



FREQUENCY, INTENSITY AND TOPICALITY (FIT) ANALYSIS OF INSTRUCTIONAL STYLES & INTERACTION PRACTICES IN ONLINE LEARNING

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ABSTRACT:

This paper discusses the use of a faceted analysis method for identifying and analyzing the interactions between participants (students, instructor, etc.) in online courses, and seeks to extend the application of that method through exploration of relationship between pedagogical style and the frequency, intensity and topicality (FIT) of interactions in online courses. The researchers sought the answer to the question: Is there a relationship between pedagogical style—defined as instructional style and the interaction practices—in online courses?

The FIT method was originally reported in Burnett, Bonnici, Miksa and Kim (2007) and Miksa, Burnett, Bonnici and Kim (2007). It was developed through an emergent coding process during a study conducted between 2000 and 2002. FIT analysis was conducted along three dimensions or facets: frequency, intensity and topicality. Courses were ranked “low,” “medium” and “high” fit. Instructors of three of the courses that were ranked “medium FIT” were asked to self-administer a Teaching Styles Inventory available online and to report the results code. The three instructors were also interviewed by telephone. Teaching styles inventory results were compared with the FIT analysis results for each to establish whether differences in instructional styles corresponded with interaction practices (FIT). In this study, the teaching style inventory was used to measure instructional style and FIT was used to measure interaction practice.



INTRODUCTION:

This paper compares course interaction data analyzed by using a faceted analysis method for identifying and analyzing the interactions in online courses with data collected through interviews and a standard teaching styles inventory (Grasha-Reichmann Teaching Styles Inventory) to investigate the relationship between instructional style and interaction in online courses. The goal of the study was to further test and refine the FIT analysis method developed previously (see Burnett, et al. (2007) and Miksa, et al. (2007)) to determine whether pedagogical style was sufficiently accounted for in the analysis, or if an additional facet should be developed to represent this variable. The method as developed in the previous study included five facets. These were developed through an emergent coding process to systematically represent how the content being coded functioned in the context of the online interactions. These facets included format, actor, action, content and activity. Quantitative content analysis was then performed to establish rankings of the interactions by course along three dimensions: frequency, intensity and topicality. While instructional style did not emerge as a potential facet during the emergent coding process, the researchers speculated after the fact that such a facet might enrich the analysis.

To explore this possibility, three of the instructors of courses that were ranked “medium FIT” in the previous study were asked to complete and report the results code for a self-administered Grasha-Reichmann teaching style survey. The inventory results for each of the three instructors were compared to establish whether differences within instructional styles clusters corresponded to differences within medium FIT. Interviews were also conducted to explore gaps and anomalies between the courses ranked medium FIT.

Purpose & Significance of Study

The purpose of this study was to explore the relationship between pedagogical style—defined as instructional style as measured by the Grasha-Reichman Teaching Style Inventory—and interaction practices (FIT) in an online learning environment. Miksa, et al. (2007, p. 1577) noted that: “new facets could be developed to account for variables such as pedagogical style, student demographics, technological preparedness, and institutional support to name a few.” This study focused on determining whether a pedagogical style facet should be developed. Pedagogical style was operationalized as instructional style and practice as measured by the Grasha-Reichmann teaching style survey, a well-established instrument. The researchers looked for evidence that adding a pedagogical style facet to the FIT method would enrich the analysis of interaction and contribute to further understanding of the relationship between interaction and student satisfaction with online learning. More specifically, the researchers sought to determine whether the pedagogical styles of the instructors of three courses ranked “medium FIT” also fell within the same Grasha-Reichman Teaching Style cluster, and



if so, whether the variations in frequency, intensity and topicality corresponded to differences in the order of styles as determined by the inventory results.

BACKGROUND

S. R. Ranganathan, who is generally credited with conceiving facet analysis, developed canons, postulates, and principles to support the implementation of this type of analysis for the better expression of compound subjects (Spiteri, 1998). Modern facet analytical theory contrasts with earlier views of knowledge as an integral whole, (which is broken down into smaller and smaller units) in that it deals with individual terms or concepts, which are clustered into categories to create a bottom-up map of knowledge (Broughton, 2002). This study extends the application of facet analysis from its predominant contemporary use (to support classification of documents) to develop a specialized content analysis system capable of representing the multidimensionality of relationships in online interaction.

Spiteri's (1998) simplified model for facet analysis was used to guide development of the system in the earlier study (Burnett, et al., 2007; Miksa, et al., 2007). The system was built from individual terms that were analyzed into groups within facets and ordered by the application of the system syntax through formulae. The formulae, which operationalized the relationships between the facets as dimensions of interaction, were developed to combine the terms and concepts and generate a three-dimensional structure, or FIT, which is representative of the complexity of interaction in online learning. In the current study, these formulae were adopted for the same purpose. Comparisons between three course instances ranked "medium FIT" were made to identify differences in interaction practice, which were then compared with pedagogical style.

The Grasha-Reichman Teaching Styles Inventory is a well-established instrument often used in conjunction with the Grasha-Reichman Learning Styles Inventory. Grasha (2002) identified five teaching or pedagogical styles that are often used in combination by individuals teaching college level courses. The five styles include: expert, formal authority, personal model, facilitator and delegator. There are four main clusters of combinations of styles, as illustrated in Table 1.

Interaction in Online Learning since 2006

Burnett, et al. (2007) and Miksa, et al. (2007) reviewed the literature on interaction in online learning through 2006, and found that while interest in interaction had increased dramatically after 2000, there were no instances of the application of facet analysis to research on interaction in online learning. One study not identified for the 2007 review also attempted to develop a system for evaluation of online courses, in this case a

pedagogical effectiveness measurement (Reyes-Méndez, J. & Harrison, L. (2004). Since the 2007 review, Topç u (2008) reported on an experimental study that combined an interaction score (INS), grade point average (GPA), and a scale to measure attitude toward the World Wide Web (AWS). The results demonstrated that using an intentional repetition technique increased the efficiency of asynchronous interaction. So and Kim (2005) reported that lack of human interaction had been an issue in online learning. Several attempts to increase human interaction, such as blended learning approaches, have been studied (Michinov & Michinov, 2008; Jackson & Helms, 2008). Cao, Crews, Lin, Burgoon, & Nunamaker (2008) investigated “virtual interaction” between participatory sessions and found that learners’ satisfaction with interaction increased when question and answer based virtual interaction is implemented. Hrastinski (2008) examined the effect of synchronous communication on participation in online courses and found that this mode supported more intense interaction with personal participation.

Teaching styles in online learning

Grasha and Yangarber-Hicks (2000) asked two samples of college faculty, including (1) 40 presenters on the use of technology in education from a regional conference, and (2) a random sample of 200 participants at a national conference on the use of technology in education, to choose two courses—one emphasizing technology and another more traditional course—and complete an evaluation questionnaire for each. They found that “introducing instructional technology into the classroom likely affects the patterns in the relationships among variables associated with teaching and learning” (n.p.). A search of the education databases identified only three articles that have addressed teaching styles in online learning. Quitadamo and Brown (2001) presented a case study that focused on the effect of teaching styles on establishing an online learning community, promoting student satisfaction and interaction, and developing critical thinking and problem-solving skills. Tallman (2003) reported on an international online teaching experience and its influence on teaching style. Arbaugh and Hwang (2006) conducted one of the first studies to assess the construct validity of the dimensions of teaching presence developed by Garrison, Anderson and Archer. They were able to produce a valid framework for studying online management education, which has been implemented subsequently (Garrison, D. R & Arbaugh, J.B., 2007; Arbaugh, J.B., 2008).

The next section provides an overview of the research design.

OVERVIEW OF RESEARCH DESIGN

This study was conducted in three phases: (1) review and extraction of the FIT analysis results from the earlier study; (2) review of the results from the self-administered



Grasha-Reichman Teaching Styles Survey by the three instructor participants; and (3) telephone interviews with the three instructor participants to explore gaps and anomalies observed in the first two phases. The design integrated qualitative and quantitative analysis of documentary evidence (chat logfiles and discussion board postings) with qualitative analysis of the survey results and interviews. Facet analysis provided the counts for the quantitative analysis. Meaning condensation, a standard content analysis technique was used for the interview analysis.

Phase 1

Online web-supported courses at the LIS school where this study was conducted had at the time both asynchronous and synchronous components.

The asynchronous component consisted of discussion boards, used primarily for learner-instructor interaction. Asynchronous discussion boards were available on a 24-hour basis; students could post questions and responses at any time of the day. The main use of discussion boards by instructors was to answer questions about course activities and assignments. Discussion board postings were archived within the course management system. Each posting was identified by the poster's name and a time-stamp consisting of date and time. Posters had the option of continuing an established thread—in which case the subject line repeated that of the previous post—or establishing a new thread with a new subject line.

The synchronous component consisted mainly of the real time interactive chat sessions, which took place in weekly two-hour sessions, unless otherwise specified by the instructor. Participation in chat sessions was required of all enrolled students. Each session was recorded in a separate logfile. Every action within each session was identified by the participant's name and a time-stamp consisting of date and time.

The researchers extracted the results of the FIT analysis of the three courses included in this study from the results for the eight included in the previous study and calculated new means.

Phase 2

To determine pedagogical style, the three instructors were asked to self-administer the Grasha-Reichmann Teaching Style Inventory, a standard instrument frequently used to assess teaching styles of college instructors available online at <http://fcrcweb.ftr.indstate.edu/tstyles3.html>. Since instructors may adopt different pedagogical styles for different courses, the instructors were asked to complete the inventory with the fall 2000 course instance in mind. Upon completion of the inventory,



results are displayed. A results code is provided for retrospective retrieval. Instructors emailed the results code to the researchers to facilitate our analysis.

Phase 3

A telephone interview was conducted with each of the three instructors. The interviews consisted of eleven questions and lasted between 7-12 minutes. Analysis of the digitally recorded interviews was done using Nvivo 8 software, which allows the researcher to code the audio recording without transcribing the interview. The coded interviews were then analyzed using the established content analysis technique of meaning condensation.

SUMMARY OF RESULTS

In the Phase 1 review of the FIT analysis data, three dimensions of interaction were identified: frequency, intensity and topicality. **Frequency** was defined as the mean number of interactions per student enrolled occurring each weekday (total=70) during an academic term. To facilitate integration of the results of this study with those of the previous study for readers who may be interested, the course identifiers from the previous study have been maintained. The three “medium” ranked courses selected for this study included: MG, MD and MF. There was considerable difference in frequency between the three courses: MG=1.70, MD=2.37 and MF=5.24. The mean for the three courses was 3.10. Instructor frequency (MG=0.38, MD=0.57 and MF=0.48; mean=.48) and learner frequency (MG=1.38, MD=1.11, MF=1.38; mean=1.29) were also calculated. **Intensity** was defined as the total number of statements generated by students as compared to the total number of statements generated by the instructor or teaching assistant(s). MG’s intensity value was 3.60, MD’s was 1.94, and MF’s was 2.85. The mean for the three sections was 2.80. **Topicality** was defined as the total number of statements on or related to the topic or activity content of the course during the week the log and discussion postings represented, as compared to the total number of statements on or about activity processes, and the total number of ancillary statements, including non-relevant statements and non-verbal statements. MG’s topicality value was 6.66, MD’s was 4.80, and MH’s was 3.17. The mean for the three courses was 4.88. A summary of the results appears in Table 2.

The Grasha-Reichmann Teaching Style Inventory was self-administered by the three instructors in Phase 2 and the results codes emailed to the researchers. Using the interpretative scale provided with the results, none of the instructors fit into Grasha’s (2002) four clusters. Instructor MG’s primary teaching styles include Facilitator, Personal Model and Delegator; instructor MD’s Personal Model and Expert; instructor

MF's Expert, Facilitator, Formal Authority and Delegator. A summary of the results for the three instructors appears in Table 3. Table 4 provides brief descriptions of each of the five teaching styles.

The interviews conducted in Phase 3 confirmed that all three instructors had access to the same interaction technologies and that attendance at weekly synchronous chat sessions was required; however, each instructor used these technologies in different ways. Instructor MG reported more specific use of the discussion boards to resolve student questions about course activities than did the other instructors. Instructor MD discussed the use of slides as a visual supplement to the lectures, while instructor MF felt that the lack of a visual component constrained ability to teach her technical topic. Only instructor MD mentioned using lectures as a pedagogical strategy; instructor MG expressed a tendency not to lecture, preferring more "give-and-take." Instructor MD indicated that the dial-up technology available to the students sometimes resulted in failure to connect, while instructor MG attributed such issues to lack of preparedness of the students rather than failure of the technology. Instructor MG also mentioned the desirability of incorporating video, but indicated that bandwidth constraints did not permit it at that time.

INTERPRETATION OF RESULTS

The objective of this exploratory study was to determine whether a correspondence exists between medium FIT and one of the teaching style clusters identified by Grasha (2002), and if such a correspondence is present, to determine the extent to which the characteristics associated with the cluster might be already measured by FIT. The results for the three instructors did not correspond to any of the teaching style clusters, nor were they similar to one another, indicating the need to incorporate a pedagogical style facet in FIT analysis.

Most of the testing of the Grasha-Reichmann Teaching Style Inventory was done prior to or early in the adoption of online delivery of higher education. Grasha and Yangarber-Hicks (2000) suggested that the introduction of instructional technology in the classroom might affect teaching style. It seems reasonable to extrapolate from this that online delivery might have even greater effects, resulting in different clustering; however, our small sample did not exhibit much commonality in teaching styles. Instructor MG and instructor MF had two primary teaching styles in common (Facilitator and Delegator); apart from this there were only single overlaps between pairs of instructors and no overlap between all three, despite the fact that instructor MF's profile includes four of the five teaching styles as "primary" teaching styles.

It is important to note that the FIT data for this study were collected relatively early in the instructional careers of all three instructors. Instructor MG and instructor MD were



doctoral students with limited prior teaching experience. Instructor MG had assisted with the course two times and was taking the lead for the second time. Instructor MD had assisted with the course three times and was taking the lead for the first time. Instructor MF was a new assistant professor with little prior teaching experience, and had never taught the course before. The lack of experience of all three instructors may explain why none fell within the established clusters.

Another explanation for the failure of the inventory results of these three instructors to cluster may be the type of academic program. The courses included in this study were part of a professional master's degree program. While Grasha's (2002) samples did include instructors of graduate courses, these were not in the majority and there is no indication whether professional master's degree programs were included. It is also unclear whether instructors of graduate courses fell within the clusters in significant numbers. Grasha (2002) does note that different types of teaching styles are preferred at different levels.

One limitation of the study is that the Teaching Style Inventory was administered at a significant distance in time (eight years) from the course offerings. While the three instructors were asked to have the specific course offering in mind as they completed the inventory, their responses to the interview questions indicate that more recent experiences may have affected specific recollection of the particular course instances.

CONCLUSION

Implications for Further Development of the FIT Facet Analysis System

In the initial study, a facet analysis system was developed that included five facets: format, actor, action, content and activity. Each facet was applied to the coding of the interactions. The FIT analysis that was derived from this coding may be viewed as a representation of interaction practice. As described above, we used questions from the Grasha-Reichmann Teaching Styles Inventory to determine each instructor's pedagogical style and compared this to their interaction practice (FIT). Little to no correspondence was found between FIT and teaching style profile, and the three instructors with medium FIT neither clustered together or with any of the clusters identified by Grasha (2002). This provides preliminary evidence of the need to incorporate a pedagogical style facet in FIT analysis. The researchers will conduct further testing with a larger sample of instructors and more recently collected FIT data to determine how to proceed with development of this new facet.



REFERENCES

Arbaugh, J.B. (2008). Does the community of inquiry framework predict outcomes in online MBA courses? *International Review of Research in Open and Distance Learning*, 9:2, 1-21.

Arbaugh, J.B. & Hwang, A. (2006). Does “teaching presence” exist in online MBA courses? *Internet and Higher Education*, 9:1, 9-21.

Broughton, V. (2002). Facet analytical theory. Retrieved May 23, 2006, from <http://www.ucl.ac.uk/fatks/fat.htm>

Burnett, K., Bonnici, L.J., Miksa, S.D., & Kim, J (2007). Frequency, intensity and topicality in online learning: an exploration of the interaction dimensions that contribute to student satisfaction in online learning. *Journal of Education for Library and Information Science*, 48(1), 21-35.

Cao, J., Crews, J. M., Lin, M., Burgoon, J. K., & Nunamaker, Jr, J. F. (2008). An empirical investigation of virtual interaction in supporting learning. *The DATABASE for Advances in Information Systems*, 39(3), 51-68.

Garrison, D.R. & Arbaugh, J.B. (2007). Researching the community inquiry framework: review, issues and future directions. *Internet and Higher Education*, 10:3, 157-172.

Grasha, A.E. (2002). *Teaching with style: a practical guide to enhancing learning by understanding teaching and learning styles*. San Bernardino, CA: Alliance.

Grasha, A. and Yangerber-Hicks, N. (2000). Integrating teaching styles and learning styles with instructional technology. *College Teaching*, 48(1), 2-10.

Hrastinski, S. (2008). The potential of synchronous communication to enhance participation in online discussions: a case study of two e-learning courses. *Information & Management*, 45, 499-506.

Jackson, M. J. & Helms, M. M. (2008). Student perceptions of hybrid courses: measuring and interpreting quality. *Journal of Education for Business*, September/October, 7-12

Michinov, N. & Michinov, E. (2008). Face-to-face contact at the midpoint of an online collaboration: its impact on the patterns of participation, interaction, affect, and behavior over time. *Computers & Education*, 50, 1540-1557.



Miksa, S. D., Burnett, K., Bonnici, L.J., & Kim, J. (2007). The development of a facet analysis system to identify and measure the dimensions of interaction in online learning. *Journal of the American Society for Information Science and Technology*, 58:11, 1569-77.

Quitadamo, I.J. & Brown, A. (2001). *Effective teaching styles and instructional design for online learning environments*. ERIC Document Reproduction Service No. ED462942). Retrieved December 26, 2008 from CSA Illumina ERIC database.

Reyes-Méndez, J. & Harrison, L. (2004). The pedagogical effectiveness measurement (PEM): a profiling framework for the evaluation of online courses. In C. Crawford et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2004*. Chesapeake, VA: AACE, 1009-1014.

So, H. & Kim, B. (2005). Instructional methods for CSCL: review of case studies. *Proceedings of the 2005 conference on Computer Support for Collaborative Learning*, 607-616.

Spiteri, L. (1998). A simplified model for facet analysis. *Canadian Journal of Information and Library Science*, 23, 1-30.

Tallman, J. (2003). Classroom teaching in Botswana and online teaching from Georgia: hard knocks and earned successes. *Journal of Education for Library and Information Science*, 44:1, 39-57.

Topç u, A. (2008). Intentional repetition and learning style: increasing efficient and cohesive interaction in asynchronous online discussions. *British Journal of Educational Technology*, 39(5), 901-919.

TABLES

<u>Cluster 1</u>
<i>Primary Teaching Styles:</i> Expert/Formal Authority <i>Secondary Teaching Styles:</i> Personal Model/Facilitator/Delegator
<u>Cluster 2</u>
<i>Primary Teaching Styles:</i> Personal Model/Expert/Formal Authority <i>Secondary Teaching Styles:</i> Facilitator/Delegator
<u>Cluster 3</u>
<i>Primary Teaching Styles:</i> Facilitator/Personal Model/Expert <i>Secondary Teaching Styles:</i> Formal Authority/Delegator
<u>Cluster 4</u>
<i>Primary Teaching Styles:</i> Delegator/Facilitator/Expert

Secondary Teaching Styles: Formal Authority/Personal Model

Table 1: Clusters of Teaching Styles (Reproduced from Grasha (2002), p. 154)

Course	Frequency	Frequency		Intensity	Topicality
		Instructor	Learner		
MG	1.70	0.38	1.38	3.60	6.66
MD	2.37	0.57	1.11	1.94	4.80
MF	5.24	0.48	1.38	2.85	3.17

Table 2: Summary of FIT Analysis Results

Course	Cluster	Expert	Formal Authority	Personal Model	Facilitator	Delegator
MG	None	4.7	4.8	6.0	6.2	5.5
MD	3	5.7	4.7	6.1	5.1	3.5
MF	3	6.3	5.5	5.7	6.0	4.5

Table 3: Summary of Grasha-Reichmann Teaching Styles Inventory Results

Expert

Possesses knowledge and expertise that students need. Strives to maintain status as an expert among students by displaying detailed knowledge and by challenging students to enhance their competence. Concerned with transmitting information and insuring that students are well prepared.

Formal Authority

Possesses status among students because of knowledge and role as a faculty member. Concerned with providing positive and negative feedback, establishing learning goals, expectations, and rules of conduct for students. Concerned with the correct, acceptable, and standard ways to do things and with providing students with the structure they need to learn.

Personal Model

Believes in “teaching by example” and establishes a prototype for how to think and behave. Oversees, guides, and directs by showing how to do things and encouraging students to observe and then to emulate the instructor’s approach.

Facilitator

Emphasizes the personal nature of teacher-student interactions. Guides and directs students by asking questions, exploring options, suggesting alternative, and encouraging them to develop criteria to make informed choices. Overall goal is to develop in students the capacity for independent action, initiative, and responsibility. Works with students on projects in a consultative fashion and tries to provide as much support and encouragement as possible.

Delegator

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Concerned with developing students' capacity to function in an autonomous fashion. Students work independently on projects or as part of autonomous teams. The teacher is available at the request of students as a resource person.