- an object of study (*vocabulary, concept*)
- learning stakeholders (*teachers, students with disabilities*)
- teaching/learning tools (*rubric, audio, applet, animation*)
- ways of presenting and acquiring knowledge (*design, discuss, scaffold, guide, practice, conceptualize, see, structure*).

Table 3 below visually compares these vocabularies across the three discipline groups. All words included in the table show statistically significant differences in the rate at which they are used by one of the three discipline groups when compared with the other two groups. Some of these words are virtually non-existent in the other disciplines. For example, the word *scaffold* seems to be familiar only for reviewers in Education, while *parameter* is used almost exclusively in the Hard Sciences. These words could be described as professional jargon. Still, a number of words, though belonging to the common lexicon, find their home in one discipline group while being rare guests in others. These words reveal a unique worldview in which some phenomena are more valued and more often talked about than others. This is supported not only by the high frequency of a lemma in general, but also by the variety of derivatives that belong to the same word family. For example, the lemma *culture* has 22 derivatives in the Humanities, 11 derivatives in the Hard Sciences (including *agriculture* and *horticulture*) and only 8 word family members in Education, which shows the importance of this concept in the Humanities.

Table 3. Not Too Surprising Category

<b>Words</b>	<b>Education</b> N=218,731	<b>Humanities</b> N=262,225	<b>Hard Sciences</b> N=436,004
disability	10 (215)*	0 (1)	0 (0)
design	23 (505)*	18 (481)	13 (570)
discuss	14 (310)*	10 (273)	8 (363)
educate	72 (1575)*	8 (204)	8 (333)
evaluate	9 (192)*	2 (50)	1 (48)
guide	13 (284)*	9 (240)	6 (281)
rubric	9 (195)*	1 (19)	0.1 (5)
scaffold	1 (15)*	0 (0)	0 (0)
teach	131 (2862)*	47 (1224)	14 (629)
audio	4 (97)	20 (537)*	2 (93)
culture	5 (114)	31 (802)*	1 (57)

French	0 (1)	25 (665)*	0 (8)
history	7 (152)	31 (800)*	5 (226)
language	8 (181)	48 (1271)*	3 (146)
music	1 (28)	25 (650)*	0 (14)
practice	12 (267)	16 (427)*	5 (203)
vocabulary	2 (41)	17 (448)*	1 (53)
animate	3 (71)	5 (131)	26 (1114)*
applet	2 (52)	5 (124)	64 (2777)*
concept	14 (312)	5 (140)	26 (1122)*
cover	3 (75)	5 (142)	10 (440)*
interactive	9 (188)	11 (289)	21 (902)*
parameter	0 (1)	0 (7)	8 (341)*
see	6 (131)	6 (153)	12 (530)*
structure	6 (110)	5 (121)	9 (399)*
understand	21 (468)	13 (334)	27 (1191)*

Note: Frequency per 10,000 words, raw number in brackets. Shaded are cells with words that are more frequent for a specific discipline group.

\*Significantly different proportions as compared to the other two disciplinary groups (confidence interval  $\geq 95\%$ ,  $p \leq 0.05$ , 2-tailed), based on Z-test for two proportions

<http://www.dimensionresearch.com/resources/calculators/ztest.html>

Thus, the Not Too Surprising category provides additional evidence that speaks to divergences among disciplinary discourses. The selection of words used reveals discipline-specific ways of speaking about MERLOT digital learning objects which illustrate significant differences in disciplinary traditions of teaching and learning.

### Descriptors

To further explore discipline-specific lexicons, we examined descriptors selected based on their frequency and compared the frequency of words in two groups: Education vs. the Hard Sciences and Humanities vs. the Hard Sciences.

The results indicated that out of 89 words selected, only 8 showed no significant difference in usage between all three disciplines: *easy, useful, most, particular, visual, major, main, better*. In 29 instances only one group - Education or Humanities - showed significant difference when compared to the Hard Sciences; these are such descriptors as *high, various, comprehensive, engaging*, etc. Judging by the words selected, in 67% of cases reviewers choose different descriptors to describe and evaluate MERLOT learning objects (see Table 4).

The analysis shows that each discipline uses descriptors that could be included into the Not Too Surprising category as they represent adjectives that are particular to the discipline. For example:

Education = *educational, instructional, professional (development), social*, etc.

Humanities = *cultural, historical, musical, grammatical*, etc.

Hard Sciences = *mathematical, physical, numerical, quantitative*, etc.

Still some frequently used adjectives yield surprising results. Reviewers in Education, for example, tend to use the adjective *scientific* twice as often as their colleagues in the Hard Sciences. We might interpret this to be in keeping with current U.S. federal policy in Education that stress this term. It is important to note in this regard that the MERLOT peer reviewers in Education are all U.S. born native speakers of English. Another anomalous use of adjectives is in the Humanities where reviewers use the descriptor *human* far less often than their colleagues in Education and the Hard Sciences.

It is interesting to note that in the Hard Sciences a wide range of words is used to evaluate learning objects; notable in that the stereotypical view of scientists involves their being less verbal than their Humanities counterparts. Some of the frequently used adjectives in the Hard Sciences, such as *good*, *excellent*, *nice* could be characterized as subjective evaluation words. Reviewers in the Hard Sciences more frequently than other disciplines also use words that describe objective parameters related to a) accuracy – *accurate/inaccurate*, *correct*, b) size– *small*, *large*, *little*, and c) parameters – *limited*, *detailed*. Comparative adjectives – *different/similar* – are also frequently employed as are terms that indicate level of difficulty – *introductory*, *basic*, *simple*, *difficult*. The evaluation of learning objects in the Hard Sciences also seems to include potentiality indicators such as *potential* and *possible*.

In addition to the frequencies indicated in Tables 4, we randomly examined the contexts in which frequently used adjectives occurred within the actual texts and found that each discipline group tend to use descriptors in different semantic contexts. For example, in Education the focus of the descriptor “appropriate” are learners as it describes such nouns as *grade level*, *age*, or *curriculum*; in the Humanities reviewers talk about appropriate material, sites, resources, while in Hard Sciences they focus on the mechanics or specific features of the learning objects (*variables*, *design features*, *labels*, *questions*, *for course*, *locations*, *vocabulary*, *functions*, *level*, *gene therapy*).

Thus, the quantitative and qualitative analysis of descriptors suggests that while academic disciplines may utilize identical lexicon items, they often do so at different rates and in different contexts.

Table 4. Most Frequent Descriptors

Descriptor	Education N=218,731	Humanities N=262,225	Hard Sciences N=436,004
appropriate	10 (213)*	7 (175)	7 (301)
valuable	6 (125)*	3 (69)*	1 (49)
educational	12 (269)*	2 (64)*	3 (110)
instructional	10 (225)*	2 (62)*	1 (38)
professional	9 (188)*	1 (33)	1 (41)
social	4 (91)*	3 (77)*	0 (12)
specific	13 (286)*	6 (149)*	8 (360)
helpful	9 (199)*	6 (150)	7 (285)
new	10 (218)*	7 (196)*	4 (181)
national	8 (184)*	2 (45)*	1 (38)
best	6 (133)*	5 (120)*	3 (114)
scientific	4 (84)*	0 (8)*	2 (99)
multiple	5 (106)*	2 (65)*	3 (143)
authentic	2 (37)*	6 (148)*	0 (3)
native	0 (6)	5 (125)*	0 (13)

individual	4 (87)	6 (148)*	4 (161)
external	1 (23)	5 (141)*	1 (47)
primary	4 (93)*	8 (199)*	2 (83)
advanced	3 (57)*	11 (279)*	5 (197)
cultural	2 (52)*	10 (263)*	0 (11)
intermediate	0 (10)*	8 (210)*	1 (34)
historical	2 (50)*	7 (196)*	1 (35)
musical	0	3 (83)*	0
grammatical	0 (3)	3 (79)*	0 (14)
traditional	1 (21)	3 (79)*	1 (56)
independent	3 (57)*	6 (161)*	2 (102)
great	4 (77)	6 (156)*	4 (177)
clear	7 (158)*	14 (355)*	11 (470)
rich	2 (40)*	3 (84)*	1 (47)
technical	3 (60)*	4 (98)*	2 (103)
mathematical	2 (45)	0 (1)*	5 (215)
physical	2 (54)*	0 (6)*	3 (152)
numerical	0 (3)*	0 (2)*	3 (146)
quantitative	0 (4)*	0 (2)*	3 (125)
graphical	0 (6)*	0 (2)*	4 (168)
potential	3 (75)*	2 (65)*	6 (244)
possible	2 (52)*	3 (82)*	5 (199)
limited	3 (65)*	2 (56)*	5 (228)
accurate	2 (54)*	3 (86)*	6 (259)
correct	1 (24)*	3 (75)*	4 (188)
interactive	7 (161)*	10 (254)*	17 (738)
effective	6 (141)*	5 (123)*	8 (356)
good	11 (243)*	11 (299)*	16 (715)
excellent	9 (188)*	10 (263)*	14 (615)
nice	1 (26)*	2 (62)*	6 (275)
different	10 (216)*	10 (275)*	13 (588)
similar	2 (34)*	2 (43)*	3 (144)
introductory	2 (37)*	2 (42)*	9 (414)
basic	10 (213)*	10 (261)*	14 (592)
simple	5 (101)*	6 (153)*	13 (549)



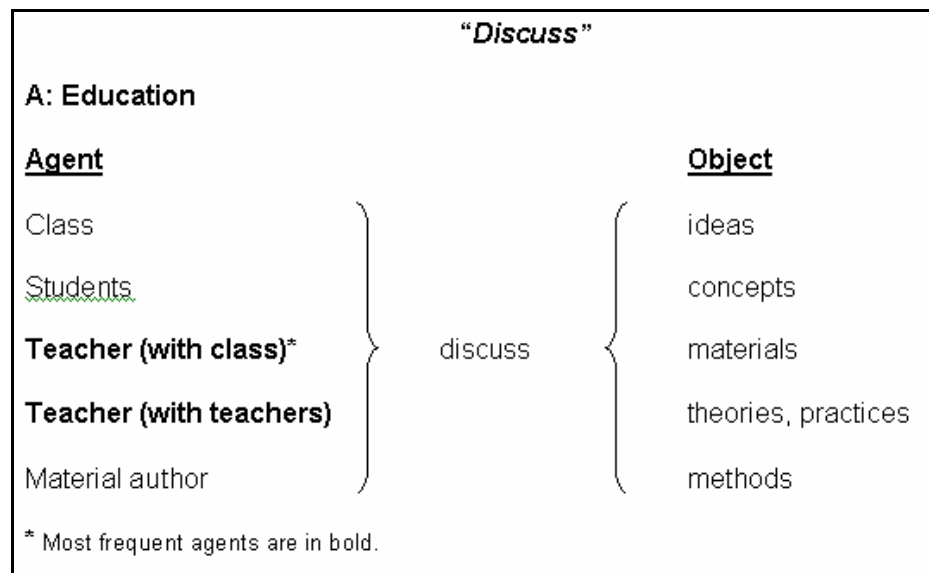
difficult	4 (84)*	4 (116)*	7 (297)
detailed	2 (45)*	3 (90)*	4 (171)
large	3(64)*	5(133)*	9(377)
little	3 (56)*	3 (85)*	5 (210)
small	2 (50)*	2 (52)*	4 (155)

Note: Frequency per 10,000 words, raw number in brackets.  
 Shaded are cells with words that are more frequent for a specific discipline group.

\*Significantly different proportions as compared to Hard Sciences (confidence interval >= 95%, p<=0.05, 2-tailed), based on Z-test for two proportions <http://www.dimensionresearch.com/resources/calculators/ztest.html>

*Processes and Agency*

We use the Processes and Agency category to document how the different disciplines use language to describe processes and outcomes of teaching and learning. This category focuses on the action (e.g., teaching, learning, interacting, etc.) and the *agent* of the action, the one who performs the action. The English language can express the agent of an action explicitly (SHE learned her lesson) or implicitly through use of the passive construction (The lesson was learned (by HER) or by implication (materials for discussion (by STUDENTS))). By examining the contexts in which the most frequently used lemmas that denote teaching and learning actions appeared, we attempt to establish whether differences exist in who is seen as performing the teaching and the learning with the learning objects being reviewed and, by extension, each discipline’s priorities for agency in the instructional processes. Indeed, through examining the contexts of use for the most frequently used actions across the three disciplines, we see distinct differences in terms of how and by whom instructional processes are undertaken. A typical illustration of this concerns the use of *discuss*:

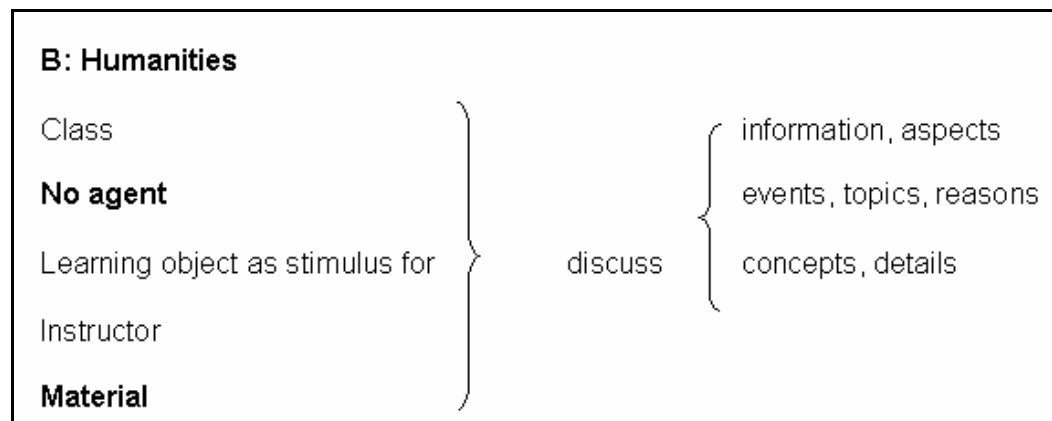


**Typical context:**

The resulting printouts are rich and can be used in a variety of ways **to discuss** teacher dispositions, the classroom teaching environment, the school work environment, etc.

As illustrated above, the lemma *discuss* most frequently carries *teacher* as agent. *Discuss* was also frequently used in the context of discussion boards (used by teachers), ways to facilitate class

discussions, and the roles for discussion in teaching and learning methods. In the vast majority of cases, the action of discussing carried teachers as the agents of the action. As most learning objects in the Education discipline of MERLOT are geared toward teacher education and teacher support materials, the teacher as agent makes sense as the most common form of agency, especially in light of the fact that contemporary Education generally sees the agency of teaching and learning primarily with the professional educators who undertake instructional practices. The vast majority of actions are in the context of teacher learning, professional dialog and professional development.



As compared to Education, we can see that the main source of agency in the Humanities learning object reviews tends to be null; that is, the passive form with no apparent doer of the action.

#### Typical contexts:

*The elemental level is discussed very briefly. (Music)*

The exception to this trend is in the World Languages reviews where students/learners are the most frequent agents of the action *discuss*:

*Students can write to each other and discuss topics that interest them such as experiences with learning English... (World Languages)*

In the case of this action, discuss/discussion, there is a clear difference between the disciplines *within* the Humanities. Unlike Music and History where the agent is typically null or the materials themselves, in World Languages, a discipline for which emphasis on active student communication is key, students are most often the agents. Where there were no instances of student agency attendant to the lemma *discuss* and its derivative in the History and Music reviews, in World Languages there are 83 instances out of 167 where students are written of as the agents, the actors of *discuss*: e.g., class/student discussion, discussion questions, discussion groups, springboard/catalyst/stimulus for discussion.

Finally, in the other two Humanities categories, Music and History, the construct whereby agency is given to the learning object itself ("allows for discussion") occurs frequently throughout.

#### C: Hard Sciences

Where there are 363 instances of some form of the lemma *discuss* in the Hard Sciences data, there is not one instance of the active tense with student nor instructor acting as agent of the action. Every instance is either passive "is discussed" whereby agency is absent entirely, or with inanimate subjects such as sites ("the site discusses"), texts ("the text discusses"), page ("the page discusses"), the researcher ("the researcher discusses"). The exception is thirteen instances of the phrase "for class discussion" and four instances of "discussion point" both implying agency on the part of instructors and students; participation in the former, accessing in the latter.

There are, therefore, differences, some salient, some subtle between the three disciplinary categories in terms of how teaching and learning gets done; specifically between the sources of agency and the guiding of instructional processes. In writing their reviews of digital learning objects, Education faculty

see the agency of teaching as lying with teachers, less with materials and less with what learners see and interact with on the computer screen. Contrary to this trend, Humanities faculty imbue materials with the agency of teaching and learning with the Hard Sciences attributing the acts of teaching and learning to the computer application per se. It is clearly the case that there are distinct ways of perceiving and expressing the activities of teaching in learning as reflected in this corpus.

### *Syntactic Features*

The syntax used in the different disciplinary discourses could be equally as suggestive as the choices of vocabulary. Moreover, examination of the reviews' syntactic features can distinguish features among registers including those that are characteristic of the particular academic discipline. The length of the text, relative organization of the sentences inside the text, as well as the sentence internal structure that reveals the relationship between parts of speech, characterize the discourse explicating its individual features. Biber and his co-authors, for example, show that corpus-based linguistic analysis of syntax may contribute to characterizing texts on such dimensions as *involved* versus *informational production*, *narrative* versus *non-narrative discourse*, or *impersonal* versus *non-impersonal styles* (Biber, Conrad, & Reppen, 2002, pp. 135-171).

For the purposes of our study, we examined three syntactic features of the texts: 1) text and sentence length; 2) passive constructions; and 3) bulleted constructions. In each of the three discipline groups a number of texts were randomly selected. 30 texts each were extracted from the Education and Humanities groups with 45 texts comprising the randomly selected texts in the Hard Sciences.

Figure 2 summarizes the results obtained after the selected reviews undergone concordancing, hand coding and descriptive statistical analysis.

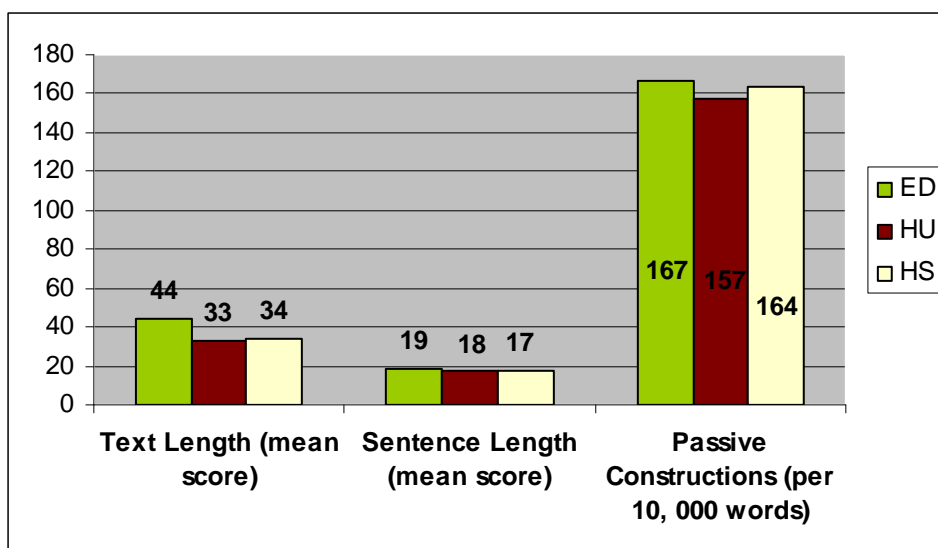


Figure 2. *Syntactic Features by Discipline*

### *Text and sentence length*

The calculations reveal that reviews in Education are on average lengthier: here an average review comprises of 44 sentences as compared to 33 and 34 sentences in the Humanities and the Hard Sciences respectively. At the same time, the sentence length in all three disciplines is similar: the average sentence in Education is comprised of 19 words, in Humanities – 18 words, in the Hard Sciences – 17 words.

The results suggest that while reviewers in Education are wordier and choose to provide lengthier evaluations of their digital learning objects, they tend to express their thoughts in sentences that are as

long as sentences selected by their colleagues in the Humanities and the Hard Sciences. It seems that educators, being very well versed in assessing teaching tools, are more verbose when reviewing MERLOT learning objects, activity that requires the assessment of the learning object's potential effectiveness as a teaching/learning tool.

#### *Passive constructions*

It is generally accepted that passive forms are more often used in formal documents and are frequently featured in science texts. Passive constructions make a text sound more impersonal (Biber, Conrad, & Reppen, 2002), that is, more objective. While taking in to account that the academic nature of reviews under analysis implied a certain degree of formality, we hypothesized that this degree could vary between the different discipline groups. The results, however, contradicted our predictions as seen in Figure 2. With 167 instances of passive forms per 10,000 words in Education, 157 instances in the Humanities, and 164 instances in the Hard Sciences, we can not claim that any discipline group tends to use passive constructions considerably more frequently

The findings suggest that reviewers in different discipline groups use passivization at a similar rate. Apparently, shared understanding of the target audience and purpose of the texts they produce, make reviewers of digital learning objects select similar syntactic constructions.

#### *Bulleted constructions*

While collecting data to describe syntactic peculiarities, we noticed that many reviews in the Hard Sciences contain bulleted constructions. Reviewers in this discipline group often prefer to describe learning objects not in paragraphs of connected sentences but rather in bulleted shorthand. Thus, some of these constructions do not represent fully developed sentences with subjects and predicates. Additionally, reviewers tend to mix complete sentences and those where some important parts of speech are omitted but easily derived from the sentence stem. Even when writing in full sentences, reviewers may omit a part of the predicate – usually the linking verb “to be”. For example, when describing the quality of content, one of the reviewers writes the following:

*Quality of Content: (4.60)(4.00) = 4.3*

- *Layout fairly well designed*
- *Material complete allowing many factors to be tested in a single simulation*
- *Accurate with excellent references to justify simulations*

Such bulleted constructions allow for quick and concise verbalization of the observation. They save time over developing text cohesion and worrying about such relatively insignificant elements as linking verbs or punctuation marks for sentence meaning. The fact that bulleted constructions are much more frequent in reviews in the Hard Sciences could be explained by the non-narrative (factual, informational) concerns of texts in ‘pure’ science (Biber, Conrad, & Reppen, 2002).

Bullets also allow for visual separation of thoughts, so important in the information era where visuals assume a leading role in providing information. Wide usage of bulleted constructions could also be explained by gradual penetration into academic writing of language features we tend to associate with electronic communication – e-mailing, instant messaging, presenting information in PowerPoint format. It would probably be safe to say that the acceptance of bulleting means that the electronic “version” of academic writing has become more democratic, less formal and more graphical (Tufte, 2003).

#### **Implications**

Like Motta-Roth's study of book reviews from three disciplines, a study which revealed distinct differences between discipline-specific methodological approaches, this study finds that variation in faculty use of language in composing digital learning object reviews is distinct. In the Motta-Roth case, implications were drawn for the teaching of English to non-native speakers. We too see the need for both native and non-native speakers to be made aware of the differing uses of the language of teaching and learning between disciplines as part of advanced academic preparation; e.g., the professoriate in training, policy/administrative staff.

Additionally, the growing field of instructional technology design and support for technology-using faculty would also benefit from understanding and perhaps making use of these differences productively in their work with faculty from varying disciplines. Finally, the complex conceptual frames and accompanying discourses used by each discipline can potentially enrich one another through productive, collaborative and synergistic work around instruction in general and the evaluation of digital learning objects in particular.

### Conclusion

As the world of information grows more dense and complex, so too do academic disciplines. As a result, disciplinary language becomes increasingly compartmentalized with a loss of mutual intelligibility between and across disciplines becoming more than a remote possibility. Such divisions have often been cited as limiting intellectual growth and discovery due to lack of communication between groups. "Disciplinary specialization inhibits faculty from broadening their intellectual horizons—considering questions of importance outside their discipline, learning other methods for answering these questions and pondering the possible significance of other disciplines' findings for their own work" (Stober, 2006, p.317). With faculty from diverse disciplines now finding themselves in mixed venues for the purpose of developing instructional technologies, opportunities for broadening their *instructional* horizons through cross-disciplinary conversations abound.

We share the view that learning about or forming connections between fields of knowledge is an essential educational need for success in the 21st century (Caine & Caine, 1991; Dwyer, 1995; Jacobs, 1989; Martinello & Cook, 1994). Using digital learning objects as catalysts for productive discussion of instructional practices represents a promising beginning. Where Bradbeer (1999) encourages the dissolution of disciplinary discourse barriers through movement toward commonality, we suggest quite the opposite: an awareness building and promotion of mutual respect for one another's epistemologies and practices as expressed in what is ostensibly a common language of teaching and learning.

### References

- Bauer, H. (1990). Barriers against interdisciplinarity: Implications for studies of science, technology and society. *Science, Technology and Human Values*, 15(1), 105-119.
- Becher, T. (1989). *Academic tribes and territories: Intellectual enquiry and the cultures of disciplines*. London: Open University Press.
- Biber, D., Conrad, S., & Reppen, R. (2002). *Corpus Linguistics: Investigating language structure and use*. Cambridge, UK: Cambridge University Press.
- Biber, D., Conrad, S., Reppen, R., Byrd, P.L., & Helt, M. (2002). Speaking and writing in the university: A multidimensional comparison. *TESOL Quarterly*, 36(1), 9-48.
- Bradbeer, J. (1999). Barriers to interdisciplinarity: Disciplinary discourses and student learning. *Journal of Geography in Higher Education*, 23(3), 381-96.
- Caine, R. & Caine, G. (1991). *Making connections: Teaching and the human brain*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Csomay, E. (2005). Linguistic variation within university classroom talk: A corpus-based perspective. *Linguistics and Education*, 15, 243-274.
- Dwyer, B. (1995). Preparing for the 21st century: A paradigm for our times. *Innovations in Education and Training International*, 32(3), 269-277.
- Godwin-Jones, R. (2004). Learning objects: Scorn or SCORM? *Language Learning Technology*, 8(2), 7-12.
- Hodgins, W. (2002). *The future of learning objects*. 2002 ECI Conference on e-Technologies in Engineering Education: Learning Outcomes Providing Future Possibilities. Retrieved January 2, 2008 from <http://services.bepress.com/cgi/viewcontent.cgi?article=1012&context=eci/etechnologies>

- Jacobs, H. (1989). Interdisciplinary curriculum options: A case for multiple configurations. *Educational Horizons*, 68(1), 25-27, 33.
- Jaspers, K. (1959). *The idea of the university*. Translated by H. Reiche and T. Vanderschmidt. Boston: Beacon Press.
- Martinello, M. & Cook, G. (1994). *Interdisciplinary inquiry in teaching and learning*. New York: Macmillan College Publishing.
- Meskill, C. & Anthony, N. (2007). The language of teaching well with learning objects. *Journal of Online Learning and Teaching*, 3(1), 79-93.
- Motta-Roth, D. (1995). *Book reviews and disciplinary discourses: Defining a genre*. Paper presented at the TESOL 29<sup>th</sup> Annual Convention and Exposition, Long Beach, CA. (ERIC Document Reproduction Service No. ED404858).
- Strober, M. (2006). Habits of the mind: Challenges for multidisciplinary engagement. *Social Epistemology*, 20(3-4), 315-331.
- Tufte, E. (2003). *The cognitive style of PowerPoint*. Cheshire, CT: Graphics Press.
- Williams, D. D. (2000). Evaluation of learning objects and instruction using learning objects. In D. A. Wiley (Ed.), *The instructional use of learning objects: Online version*. Retrieved March 30, 2007, from <http://reusability.org/read/chapters/williams.doc>.
- Wiley, D. (2000). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In D. A. Wiley (Ed.), *The instructional use of learning objects: Online version*. Retrieved November 11, 2007 from <http://reusability.org/read/chapters/wiley.doc>
- 

Manuscript received 6 Feb 2009; revision received 23 Apr 2009.



This work is licensed under a  
[Creative Commons Attribution-NonCommercial-ShareAlike 2.5 License](http://creativecommons.org/licenses/by-nc-sa/2.5/)