Field Dependence As A Factor
In Faculty And Student's Views
Of Different Online Instructional Tools

Peter Draus
draus@rmu.edu
Department of Computer and Information Systems
Robert Morris University
Moon Township, PA

Abstract

This study looked at faculty and student's views of twelve different instructional methods common in online learning. The subjects were grouped by their level of Field Dependence as measured by the Group Embedded Figures Test. No significant differences were found between the faculty and student's ranking of the instructional tools. There were four moderate correlations between the scores on the GEFT and the instructional methods and four different groups had significant differences using ANOVA's between the instructional tools and three groupings based on the GEFT score. The results suggest there might be some connection between the level of Field Dependence and their preference for different instructional methods.

Keywords: Field Dependence, Online Instruction, Faculty/Student differences, Group Embedded Figures Test.

1. INTRODUCTION

Just as in a traditional classroom, there are multiple instructional methods that are available in an online environment. Both students and faculty have preference for online learning, but the goal of this research is to examine this preference at the individual instructional method. Future research will focus on the ability of software to tailor instruction to the individual student's preferences experience. For this to happen we first need to determine if such individual preference exist and then if they are grouped in some fashion.

Personality and cognitive styles in selecting instructional strategies

Kamal and Radhakrishnan (2019) proposed using the Myers-Brigs and Felder-Silverman Index of Learning Styles tests to assign students into four learning categories which are used to match students to e-learning environments. Another recent study proposed using the Big 5 personality traits as the basis for grouping students for online learning (Rios, 2019).   Rios utilized the Community of Inquiry framework for their study and found a significant correlation between the personality traits of conscientiousness and openness and social, cognitive, and teaching presences when utilizing online learning.

Other researchers have proposed a more robust method of forming the learning style groupings. Denphaisarn (2019), proposed an 8x8 matrix of personality and learning style to 8 different categories of online learning environment. The researcher then gathered data form 400 students and comnpared their preferences to the proposed matrix and concluded, "…that by integrating the personality type, different e-learning course contents may be required for users with similar Learning Style in order to make them satisfied with the materials."(Denphaisarn 2019,p.157)

Cognitive styles are an important characteristic of learners that can be utilized to provide customized instruction leading to better performance. One recognized cognitive style is Field Dependence, which is reliably measured by using the Group Embedded Figures Test (GEFT). One of the useful characteristics of online learning is the ability to simultaneously utilize multiple learning methods to present material to the students. Still, faculty have only so much time to work to develop the online courses and must pick and choose which methods to employ. This study looked at the preference for different instructional methods and their relationship with the faculty's level of Field Dependence as measure by the GEFT.

Field Dependence

Field Dependence was first recognized as a cognitive style by Witkin (Witkin 1949-77). Goodenough and Witkin (1977) defined Field Dependence as "the tendency to rely primarily on internal references in information processing" and Field Independence as "the tendency to place greater reliance on external referents." Measures of this cognitive style are reportedly stable over time (Pithers, 2002). Most of the previous research in this area focused on student performance with little research at the university faculty level. There has been some evidence that there are differing levels of Field Dependence in different areas of study in higher education (Pithers, 2002) and some showing differences when different transmission mediums are utilized (Draus 2016). Different instructional tools may emphasize different medium of transmission as well as organize the information differently in relation to the background of the message. Jones and Blankenship (2018) looked at Field Dependence gender and academic performance in an online environment focusing on Hispanic students. They concluded, "…that students were in online classes and these online classes may require more of a field independent learner." (Jones and Blankenship 2018 p.7) Field Dependence may be an indicator of which tools may be preferred and ultimately may indicate which tools will enhance performance. Other researchers have looked at the connection between a teacher's learning style and their instructional methods.

Group Embedded Figures Test

Since the 1970's the standard measure of Field Dependence is the Group Embedded Figures Test. Early studies measured the level of Field Dependence using a modified room; this was later modified into a mobile device, which required the subject(s) to have their head(s) strapped into the device. By the 1970's a paper and pencil test, the Embedded Figures Test was developed. This was further modified into the Group Embedded Figures Test, which allowed for group administration of the test (Witkin 1949-77). The GEFT is a timed instrument where the subjects are asked to trace a simple figure located inside of a more complex figure. There are 18 questions on the instrument, and the results are scored on a scale of zero to 18, where the low end has been classified as Field Dependent and the higher end as Field Independent.

Field Dependence and Online Learning

Since this cognitive style directly relates to how people process information in the visual field, and more importantly, their ability to separate the information from the presentation environment, previous research has suggested that students who are Field Dependent (scoring lower on the GEFT) should utilize different screen design for online instruction (Hannafin and Hooper,1989). The instructional design of online education would be an excellent area where field dependence might reflect bias of the content developer (faculty). While normal instructional design principles attempt to provide multiple methods of instruction, each instructor has his/her own individual style. The literature in this area focuses on differences in performance in online or eLearning environments between subjects with different levels of Field Dependence (Sözcü, et al., 2016; Sabet; Mohammadi 2013). Most of the literature on the teacher/instructor has been conducted on pre-service teachers. The findings indicate no differences in their performance as students or their preference for receiving online instruction (Altun and Cakan, 2006). Altintaş, S. and Görgen found small differences in the preference against deep learning vs surface learning based levels of Field Dependence. (Altintaş and Görgen, 2018) There is sparse mention in the literature on preferences in the types of learning activities utilized in online environments by subjects with different levels of Field Dependence (Ipek, 2010; Karamaerouz, 2013; Pithers 2002). There has been some speculation and anecdotal notice of differences in teacher's preferences for online learning itself and have some relation to their levels of Field Dependence, but no controlled research (Yazici 2014; Yildirim, and Zengel, 2014). This study proposes to look at the individual methods of instruction in an online environment.

2. RESEARCH METHODOLOGY

This is an exploratory study to determine if there is any indication that a faculty and student's

member's level of Field Dependence impacts their online teaching and learning style or preferences. This study does not examine the effectiveness of any of the tools on student performance.

Subjects were first administered the Group Embedded Figures Test (GEFT) to measure their level of field dependence. Subjects were then assigned a field dependence rating (Field Dependent, Field Neutral, Field Independent) based on their GEFT score. Then a survey on their preferences for different online teaching methods and experience was administered. This survey used a Likert type scale with the following scale; Dislike greatly = 1; Dislike = 2; No Preference = 3; Prefer = 4; Prefer greatly = 5.

The instructional methods were selected by the researcher and validated by two Instructional designers and three other faculty members prior to administration.

3. RESULTS

Sample
The subjects were drawn from the students and faculty at a small private university with a significant online presence. The entire subject pool had considerable experience in online instruction. All faculty held doctoral degrees. Subjects ranged from age 18 to 73. While the gender was equally split between men and women, this was by chance and was not part of the research design. There were 30 subjects in the pool.

Field Dependence
The subject's level of field dependence as measured by the GEFT ranged from 0 to 18; which is the entire range of the GEFT scores. The GEFT scores were used to assign the subjects into one of three categories, Field Dependent, Field Neutral and Field Independent. The distribution was 40% Field Dependent, 20% Field Neutral and 40% Field Independent.

Instructional Tools by Faculty/Student groups
The survey asked about 12 different instructional tools using a Likert type scale (Dislike Greatly, Dislike, No Preference, Prefer, Prefer Greatly). The resulting means for each method is shown in Table 1. Overall "Tests" and "Homework" had the highest mean rankings while for faculty alone "video tutorials" had the highest ranking. Students preferred "tests" and "homework" the most. T-Tests were utilized to look for differences between the student ranking and the faculty rankings. No statistical differences were found.

Instructional Tools by Field Dependence Groups
Table 2 shows the Means and ANOVA results for the ratings on the Instructional tools grouped by levels of Field Dependence. Four of the tools had a significant ANOVA result and a Tukey analysis was run to determine the individual groups that differed.

Tukey results for Significant ANOVA's
For the "Instructor lecture videos" instructional method a Tukey analysis indicated differences between the Low and medium GEFT groups. For the "worksheets" instructional method the Tukey analysis indicated differences between the Low and medium as well as the low and high GEFT groups. For the "simulated labs" instructional method a Tukey analysis indicated differences between the low and medium as well as the medium and high GEFT groups. The medium group had the lowest GEFT score and the low and high groups had similar (higher) average scores. For the "end of chapter questions" instructional method a Tukey analysis indicated differences between medium and high GEFT groups.

Correlations between Field Dependence Groups and Instructional Tools
Using Goodenough and Witkin's definitions; Field Dependence as "the tendency to rely primarily on internal references in information processing" and Field Independence as "the tendency to place greater reliance on external referents"; Spearman Correlations were then calculated using the raw GEFT score and the subjects' responses on the different instructional tools. The results are shown in Table 3.

For the overall scores, the largest correlation is for the use of worksheets. Being that this is a negative correlation and the way the GEFT is scored, we can read the results as "the use of worksheets" is correlated with their level of Field Independence; or higher score on the GEFT.

The other two interesting correlations concerned "Instructor Lecture Videos" (rho = -.422) and "Tutorial Videos" (rho = .230). It is somewhat surprising that two very similar instructional formats yielded dramatically different correlations to the GEFT raw scores. The results suggest that Field Independent faculty and students prefer to use tutorial videos and don't want to use lecture videos and the reverse for Field Dependent faculty and students members.

For the Faculty group "worksheets" had the highest correlation (rho = -.663) with "Instructor lead Videos" having the second highest

correlation (rho = -.502). Again, being that this is a negative correlation and the way the GEFT is scored, we can read the results as "the use of worksheets" and "Instructor lead Videos" is correlated with their level of Field Independence; or higher score on the GEFT.

For the Student group "Online Readings" had the highest correlation (rho = -.572) which was different than either the faculty group or the combined groups. Again, being that this is a negative correlation and the way the GEFT is scored, we can read the results as "the use of worksheets" and "Online Readings" is correlated with their level of Field Independence; or higher score on the GEFT.

It is interesting that all of the highest correlations were negative. A negative correlation between preference for a method and the GEFT would show that generally the higher the GEFT the lower the preference for a particular method. This indicates an area for future study.

To get a better look at these phenomena, an ANOVA was run against the individual instructional methods using the Field Dependent variable as the grouping factor for both the student and faculty individual groups. No significant differences were found for the level of Field Dependence.

4. SUMMARY

The subject pool of faculty and students had a wide range of scores on the GEFT and reported a variety of ratings for twelve different instructional tools. No significant differences were found between the faculty and student's ranking of the instructional tools. There were four moderate correlations between the scores on the GEFT and the instructional methods and four different groups had significant differences using ANOVA's between the instructional tools and three groupings based on the GEFT score. The results suggest there might be some connection between the level of Field Dependence and their preference for different instructional methods.

5. REFERENCES

Altintaş, S. and Görgen, I. (2018). The Effects of Pre-service Teachers' Cognitive Styles on Learning Approaches. *International Journal of Evaluation and Research in Education (IJERE)*. 7(4), December 2018, 285~293

Altun, A., and Cakan, M. (2006). Undergraduate Students' Academic Achievement, Field Dependent/Independent Cognitive Styles and Attitude toward Computers*. Educational Technology and Society*, 9 (1), 289-297.

Draus, P. (2016). Differences in Effects of Help Sequence's Delivery Medium On Users Of Differing Levels Of Field Dependence. *Issues in Information Systems.*17(I), 149-156.

Denphaisarn, N.(2014)A New Framework for E-Learning Using Learning Style and Personality. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*(2014)13(1), 145-159.

Ipek, I. (2010). The effects of CBI lesson sequence type and field dependence on learning from computer-based cooperative instruction in web, *Turkish Online Journal of Educational Technology (TOJET)*, 9(1), 221-234.

Jones, I., Blankenship, D. (2018) Learning styles, online courses, gender, and academic achievement of Hispanic students in higher education. *Research in Higher Education Journal*, Volume 35(1), 1-14.

Kamal, A. and Radhakrishnan, S. Individual Learning Preferences Based On Personality Traits In An E-Learning Scenario. *Education in Informaation Technology* (2019) 24: 407. https://doi.org/10.1007/s10639-018-9777-4

Karamaerouz,M., Abdi, A. , Laei, S.(2013) Learning by Employing Educational Multimedia in Field-dependent and Field-independent Cognitive Styles. *Universal Journal of Educational Research* 1(4): 298-302, 2013

Goodenough, D. R. (1976). The role of individual differences in field dependence as a factor in learning and memory. *Psychological Bulletin*, 83, 675-694.

Goodenough, D. R., Witkin, H. A. (1977). Origins of the field-dependent and field independent cognitive styles. Washington, D.C.: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 150 155)

Hannafin, M. J., and Hooper, S. (1989). An integrated framework for CBI screen design and layout*. Computers in Human Behavior*. 5, 155-165.

Liew, T. W., Tan, S. M., and Seydali, R. (2014). The Effects of learners' differences on variable manipulation behaviors in simulation-based learning. *Journal of Educational Technology Systems*, 43(1), 13-34.

Muhammad, T., Daniel, E. G. S., and Abdurauf, R. A. (2015). Cognitive Styles Field Dependence/Independence and Scientific Achievement of Male and Female Students of Zamfara State College of Education Maru, Nigeria. *Journal of Education and Practice,* 6(10), 58-63.

Pithers, R. T. (2002). Cognitive learning style: a review of the field dependent-field independent approach. *Journal of Vocational Education and Training,* 54(1), 117-132.

Rios, Tetyana (2019). The Relationship between Students' Personalities and Their Perception of Online Course Experiences. *Journal of Educators Online,* 16(1) Jan 2019

Sabet, M. K., and Mohammadi, S. (2013). The relationship between field independence/dependence styles and reading comprehension abilities of EFL readers*. Theory and Practice in Language Studies,* 3(11), 2141.

Sözcü, Ö. F., İpek, İ., and Kinay, H. (2016). The Attitudes of Field Dependence Learners for Learner Interface Design (LID) in e-Learning Instruction. Universal *Journal of Educational Research,* 4(3), 539-546.

Witkin, H.A. (1949). Perception of body position of a visual field. *Psychological Monograph*, 63, 1-46.

Witkin, H.A. (1950a). Perception of the upright when the direction of the force acting on the body is changed. *Journal of Experimental Psychology,* 40, 93-106.

Witkin, H.A. (1950b). Individual differences in ease of perception of embedded figures. *Journal of Personality*, 19, 1-15.

Witkin, H. A. (1973). The role of cognitive style in academic performance and in teacher-student relations. Educational Testing Services, Princeton New Jersey.

Witkin, H. A., Dyk, R. B., Paterson, H.F., Goodenough, D.R., Karp, S. A. (1962).Psychological differentiation: Studies of development. New York: John Wiley and Sons.

Witkin, H. A. Goodenough, D.R. and Karp, S. A. (1967). Stability of cognitive style from childhood to young adult. Journal of Personality and Social Psychology, 7, 291-300.

Witkin, H. A., More, C. A., Goodenough, D.R., Cox, P.W. (1977). Field-dependent and field independent cognitive styles and their educational implications. *Review of Educational Research*, 47, 1-64.

Witkin, H., A., Moore, C. A., Oltman, P. K., Goodenough, D. R., Friedman, F. (1977). Role of field-dependent and field independent cognitive styles in academic evolution: a longitudinal study. *Journal of Educational Psychology*, 69, 197-211.

Yazici, E. (2014). Spatial visualization abilities of field dependent/independent preservice teachers. *Electronic Journal of Research in Educational Psychology,* 12(2), 371-390.

Yildirim, I., and Zengel, R. (2014). The Impact of Cognitive Styles on Design Students' Spatial Knowledge from Virtual Environments. TOJET*: The Turkish Online Journal of Educational Technology*, 13(3).

Appendices and Annexures

	Overall Mean	Mean for Faculty	Mean for Students	T-Test between Faculty and Student ratings
Instructor lecture videos	2.47	2.60	2.30	.285
Video tutorial	3.00	4.00	2.00	.591
Online readings	3.70	3.70	3.70	.347
Discussion questions	3.20	3.40	3.00	.564
Worksheets	2.60	2.40	2.80	.504
Simulated labs	2.65	2.70	2.60	.847
Homework	3.85	3.60	4.10	.472
End of chapter questions	2.60	2.60	2.60	.729
Quizzes	3.00	3.40	2.60	.895
Tests	4.00	3.70	4.30	.277
Essays	3.65	3.40	3.90	.784
Term papers	3.05	3.00	3.10	.282

Table 1. Means and T-Test p values of Ratings for Instructional Tools for Faculty and Students

	Low GEFT score	Medium GEFT score	High GEFT score	ANOVA p value
Instructor lecture videos	3.38	1	2.25	.007
Video tutorial	2.63	2.75	3.50	.491
Online readings	4.00	3.50	3.50	.671
Discussion questions	3.50	2.25	3.38	.404
Worksheets	3.50	1.75	2.13	.003
Simulated labs	3.13	1.00	3.00	.006
Homework	4.13	2.75	4.13	.174
End of chapter questions	2.25	2.00	3.25	.043
Quizzes	3.25	2.75	2.88	.790
Tests	3.75	3.75	4.38	.433
Essays	4.25	3.50	3.13	.230
Term papers	2.88	3.00	3.25	.789

Table 2. Means and ANOVA p values of Ratings for Instructional Tools by Field Dependent Groupings

	GEFT (Spearman rho) Overall	GEFT (Spearman rho) Faculty	GEFT (Spearman rho) Students
Instructor video	-.422	-.502	-3.16
Tutorial video	.230	.504	.341
Online Readings	-.313	-.060	-.572
Discussions	-.0.30	-.330	.309
Worksheets	-.493	-.663	-.284
Labs	-.130	-.249	.029
Homework	-.034	-.181	.143
End of chapter questions	.393	.308	.469
Quizzes	-.223	-.325	-.047
Tests	.276	.277	.313
Essays	-.358	-.349	-.373
Papers	.050	-.159	.239

Table 3. Spearman Correlations between GEFT and Instructional Tools