Testing an Experimental Universally Designed Learning Unit in a Graduate Level Online Teacher Education Course

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Abstract

The recent rapid increase in online training offers a potentially powerful solution to teacher shortages. Yet, while we quickly develop online courses for this purpose, we must continue to examine our pedagogy to assure high quality learning experiences. This study explored outcomes of designing an online graduate level unit for a teacher education course using universal design for learning (UDL). Using UDL, students receive, interact with and demonstrate proficiency in ways that best highlight their strengths. The methods included (1) surveying online student preferences and experiences, and (2) comparing an experimental UDL course unit with other online units. Most participants reported a preference for the UDL design on all measured parameters. Conclusions point to recommendations for further examination of effective methods for designing and evaluating online learning experiences.

Keywords: accessibility, higher education, learning styles, universal design for learning, special education, graduate education

Introduction

In fall of 2002, over 1.6 million students took online courses at degree granting institutions. As of fall of 2005, that number had doubled (Allen & Seaman, 2006). The rapid growth of online education as a distance learning option has caused unprecedented growth in credit hours in teacher education institutions (Allen & Seaman, 2006). Whether the popularity of online delivery for teacher education is driven by effectiveness of the delivery method, the ability to train more teachers, or the increased revenue experienced by colleges of education is not yet clear. Perhaps there are elements of all three forces. What is clear is that faculty must transform their teaching styles in order to provide effective online pedagogy.

Re-training faculty to provide effective online instruction has become no less than a national priority, but without an established body of research on effective online practices, there are no guiding principles for best practices in course design (Maddox, 2004; NEA, 2000; Spellings & Stroup, 2005; Lee & Busch, 2005). Out of necessity and the increase in online credit hours, faculty continue to be called upon to

teach online courses with little or no training in online delivery methods.

As of 2003, 17 commercial companies that "teach online to teach online" had already been established (Carnevale, 2003). A number of recent publications have begun to explore the possibilities for in-service faculty training, and a few universities have even developed graduate certificates in online teaching. The majority of university based training for faculty is perfunctory, based on the basic equipment and course management systems rather than on pedagogical effectiveness (Wilson, 2004).

One of the challenges of teaching an online course is the development and inclusion of materials that teach the concepts in a meaningful manner. At the graduate level, it is especially important for faculty to be able to teach students how to apply, synthesize and evaluate concepts. While rigor of content is essential, development of an environment that meets the learning needs and communication preferences of students must be considered. This study examined a method for making courses more meaningful for graduate level teacher education students, by offering choices about how to access information, interact with activities and materials, and how to report back what they had learned. To do so, this study implemented an experimental application of universal design for learning (UDL) to an online graduate course.

Applications of universal design in architecture, electronics and civil engineering have had great success in making the world more accessible to all users. Most recently, it has been used extensively to make the world-wide-web accessible to all users (Roberts, 2004; Burgstahler, 2002; IBM, 2005; Pearson & Koppi, 2003). While universal design has been successful in making online courses more accessible in the realms of physical and sensory needs, the design method doesn't fully address the need for varied learning needs. This is especially interesting given that nationally, students with learning disabilities – not those with sensory or physical disabilities – are the most rapidly growing group of university students with disabilities (National Center on Educational Statistics, 2005).

Universal design for learning (UDL) has been promoted over the past decade as a way to make learning accessible to more users, based on an array of choices made by the learner (Hall, Strangman & Meyer, 2005). Widely recommended as a tool for differentiation of instruction in K-12 classrooms, only recently have a few studies begun to discuss its use in postsecondary settings (Field, Sarver, & Shaw, 2003).

There were several research questions addressed in this study. First, would students in an online course in teacher education find a set of learning activities designed with UDL to be (a) more flexible, with better opportunities to show their strengths; (b) a more enjoyable experience, allowing each student to access information and interact with it in the way they most preferred, and (c) more of an opportunity to challenge themselves as learners? A second research question was whether participants would report leaving the course with a deep understanding of the power of UDL, and plans to take this understanding back to their own classrooms. Finally, this study posed several smaller questions to support the findings from the first 2 questions: (a) How varied are the learning styles of students participating in online courses in teacher training? (b) How much do course members in graduate level teacher training vary in their personal preferences, as measured by a Myers-Briggs-like assessment? (c) Do students' personal preferences affect their activity preferences in online courses? and (d) What would be the outcome of providing universal design for learning (UDL) choices in one of the online instructional units for a graduate course in differentiating instruction?

Method

Participants

The sample of participants was drawn from a required online graduate course in teacher preparation, "Addressing Differences in Human Learning". Student participants from all sections of the course were solicited each semester, between Summer Session of 2005 (the pilot study) and Fall of 2006. Although the sample was not randomly selected, it did represent a wide cross-section of participants in terms of experience with online instruction, teaching experience, distance from campus and teaching discipline. This course was a good source of participants for the study for several reasons: First, all students in the College of Education took this "core" course as a requirement, so students came from all discipline

areas. Second, one of the goals of the course is to teach graduate students to use universal design for learning with their students, and participation in this research gave them first-hand experience in and a deeper understanding of UDL. Third, a consistency was established by using the study only in sections of this one course. Finally, this sample was convenient, and easily accessible to the researchers.

The sample included 216 participants. They varied widely in their degree of experience with online learning. When asked how many online courses they had taken, the range of responses went from 0 to 20. The average number of online courses taken by the 216 students who responded to this item was 7 courses. The most often reported response (30 students) was 2 courses.

The range of experience with online courses that was reported is shown in Figure 1. As shown, most students had taken between 0 and 9 online courses. This variation may have had an effect on responses. When participants reported their "favorite" online activities, those with less experience may not have been aware of many of the choices, not having experienced them.

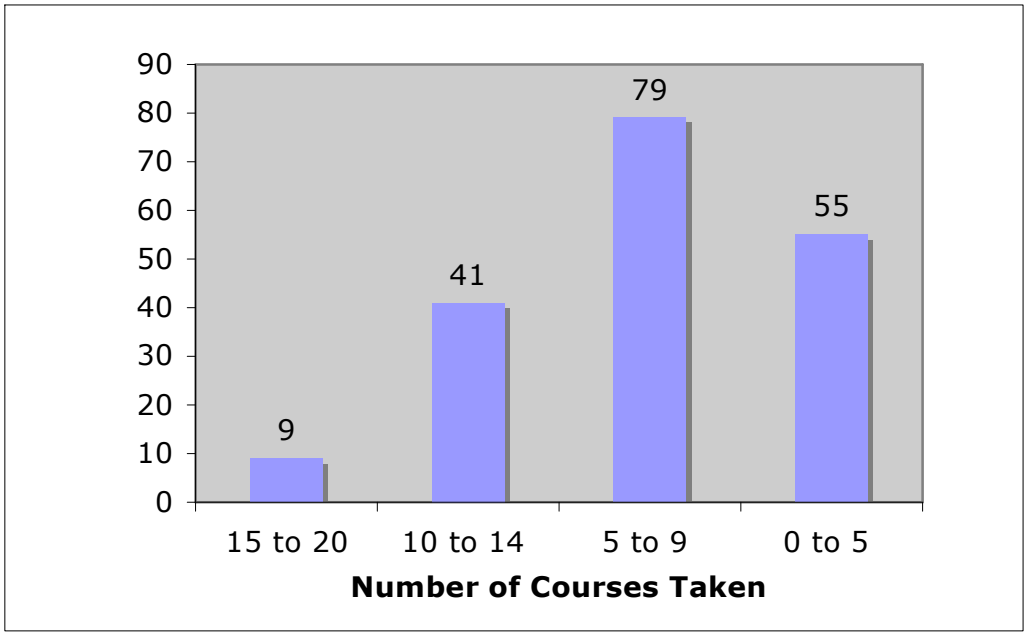

Figure 1. Experience in Number of Online Courses Taken Across the Sample (n=216).

A wide range of classroom teaching experience was represented, ranging from 0 to 39 years. The largest number of participants had no classroom teaching experience, but the average number in the sample was 7 years.

Study participants mostly lived near or on campus, but many lived at quite a distance, with a range of distance from campus of 0 to 3500 miles (participants living in Great Britain and Ghana). The mean number of miles from campus was 104, while the median was 57 and the mode was 0 miles.

The representation of age groups taught by participants is shown in Figure 2. The groups roughly reflect the proportion of the department sizes on campus.

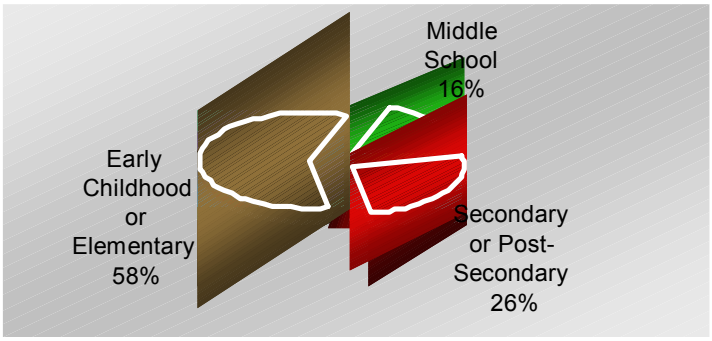

Figure 2. Age Groups Taught by Participants

Respondents were all fully certified teachers, working on advanced licensure, or some area of add-on licensure. Content areas varied widely, including almost every content area and special education, as shown in Figure 3. The overrepresentation of some areas is due to the 'cohort" model used in some of the College's departments (e.g. Health Education and Business Education). This meant that some semesters, whole sections of one discipline area would take the course from which the sample was drawn.

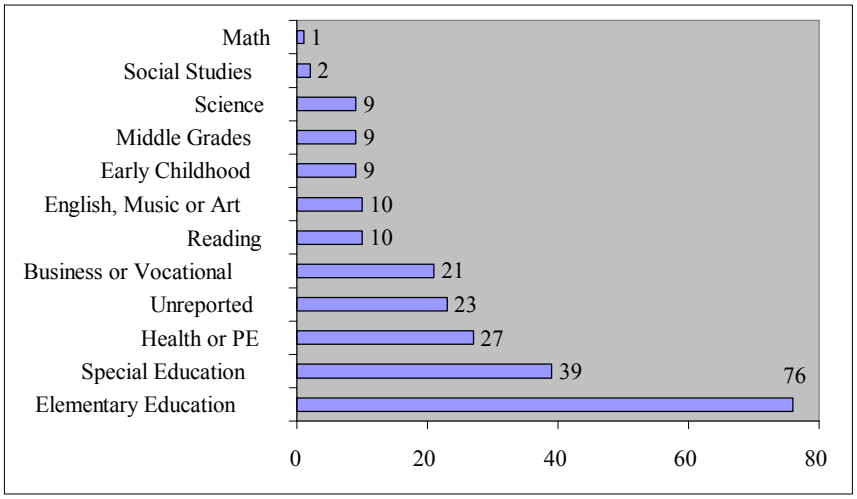

Figure 3. Teaching Disciplines Represented in Sample (n=216)

Across the life of the study, about 15% of students reported that they used dial-up internet services, but by the last administration of the survey, most students were using some sort of broadband service, with only 3% using dial-up internet access.

Instruments

The "Online Learning Preferences Survey" (See Appendix A) was constructed and administered to participants. This survey instrument was developed and piloted on a small sample in the 1st summer session of 2005. Several changes were made to the original survey, and the current survey was implemented, beginning the 2nd summer session of 2005. Although minor changes were made in format, mostly for clarity, after that time, the instrument remained essentially the same. The parts of the survey and the rationale for their inclusion are described below.

Learning Styles

The first part of the survey asked participants to report their learning styles, as measured on a simple checklist. For the checklist results, students were asked to complete the Solomon and Felder online assessment at http://www.engr.ncsu.edu/learningstyles/ilsweb.html (Solomon & Felder, 1999) and report their summarized results. Participants were asked to report on four axes of learning styles. They could be at either end of the axis for each pair, or in the middle, showing no preference for either end. The four pairs were (a) reflective vs. active; (b) sensing vs. intuitive; (c) visual vs. verbal; and (d) sequential vs. global. This particular checklist was selected because it has successfully been used in numerous other studies for a similar purpose, and it is easily accessible to students, at no cost. This index was initially developed to measure learning styles in engineering students, but its use became almost immediately widespread in other content areas (Genovese, 2004). Although the validity and reliability of this learning styles index have more recently come into question for use in predicting performance in classrooms, this was not a problem for the current study, which used it merely to determine learning preferences.

Personal Preferences

For a deeper understanding of learning style profiles of the participants, they were asked to complete the Humanetrics “Jung Typology” test, which is similar to the Myers-Briggs Temperament Indicator. Research on personality preferences and their relationship to educational practices has waxed and waned since the introduction of the Myers-Briggs personality types in the 1970’s. In Schroeder’s (1993) study of over 4,000 freshmen, he concluded that the “lecture/listen” model was ineffective with most of the identified personality types. Due to his finding that over 60% of the students were “sensing” (rather than “intuitive”), he concluded that the majority of college freshmen would perform better given concrete, hands-on experiences.

Although the application of learning style and personal preference research to developing postsecondary content is not new, the interest in this area has re-awakened with the advent of online education. A number of researchers have pointed out that students could improve class performance when they understood their own learning styles, and most have concluded that a mixture of many instructional styles are superior than the use of only 1 or 2 (O'Brien & Brandt, 1997). In his study of learning styles and how instructors select their instructional methods, Schroeder (1999) reported that a common attitude among instructors seemed to be "My classroom would be a much better place if my students were more like me!”. Instructors tend to plan their learning activities according to their own learning styles, rarely varying it for their students’ preferences. Another common dilemma is that when instructors design for any one type of learning preference, they do not address those of most of their students (Hall, 2006).

More recently, studies that have examined the relationships between personality preferences, learning styles and instructional methods used in online courses, making recommendations based on their findings (Irani, Telg, Scherler, & Harrington, 2003; Higgins, 2002; Kim & Schniederjans, 2004; Jenkins & Downs, 2003). In some cases, there have been surprising results when applying MBTI types to internet activity preferences (Desmedt & Valcke, 2006; Amichai-Hamburger, Wainapel, & Fox, 2003, Bonebrake, 2002; Nussbaum et. al, 2004; Contreras, 2004). Although the reliability and validity of the MBTI have been questioned since its inception, the Myers and Briggs Foundation (http://www.myersbriggs.org) reports that the instrument is still commonly used in studying learning, career and relationship preferences (Hunsley & Wood, 2004).

In this study, participants were asked to report their 4-letter type, after taking the Humanetrics “Jung Typology” Test. The Humanetrics company consists of psychologists and mathematicians with 30 years of experience in application and development of comprehensive tests. While the Humanetrics version yields a 4-letter type much like the Myers-Briggs assessment, it is only a facsimile of that test, provided to the public at no charge. The results of this assessment can in no way be said to match those of the more costly Myers-Briggs-Temperament-Indicator (MBTI). Although the Humanetrics version of the assessment was used for reasons of convenience and no cost, this informal checklist worked well for this study, in which results were used to compare learning styles and preference profiles with instructional methods. Its results also provided students insightful information about the attitude types

(extrovert [E] vs introvert [N]), and function types (thinking [T] vs feeling [F]; sensing [S] & intuition [I]; judging [J] & perceiving [P]), predominant in their preferred learning experiences.

The UDL Unit

The term "universal design for learning" can be described as designing not for the "typical student", but for every student. There is a wide variety in the learning needs and preferences of the university student population, yet we continue to design our online courses either according to the course management system available to us, or according to our own learning styles and preferences (Rosenfeld & Rosenfeld, 2004).

The Center for Applied Technology has defined universal design for learning as: "Multiple means of representation, to give learners various ways of acquiring information and knowledge; Multiple means of expression, to provide learners alternatives for demonstrating what they know; and Multiple means of engagement, to tap into learners' interests, offer appropriate challenges, and increase motivation" (http://www.cast.org/research/index.html). The idea behind UDL is to provide differentiation and flexibility before, rather than after course development. Like universal design in architecture and telecommunications, using UDL in the development and delivery of online courses benefits all students, by allowing them to learn in the ways that play to their strengths and needs. Additionally, many users are at a distance from the university that prevents them from taking courses on campus. Courses designed with UDL can benefit those who have slower connection speeds and cannot access video or other broadband type resources.

The experimental unit in this study provided choices in the way students received, interacted with, and expressed information and concepts as part of the course (see Appendix B). To accomplish this, for each of the activity competencies, students were asked to select from several options for completing them.

The Four Questions

After completion of the experimental unit designed using UDL principles, participants answered four questions about it, as follows: (1) Did they feel like they had been presented with "real" choices? (2) Would they want to have these sorts of choices throughout courses? (3) Did they feel that the choices gave them more of an opportunity to show their best work? and (4) Did they think that the choices gave them more opportunity to "challenge themselves"? Together, these questions directly addressed one of the four research questions of the study.

The Online Course Preferences Section

The rest of the survey was based on research questions regarding online course activity preferences, and student demographics. For example, in many of the items, students selected and ranked their most and least preferred online course activities. Other items concerned distance from campus, the content area they taught, and so forth. A summary of findings from administration of the survey instrument is shown in the results section, below.

Results and Discussion

Teacher Education Participants' Reactions to UDL Unit

This study was implemented at the same time that students completed an instructional unit on UDL. Along with text and supplementary readings it included learning activities that were designed to meet different learning preferences/styles Students were given the opportunity to choose the activity they wished to complete to attain competencies. An activity was also included that questioned students about their reaction to this experimental unit, and the results of their responses are organized by question, as follows.

Did You Feel As Though You Had Real Choices In Learning Methods?

The purpose of this question was to assure that students perceived the options as having an acceptable level of variety. Responses were gathered on these items for 138 of the participants in the sample. Overall, 133 out of 138 participants did feel that the choices had very distinct differences.

Would You Prefer Having Every Week's Work Presented Like This?

When asked if they would like to see choices incorporated in each week's units, 107 out of the 138 (about 78%) indicated that they would like that. There were many open-ended comments of mostly 2 types: One was the comment that said, "it took me too long to decide which ones to choose" and the other was "I had a hard time deciding on the one you (the instructor) wanted me to choose". This second comment was especially interesting since the majority of group were "SJ" (Sensing/Judging) learning style types. The literature reports the tendency of that group to try to do things the way the instructor wants (or the "right" way) (Golay, 1983). Even when given open-ended opportunities, they superimposed the notion that there must be a secret instructor-preferred group of activities for them to choose.

Did Having A Choice Of Activities Give You More Confidence About Your Ability To Succeed In The Course?

Overall, participants reported that having choices did make them more confident about how they would perform, because of their opportunity to choose a method. About 83% reported this. One interesting response that came up repeatedly in the open-ended comments was that this method didn't increase their confidence because they already felt very confident in their abilities. Many respondents went on to explain that they were high achievers, and so on, and didn't really need differentiation in order to perform well.

Did Having A Choice Of Activities Provide You With More Opportunity To Challenge Yourself?

Out of 138 participants, 113 (82%) reported that the choices did allow them more opportunities with which to challenge themselves. They gave reasons like, "I tried something new", or "I tried something I never would have thought of". Many of the participants who reported that they had not been more challenged tended to qualify their answer by saying that "I just chose the easiest one" or "I could have been more challenged, but didn't have time to pursue it". It was interesting that "the easiest one" chosen almost always varied from student to student, based on their learning preferences.

A Deeper Understanding Of The Power Of UDL

In the open-ended comments requested after the "Four Questions" and in the Course Evaluations, a majority of respondents reported that now that they understood UDL and how it felt to have empowering choices about their learning, that they would take this method back to apply in their own classrooms. These comments, although unsolicited, were numerous.

Student Characteristic Variations

Learning Styles

Participants were asked to report on four axes of learning styles. They could be at either end of the axis for each pair, or in the middle, showing no preference for either end. The four pairs were (a) reflective vs. active; (b) sensing vs. intuitive; (c) visual vs. verbal; and (d) sequential vs. global. The results were as follows.

In the group of 220 teachers who responded to this section of the survey, most were active, sensing, visual and sequential learners, as shown below. On the reflective/active axis, there was an overwhelming majority of participants who reported either an active preference, or no preference, as

shown in Figure 4.

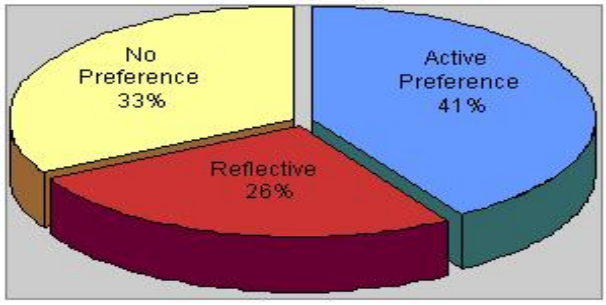

Figure 4. Active/Reflective Learning Styles Axis

On the sensory vs. intuitive learner preference, most participants reported that they preferred sensory learning, as shown in Figure 5.

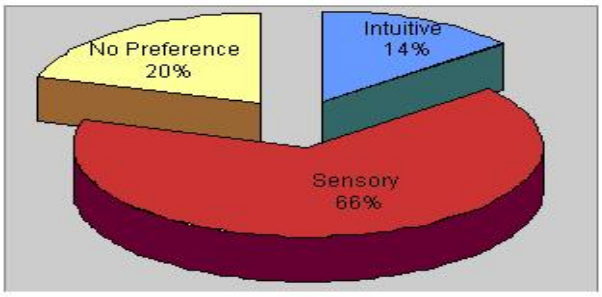

Figure 5. The Sensory vs. Intuitive Learning Preference

On the visual vs. verbal preference index, there was an overwhelming majority of visual learners, as shown in Figure 6.

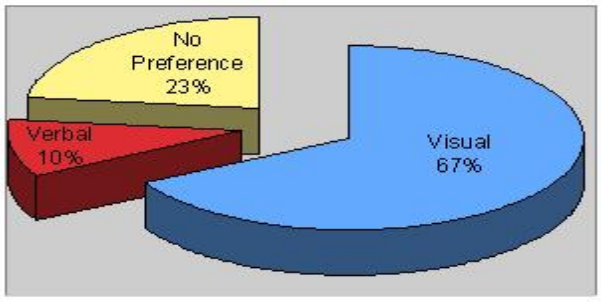

Figure 6. The Visual vs. Verbal Learning Axis

Another overwhelming preference (shown in Figure 7) was the majority who reported preferring sequential to global learning.

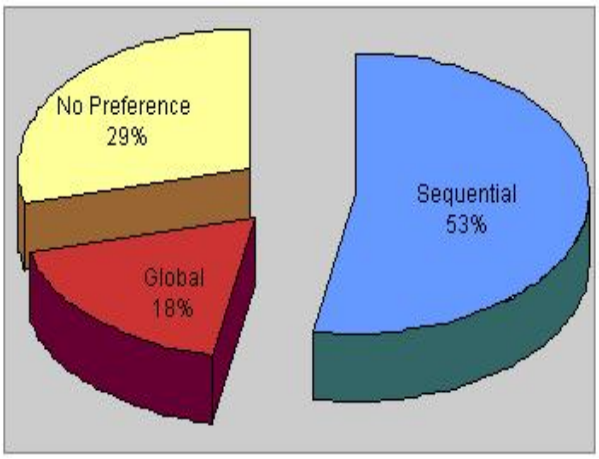

Figure 7. The Sequential vs. Global Preference Axis

Most of these learning preferences are discussed, at length in their relationship to personality preferences, below.

Personal Preferences

There were marked distinctions in the categories of personal preferences reported in this sample. In this system, there are the following possible parameters: (a) Extrovert or Introvert ("E" or "I"); (b) iNtuitive or Sensing ("N" or "S"); (c) Feeling or Thinking ("F" or "T"); and (d) Perceiving or Judging ("P" or "J").

Each letter in the types represents an aspect of personality preference as shown in the list, above. A "type" includes one aspect from each pair, so that there are 16 possible combinations, each of which has very specific preferences. There were no participants who reported being in the ENFP, ENTP, or ISTP categories. The least reported of the 13 remaining categories were ESTP, INFP, INTP and ISFP, with only 1 person each. Only 2 people reported the ENTJ preference. Six participants each reported the EFSP and INTJ categories. Figure 8 demonstrates this distribution.

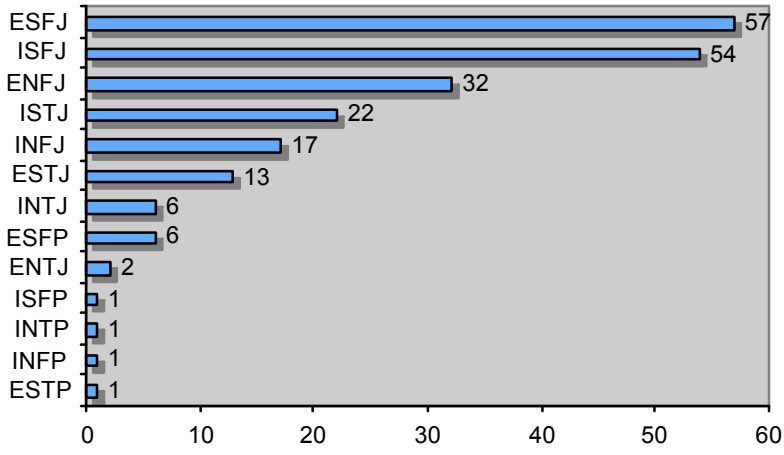

Figure 8. Distribution of Personality Preference Types in Sample (n=213)

Most notable, were the majority of participants who reported being in the categories of ESFJ, ISFJ, ENFJ, ISTJ AND INFJ. Over half of the survey respondents fell into either the ISFJ (25%) or ESFJ (28%) categories, closely followed by the ENFJ (15%) group. The first 2 of these groups made up 53%

of respondents. An interesting note is that none of the groups in this sample larger than 3% reported the "perceiving" (or "P") preferences.

The ISFJ and ESFJ preference categories have several features in common. According to Golay (1983), this means that they fall into the "SJ", or Sensing/Judging Temperaments. In his "learner portrait" description, he calls this group the "actual-routine learners" (ARL). Some characteristics of the "ARL" or "SJ" learner are listed here: (1) Focus on responsibility, study habits, teacher approval; (2) learns through identifying and memorizing facts and procedures, through repetition and drill; (3) prefers sequenced, step-by-step presentation of material; (4) sees "fundamentals" as most important – sees little value in abstractions and theoretical principles; (5) prefers consistent, clearly defined procedures, order and structure; interested in what they and their classmates are "supposed" to do; (6) when asked to invent own procedures, or given vague directions, may become distressed and falter in their work; (7) very detail-oriented, and interested in doing things "the right way"; wants to know teacher preferences and expectations so they can conform to them exactly; (8) craves membership in groups, especially if they involve instructor approval. It is no coincidence that the top personality preference matches 2 of the top identified learning styles. Participants who reported being in the "SJ" category were also those who reported being active, sensory, and sequential learners.

Some of the instructional strategies recommended for this type of student include the following methods: (a) lecture is effective, but only if carefully structured, with major points emphasized; (b) instructor-provided outlines and repetition of material work well; (c) to benefit from a discussion, this student prefers to NOT be spontaneous, but to have information and questions ahead of time, so that s/he can prepare responses; (d) likes drill and practice, and searching for information (if in a very directed way); (e) structured exercises, with clearly defined instructor expectations are very effective (Golay, 1983; Myers & Myers, 1993, Keirsey & Bates, 1984; Morgan, 1997).

Do Their Personality Preferences Affect Preferences In Online Course Activities?

The responses in this study do indicate that personality preferences closely match online activity preferences. For example, the top three favorite internet course activities were cited by all of the "SJ" types in the study as follows: (1) discussion board (47%), (2) small group virtual chat (28%); and (3) independent reading and responding to objective questions (23%).

After the "SJ" groups, the largest group of personality preferences reported were ENFJ and INFJ. The NF learner is described as searching for meaningfulness in life. Rather than actions and information, the "NF" is interested in relationships and interactions. This learner is more interested in concepts and abstract meanings, and in the more global aspect and significance of instructional content. Recommended instructional strategies for the "NF" learner include (a) an individualized and personalized approach; (b) enthusiastic presentations based on personal illustrations; (c) small group discussions; and (d) creative learning projects such as role-playing or dramatizations, or (e) cooperative projects with peers. Repetition and drill, and very prescriptive sequential instructions do not appeal to this type of student (Golay,1983).

Looking back to the study, data did show a difference in favorite online course activities for the NF preference group. This was a somewhat smaller group than the 150 in SJ group. The NFs in the study included only 50 respondents. Their top 3 preferred internet course activities were (a) discussion board (38%); (b) email with the instructor (22%); and the small group virtual chat (20%) – all three of which involve relationship-building activities.

Unrepresented types. The 3 personality preference types not represented in the sample were ENFP, ENTP and INTP. Although it is tempting to make generalizations about these types and why they were not represented, the sample size was not really large enough to make many such generalizations. An interesting note is that all three share the "perceiving" (P) component. In fact, only 10 people in the entire sample of 216 participants reported having this component in their personality preference profile. Given the personality preferences of the "p" type, it is not surprising to find such a small number among K-12 teachers. The "perceiver" tends to be spontaneous rather than systematic, open-minded and curious rather than ordered and planned. This type is curious and adaptable, with a zest for learning, as opposed

to the “J” type, who is more planned, routine, and decisive.

The learning preferences described above are very different from one another. While it’s true that you can’t “please all of the people all of the time”, there are ways to provide for all types, with careful planning (Myers & Myers, 1993). One way that was explored in this study was the application of universal design for learning to an online course unit.

Limitations, Conclusions, and Further Questions

The study had several limitations. First, the sample size was too small to extrapolate too much from the results, except for the areas that stand out as most obvious (like having over 85% “SJ” population within a sample of teachers). This will be addressed as we continue to add to our database each semester. Another limitation was that not all data were available for all variables. The database had some gaps, where information was not available (thus we reported on over 213 personality preference profiles, but only 113 survey respondents reporting on their favorite activities). While all participants responded to the questions about the UDL unit, only some of them opted to complete the additional survey components. Yet another limitation was that the instruments themselves were valid enough for some generalizations about learning needs, but the “Humanetrics” version of typology is not as valid or reliable as the actual Myers-Briggs Temperament Indicator, and our own survey was home-made, and only used in this particular study.

Several conclusions can, however, be made. First, it was found that most of the students in this program are most comfortable with sequential, structured assignments, with clearly defined expectations. Second, a substantial percentage of students need to learn things visually, which is an easy thing to do in an online course, because of the visual nature of most learning activities. Third, many of the students in this program are “NFs”, searching for the meaning and concepts behind their assignments. For this reason, instructions need to be sequential and the “big picture” needs to be explicit to these learners, with opportunities provided for relationship building and creativity. Finally, it was found that most students do prefer a choice in how to access and then engage in activities, and that choices can be tailored to different learning styles.

Recommendations for areas needing further study based on this research include (a) comparing and contrasting what graduate faculty in the College of Education believe about what teacher education students need online, and what students report; (b) comparing and contrasting learning styles and personality preferences of College of Education faculty developing online graduate level courses with those of students; (c) asking more specific preference questions about the UDL unit to reveal which personality types preferred which types of activities; (d) examine the relationship between student preferences and the quality of their performance when given choices; and (e) ways for faculty to incorporate UDL into their online courses and be able to evaluate student work, without feeling as though they are providing an independent study course for each student.

References

Allen, E., & Seaman, J. (2006). Making the Grade: Online Education in the United States. Babson Survey Research Group, Sloan Consortium: Needham, MA.

Amichai-Hamburger, Y, Wainapel, G, & Fox, S. (2002). "On the internet, no one knows I'm an introvert": Extroversion, neuroticism, and internet interaction. Cyberpsychology and Behavior, 5(2), 125-128.

Bonebrake, K. (2002). College students' internet use, relationship formation, and personality correlates. CyberPsychology and Behavior, 5(6), 551-557.

Burgstahler, S. (2002). Universal design of distance learning. Information Technology and Disabilities, 8 (2002).

Carnevale, D. (2003). Teaching online to teach online. Chronicle of Higher Education, 50(10).

Contreras, C. (2004). Predicting computer self-confidence from demographic and personality variables and computer use. Quarterly Review of Distance Education, 5(3), 173-181.

Desmedt, E., & Valcke, M. (2006). Mapping the learning styles "jungle": An overview of the literature based on citation analysis. Educational Psychology, 24(4) 445-464.

Field, S, Sarver, M., & Shaw, S. (2003). The importance of self-determination in postsecondary settings. Remedial and Special Education, 24(6).

Genovese, J. (2004). Index of learning styles An investigation of its reliability and concurrent validity with the preference test. Individual Differences Research, 2(3), 169-170.

Golay, K. (1982). Learning Patterns and Temperament Styles: A Systematic Guide to Maximizing Student Achievement. Manas Systems: Fullerton, CA.

Hall, E. (2006). Learning styles – Is there an evidence base for this popular idea? Education Review, 19(1) 49-56.

Hall, T., Strangman, N., & Meyer, A. (2005). Differentiated Instruction and Implications for UDL implementation. NCAC (National Center on Accessing the General Curriculum)

Higgins, P. (2003). Temperament-based learning styles: Implications for distance education. Capella University, Doctoral Dissertation.

IBM Report (2005). Identifying reasons for producing accessible content and products. IBM.com.

Irani, T, Telg, R., Scherler, C., and Harrington, M. (2003). Personality type and its relationship to distance education students' course perceptions and performance. Quarterly Review of Distance Education, 4(4), 445-454.

Jenkins, S, and Downs, E. (2003). Demographic attitude, and personality differences reported by students enrolled in online versus traditional courses. Psychological Reports, 93(1), 213-222.

Keirsey, D., & Bates, M. (1984). Please understand me. Prometheus Nemesis Book Company: Del Mar, Ca.

Kim, E., and Schniederjans, M. (2004). The role of personality in web-based distance education. Communications of the ACM, 47(3), 95-99.

Lee, J., and Busch, P. (2005). Factors related to instructors' willingness to participate in distance education, Journal of Educational Research, 99(2) 109-115.

Maddux, C. (2004). Developing Online Courses: Ten Myths. Rural Special Education Quarterly, 23(2) , 27-33.

Morgan, H. (1997). Cognitive Styles and Classroom Learning. Praeger: Westport, Ct.

Myers, I., and Myers, P. (1993). Gifts Differing: Understanding Personality Type. CPP Books: Palo Alto, CA.

NEA (2000). Confronting the Future of Distance Learning - Placing Quality In Reach. NEA News Release.

Nussbaum, E., Hartley, K., Sinatra G., Reynolds, R. & Bendixen, L. (2004). Personality interactions and scaffolding in on-line discussions. Journal of Educational Computing Research, 30(1&2), 113-137.

O'Brien, J. & Brandt, R (1997). The Language of Learning: A Guide to education terms, Alexandria, VA: ASCD.

Pearson, E. & Koppi, T. (2003). Essential elements in the design and development of inclusive online courses. International Journal on E-Learning, Oct-Dec, 52-59.

Roberts, K. (2004). The need for universal design in online learning environments. AACE Journal 12(2), 188-197.

Rosenfeld, M. & Rosenfeld, S. (2004). Developing teacher sensitivity to individual learning differences. Educational Psychology, 24(4), 465-496.

Snyder, T., Tan, A., & Hoffman, C. (2005). Digest of Education Statistics, 2005. National Center For Educational Statistics. Educational Publications: Jessup, MD.

Schroeder, C. (1993). Untitled, Change, October.

Solomon, B., & Felder, R. (1999). Index of Learning Styles Questionaire, North Carolina University (http://www.engr.ncsu.edu/learningstyles/ilsweb.html).

Spellings, M., & Stroup, S (2005). Third report to congress on the distance education demonstration program. US Dept of Ed, Office of Postsecondary Education, Office of Planning and Innovation

Wilson, G. (2004). Online interaction impacts on learning: Teaching the teachers toteach online. Australasian Journal of Educational Technology, 20(1), 33-48.

Appendix A. Survey Instrument

This research is being conducted in order to improve online teaching practices in universities. This particular research study measures relationships between and among the following characteristics in online student learners:

1. demographic information
2. Meyers –Briggs Personality Test (MBPT)
3. Occupation and years experience
4. Learning style and/or special learning needs
5. Preferred online course activities

Subjects will complete an anonymous (but coded) survey, a MBPT test (on-line), a learning style checklist, and a course preference survey.

The information will be combined to assess which factors are related to preference of various online course activities. The results will be used to recommend online course design more suitable to student populations. No student names will be used in the study. Participation is voluntary, and all records will be anonymous and confidential.

Once you agree to participate, you will go through the pages of this document, filling your name in the blank below (consent to participate) filling out the rest of the questions in the document, as appropriate. When you finish, please return this entire document (filled out by you) to us at englemanm@mail.ecu.edu.

YES! I will participate in the research project as described above. I understand that I will receive ***10 points extra credit*** in SPED 6002 for participation. (Your name in **bold print** will indicate your agreement.)

_____ _____

Name Date

Check here if you would like a copy of the study when it is completed _____

If you **do not** wish to participate, please fill in the appropriate blank below, and send this to us (with the rest of the document blank) at xxxxx@xxxx.ecu.

NO! I do not wish to participate in this research study.

_____ _____

Name Date

(AFTER you finish this page, proceed to next page, "Instructions and Forms for Learning Style Personality Preference Sorters".)

Instructions And Forms For Learning Style And Personality Preference Sorters

WRITE YOUR CODE NUMBER HERE: _____

Learning Style

Complete the checksheet at http://www.engr.ncsu.edu/learningstyles/ilsweb.html

Record your results here: **(Change one response to *bold italics* on each of the four lines to indicate your selection.)**

Were you more….

Active?	Reflective?	In the Middle (same score for both)
Sensing?	Intuitive?	In the Middle (same score for both)
Visual?	Verbal?	In the Middle (same score for both)
Sequential?	Global?	In the Middle (same score for both)

Meyers-Briggs Type Indicator

Take the sorter at http://www.humanmetrics.com/cgi-win/JTypes2.asp

What was your 4-letter type? _____

(example: ENFP)

(You don't need to send copies of the checklists or analyses. Just filling in the information in the blanks above is enough.)

When you finish with these two checklists, proceed to the last part of your participation – the Survey – beginning on the next page.

Survey on Universal Design for Learning in On-Line Courses

Please respond to each item below. Some items have pull-down menus (they all have asterisks*), and many have places for you to add your comments. Thank you for your time in completing these surveys.

YOUR CODE NUMBER	
Your City	
Your State	If outside NC, fill in here:
Age Group You Teach	Pre-Kindergarten* If other, fill in here:
Type Internet Connection	Fast!*
Your Certification Area	
Are you teaching in your certification area?	Yes* No, I'm actually teaching in the area of
Years you have taught?	Write number here:
Number online courses taken?	Write number here: ☐

Proceed to Next Page

Which of the activities on the right have you had the opportunity to try?	☐Chat discussions ☐Discussion Board ☐Online Multiple Choice Reviews ☐Independent Reading and Responding to Content Questions ☐Communication via Email with the Instructor ☐Communication via Telephone with the Instructor ☐Communication via Virtual Chat with Instructor ☐Independent Reading and Responding to Case Studies ☐Video Streamed Lectures ☐Power Point Presentations on Content ☐Power Point Presentations with Voice-Over ☐2-way Audio Communication ☐Webquests ☐Writing Reports on Linked Internet Sites ☐Use of Linked Internet Sites for Supplementary

	Information and Reference. ☐Problem-Solving Assignments ☐Other (explain here):
Are there any you haven't tried that intrigue you? If so, list them here.	

Proceed to Next Page

Please mark your 3 favorite internet courseactivities.	☐Chat discussions ☐Discussion Board ☐Online Multiple Choice Reviews ☐Independent Reading and Responding to Content Questions ☐Communication via Email with the Instructor ☐Communication via Telephone with the Instructor ☐Communication via Virtual Chat with Instructor ☐Independent Reading and Responding to Case Studies ☐Video Streamed Lectures ☐Power Point Presentations on Content ☐Power Point Presentations with Voice-Over ☐2-way Audio Communication ☐"Webquests" ☐Writing Reports on Linked Internet Sites ☐Use of Linked Internet Sites for Supplementary Information and Reference. ☐Problem-Solving Assignments ☐Other (explain here):
Rank Course Activities you chose from Favorite (1) to Least Favorite (3)	Rank your 3 favorite course activities (from above) in order of your preference:

Comments on why they are your favorites?

Please mark your 3 LEAST favorite internet course activities.	☐Chat discussions ☐Discussion Board ☐Online Multiple Choice Reviews ☐Independent Reading and Responding to Content Questions ☐Communication via Email with the Instructor ☐Communication via Telephone with the Instructor ☐Communication via Virtual Chat with Instructor ☐Independent Reading and Responding to Case Studies ☐Video Streamed Lectures ☐Power Point Presentations on Content ☐Power Point Presentations with Voice-Over ☐2-way Audio Communication ☐"Webquests" ☐Writing Reports on Linked Internet Sites ☐Use of Linked Internet Sites for Supplementary Information and Reference. ☐Problem-Solving Assignments ☐Other (explain here):

Comments on why they are your LEAST favorites?

Which are your preferred internet activities? (Check all that apply.)	☐Individual activities ☐Group Activities – Instructor Assigns Groups ☐Group Activities -- Student Selects Group ☐Whole Class Meets In Real Time ☐Other - Explain:
Which are NOT your preferred internet course activities?	☐Individual activities

(Check ALL that apply)	☐Group Activities – Instructor Assigns Groups ☐Group Activities -- Student Selects Group ☐Whole Class Meets In Real Time ☐Other - Explain:
Which types of assignments do you prefer in online courses?	Pre-set due dates, incremental assignments* Comments?
What types of feedback on your work do you prefer? (Check all that apply)	☐Grades and percentages with lots of ongoing written feedback, critiquing my responses. ☐Grades and percentages with occasional written feedback, when I make errors or do something unusually well. ☐Group assignment comments (instructor summarizes feedback for all students in one document) are fine with me, and can be very helpful. ☐Direct emails from the instructor. Comments?
Would you be pursuing a masters degree if it were not offered online?	Yes* Comments?
About how far away from where you live is the nearest university where you could obtain a masters degree in your specialty area?	miles
Was convenience the primary factor that led you to pursue this degree online?	Yes* If other, please explain here:
If there were a face-to-face masters degree program near where you live, would you pursue it instead of the online program?	Yes*
If you responded YES, that you would prefer a face-to-face program (if it were available), tell why.	
If you responded NO, that you would NOT prefer a face-to-face program (if it were available), explain why.	

Do you prefer having choices of activities for the competencies you are acquiring?	Yes* Please Comment:
Do you prefer having set assignments, with no choices offered?	Yes* Please Comment:
Do you think your performance in online courses would be stronger if you had more flexibility in the ways you ***receive instruction?***	Yes* Please Comment:
Do you think your performance in online courses would be stronger if you had more flexibility in the ways you ***interact with the learning materials?***	Yes* Please Comment:
Do you think your performance in online courses would be stronger if you had more flexibility in the ways you ***demonstrate competency in each assignment?***	Yes* Please Comment:
Some students feel that most online activities are "busy work". If, in an online course, you were provided with choices (a) in the instructional method used, (b) of the method of interaction with content and (c) of the method of demonstration of competencies, would your perception of this description change?	Yes* Please Comment:
Do you have a slow, dial-up internet connection that you use for online courses?	Yes*
If you answered "yes" that you have a slow internet connection, are you sometimes not able to complete work in the way it is assigned (using video clips, virtual chat or other memory	Yes* Please Comment:

intensive devices)?	

If you have a slow internet connection, do you think that courses that are more flexible in instruction, engagement and demonstration of competencies would make it easier for you to succeed?	Yes* Please Comment:
Do you think you are getting as good of an educational experience as you would with a face-to-face program?	Yes* Please Comment:
If you could change one thing about the way online courses are designed, what would it be?	Comment here

Thank you for participating in our study! Please save your responses in this document and send it as an attachment to us via the following email address:

xxxxxxx@xxu.edu

Appendix B. Sample Item from UDL Unit

Activity 4 (40 points)

Choose ONE!!

Activity 4a

Consider and discuss both the pros and cons of using UDL in general education classrooms. Explain both sides in a 1-2 page (double-spaced) paper. Cite information from the readings (at least 3) to back up your points. Be sure to provide a reference list at the end. Submit in the Assignment section.

Activity 4b

Go to the textbook website, and then to Chapter 8. Complete the 3 of the 5 activities under "guided review" (link is on left of page). http://wps.prenhall.com/chet_salend_creating_5/0,9622,1582280-,00.html

Please do NOT submit them through the website, but respond in a regular word processing document and then submit to the assignments section.

Activity 4c

Discuss ways you have already incorporated principle of UDL in your classrooms and how UDL could be further incorporated into teaching and classrooms this coming year in a 1-2 page (double-spaced) paper. Explain how these fit into the framework of (a) flexible means of presentation; (b) flexible means of engagement and (c) flexible means of expression.

4d Create a differentiation or UDL "Web Quest". For information on and examples of webquests, go to www.webquest.org. They also have a section there to take you through the whole process.

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