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# No Difference? A Study On Learning Process And Outcome Among Online, Hybrid, And Face-To-Face Courses

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# NO DIFFERENCE? A STUDY ON LEARNING PROCESS AND OUTCOME AMONG ONLINE, HYBRID, AND FACE-TO-FACE COURSES

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**Abstract:**

Many researchers and educators have questioned whether online course management technologies make a significant impact on student learning process and outcomes. Guided by the Seven Principles framework of student learning, our study examined the impacts of three instructional methods including face-to-face (F2F), hybrid (Web-enhanced), and online courses on the learning process and outcomes. Data were collected at a major mid-western university and 1233 valid responses were analyzed in AMOS. We found that there was no significant difference among F2F, hybrid, and online instructional methods in learning outcomes. However, both high expectation of faculty and accommodation for diversity influenced learning outcomes significantly. In addition, faculty contact had a significant impact on outcomes but only in hybrid courses.

**Keywords:** online course management, WebCT, distance education, learning process, outcomes

## I. INTRODUCTION

Distance education, whether by video conferencing, or Internet-based delivery mechanisms, has expanded dramatically over the past decade. During the 1994-1995 academic years, it was estimated that 753,640 students from 2 and 4 year public and private colleges were enrolled in institution distance education courses [U.S. Department of Education, 1995]. Two years later that number rose to 1,661,000 [Lewis et al., 1999] and by the 2000-2001 school year 3,077,000 students enrolled in distance courses online [Waits and Lewis, 2003].

Online course management systems are designed to provide an online support to instructors and students for communication and sharing course materials. Among a few popular systems, WebCT (Web Course Tools) (together with Blackboard after their merge in 2005) is now the most popular platform supporting 5,000 institutions and millions of users globally. ABC University in the mid-west of U.S. has made a major commitment to offering online course management technologies to support distance education and to supplement traditional classroom instructional methods. The number of instructors using WebCT grew from 31 in fall of 1999 to 786 by the fall of 2009. The courses that employ WebCT in some capacity grew from 18 to 639 and the number of student taking online or WebCT-supported courses increased from 200 to 19,562 over that same period. ABC University now offers 7 degree programs through distance learning in WebCT.

Despite the increasing popularity of online education and web-supported teaching and learning, some researchers state that there is no significant difference in learning outcomes between traditional F2F classroom environments and technology mediated teaching, such as video conferencing, computer assisted learning, teleconferencing, and Web-based online learning [Clark and Jones, 2001; Keogh and Smeaton, 1999; Russell, 2001]. However, not all researchers agree. The IHEP [1999] report concludes that “a closer look at the research, however, reveals that it may not be prudent to accept these findings at face value. … It is important to emphasize that, despite the large volume of written material concentrating on distance learning, there is a relative paucity of true, original research dedicated to explaining or predicting phenomena related to distance learning.” (p.3)

Our study adapts the Seven Principles of Good Practice in Student Learning [Chickering and Gamson, 1987, 1991] and examines the differential impacts of three instructional methodologies, including F2F, hybrid (Web-enhanced), and online courses on the learning process and in turn on

the learning outcome. The objectives of our study are 1) to examine the difference of the impacts of instructional methodologies on student learning outcomes and 2) to evaluate student learning process guided by the seven principles framework.

## II. THEORETICAL DEVELOPMENT AND HYPOTHESES

Chickering and Gamson [1987] proposed a framework of the Seven Principles of Good Practice in Student Learning, which evaluates the students' perceptions of the learning process related to effective and successful teaching and learning. The seven principles of learning process and their meanings are explained in Table 1.

Table 1: Seven Principles of Good Practice in Learning Process [Chickering and Gamson, 1987]

| Principle | Explanation |
|---|---|
| Faculty contact between students and faculty | Frequent student-faculty contact in and out of class is a most important factor in student motivation and involvement |
| Cooperation among students | Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated |
| Active learning | Learning is not a spectator sport. Students do not learn much just by sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers |
| Prompt Feedback | Students need appropriate feedback on performance to benefit from courses |
| Time of Task | Time plus energy equals learning. There is no substitute for time on task |
| High Expectation | Expect more and you will get more. High expectations are important for everyone |
| Accommodation of Diverse Talents and Ways of Leaning | There are many roads to learning. People bring different talents and styles of learning to college |

The Seven Principles framework has been adopted and empirically tested in studies such as Chickering and Gamson [1991] and MacDonald et al., [2002]. This framework was believed to be particularly suitable for online learning environment. For instance, Bangert [2006] observed that the practices proposed in this framework are "well-suited for guiding the design and delivery of quality of Internet-based instruction." (p.229) Furthermore, Hutchins [2003] stated that the Seven Principles framework was also "clearly applicable to web-based and other distance learning formats in that they provide instructional strategies focused on the learner, rather than on the medium used to teach the learner." (p.1)

We define three types of instructional methods including traditional F2F, hybrid, and online courses in our study. Traditional F2F courses are classroom courses with no support of online course management or web-based technologies and applications. These are the traditional courses taught in physical classroom with F2F interaction of instructions and students. Online courses are typical distance learning courses that utilize online course management platform such as WebCT to the maximum capacity (web-only). No physical classroom participation is involved and the students only interact with the instructor and other students over distance. Hybrid courses have the combination of both traditional F2F mode of education and distance learning element (web-enhanced). Such courses involve both online and classroom instruction. Students may maintain a F2F contact during classes but use online course management system to do course work, collaborate with other students, and communicate with the instructors on a regular basis.

Many modern information and communication technologies are well embedded in online course management systems. For instance, WebCT integrates communication tools, including online discussion, news alert, chat room, private e-mail, and calendar on the course site. In addition, graphics, video, and audio files can be incorporated as well. Researchers have empirically

demonstrated that such features can facilitate interaction between faculty and students [Burgess, 2003; Morss, 1999] and therefore enhance learning outcomes. For instance, Burgess [2003] found that technology education undergraduate majors had a strong positive response to the question of the usefulness of WebCT as a course tool. Similarly, Klesius et al., [1997] reported that the students they surveyed rated distance education instruction and learning as equal to or better than traditional instruction on all variables studied. We therefore propose our first hypothesis as follows:

H1: There is a significant difference in student learning outcome among the three types of instructional methodologies including traditional F2F, hybrid, and online courses.

Each of the seven factors in the framework has demonstrated to have impact on learning outcomes. First, frequent student-faculty contact in and out of class is a most important factor in student motivation and involvement [Chickening and Gamson, 1987]. Historically, many authors have reported the importance of faculty student contact as a factor in improving student leaning. Epting et. al., [2004] found that ideal professors are highly accessible to students and provide a comfortable learning atmosphere for students. Others suggested that technologies can facilitate the interaction between the teacher and student [Chickening and Ehrmann, 1996]. Rudenstine [1997] found that the use of the Internet and email provides a distinct advantage when communicating with students, particularly in a large class. Similarly, Ritter [2000] found that eighty percent of his students either agreed or strongly agreed that email fostered more communication with their instructor.

Second, cooperation among students is often reflection of good practice in teaching. Good learning should be collaborative and social, not competitive and isolated [Chickering and Ehrmann 1996]. Importantly, these interactions can be dramatically strengthened through communication tools [Chickering and Ehrmann 1996]. Instructors can promote student collaboration through web-based course management systems such as WebCT to work on group projects and assignments. Interactive emails or discussion threads among students can facilitate Web-based learning [Rosenbaum, 2001]. Further, the course management software used for distance classes provides a data repository for reference materials, project documents, and other assignment related information. All of these tools can also be used to facilitate student-to-student interaction, which has been demonstrated to be positively correlated with achievement [Rosenbaum, 2001].

Third, current technologies could improve the active participation of students in the learning experience [Chickering and Ehrmann, 1996]. Sanders and Morrison-Shetlar [2001] found that asynchronous learning for students showed a positive effect on student learning, problem-solving skills, and critical thinking skills. Knowlton [2000] suggested that the instructors' role in online classes will need to evolve from their traditional position as knowledge giver into one of facilitator to promote collaborative learning. Students should be given assignments that require active participation such as online research, simulations, online polling during discussion, which have been demonstrated to have a positive effect on attitude and learning [Borkowski and Welsh 1996].

Forth, Braxton et al., [1996] recommended instructors to providing frequent, prompt, and constructive feedback on student performance. Hattie and Timperley [2007] concluded that the type of feedback and the way it is given can be differentially effective. Chickering and Ehrmann [1996] stated that technology can facilitate the process of providing prompt feedback and the online learning environment provides the efficient tools to communicate constructive and positive feedback to students. Such communication can be by way of prompt emails, posting grades, assignment reviews, and corrections. Feedback can also come from other students collaborating on a project or discussion thread. Online quizzes and frequent homework assignments, if graded promptly can also provide timely feedback.

Fifth, new technologies can dramatically improve time on task for students and faculty members. Time on task can be encouraged by providing regular assignments due throughout the course with specific deadlines. Web-based course management systems and email provide a convenient vehicle to provide students with assignments, projects and feedback to keep them engaged in the

course. The convenience of having 24 x 7 access to course materials and other online resources maximizes the accessibility and encourages student participation.

Sixth, instructors who implement high expectations more frequently are more likely to motivate students in learning [Chickering and Gamson, 1987]. Research has demonstrated that when instructors set high standards their students used higher level learning strategies [Middleton and Midgley, 2002]. Researchers have found that new technologies can communicate high expectations explicitly and efficiently [Chickering and Ehrmann, 1996]. Kuh et al., [2005] found that students will strive to higher standards when instructors communicate their expectations to the students.

Last, technological resources can accommodate different methods of learning through an endless spectrum of tools and arrangements [Chickering and Ehrmann, 1996]. Instructors have a variety of methods to accommodate different learning styles and backgrounds, including self-directed projects, incorporation of multiple types of instruction media, and learning exercises that encourage the student to express their point of view.

Considering the discussions above, we thus propose our second hypothesis as follows:

H2: Each learning process factor has a significant impact on learning outcome.

## III. METHODOLOGY

### Measurement

The measurements of learning process were adapted from the framework of seven principles in Chickering and Gamson [1987]. The original wording of the survey was revised to better suit our research context by focusing on the instructors' approaches and students' learning behavior. Learning outcomes was measured using the scales in MacDonald et al. [2002]. The Appendix shows the survey measures. All constructs of learning process and outcomes were measured on 7-point Likert scale (1: Strongly disagree … 7: Stronger agree). Before the administration of the survey, the instrument was reviewed and pre-tested. The instrument was then revised and refined based on the feedback before used for the main data collection.

### Data Collection

A web-based survey of our study was administrated at a medium sized midwestern university in U.S. All current students of ABC University were invited to participate in this study through 1) an e-mail message with a link to the online survey was send to the entire student body and 2) a notice was placed on the university's WebCT home page. Each student was allowed to take the survey only once. A total of 1233 responses were returned within five weeks. All received responses were valid and therefore were used in statistical analyses.

### Analysis Strategy

Structural Equation Modeling (SEM) was used as the major statistical technique for data analysis. SEM is a statistical methodology estimating the measurement model and the structural model at the same time. The measurement model is composed of latent variables that are modeled by their observed indicators and the structural model is represented by causal connections or correlations among the latent variables [Blunch, 2008; Byrne 2001]. In our study, each of the eight latent variables was measured by three indicators. Thus, SEM was preferable than other traditional statistical analyses in our study. To test our hypotheses, we used AMOS (Analysis of Moment Structures), one of the most popular computer applications for SEM.

## IV. ANALYSIS & RESULTS

The average age of all participants was 28 years old. Table 2 shows other descriptive statistics of the characteristics of the subjects who responded the survey.

Table 2: Demographic Characteristics of Participants

| Sample size = 1,233 | | |
|---|---|---|
| | Frequency | (%) |
| Gender | | |
| Male | 398 | 32.3 |
| Female | 835 | 67.7 |
| Ethnicity | | |
| Caucasian/White | 981 | 79.6 |
| African American | 107 | 8.7 |
| Native American | 5 | .4 |
| Asian | 72 | 5.8 |
| Hispanic | 21 | 1.7 |
| Other | 47 | 3.8 |
| Education Level | | |
| Associate's Degree | 69 | 5.6 |
| Bachelor's degree | 833 | 67.6 |
| Master's degree | 271 | 22.0 |
| Doctorate degree | 34 | 2.8 |
| Other | 26 | 2.1 |
| Employment | | |
| Unemployed | 251 | 20.4 |
| Full time employee | 401 | 32.5 |
| Part time employee | 581 | 47.1 |
| Computer Skills | | |
| Beginner | 61 | 4.9 |
| Intermediate | 848 | 68.8 |
| Advanced | 324 | 26.3 |
| Instructional Method | | |
| F2F | 477 | 38.7% |
| Hybrid | 560 | 45.4% |
| Online | 196 | 15.9 |

The mean and standard deviation of all measurement items are shown in Table 3. Normality of distributions was tested in SPSS. Values of skewness and kurtosis of all measurement variables were small and close to zero. The QQ plot of the distribution of each variable was not significantly deviated from the diagonal line. We therefore considered that it was acceptable to treat our sample as normal distribution in data analysis.

Table 3: Mean, Standard Deviation, Standardized Regression Weights, and Squared Multiple Correlations of Measurement Items

| Measurement Items | Mean | Standard Deviation | Standardized Regression Weights on Factor (Loading) | Squared Multiple Correlations ($R^2$) |
|---|---|---|---|---|
| FacCont1 | 5.85 | 1.228 | .819 | .749 |
| FacCont2 | 5.46 | 1.581 | .685 | .859 |
| FacCont3 | 5.81 | 1.259 | .880 | .753 |
| CoopStu1 | 5.41 | 1.495 | .753 | .715 |
| CoopStu2 | 5.57 | 1.368 | .884 | .665 |
| CoopStu3 | 5.57 | 1.394 | .841 | .485 |
| ActLearn1 | 5.45 | 1.406 | .824 | .201 |
| ActLearn2 | 5.25 | 1.519 | .736 | .601 |
| ActLearn3 | 5.58 | 1.392 | .844 | .542 |
| Feedback1 | 5.68 | 1.478 | .903 | .361 |
| Feedback2 | 5.69 | 1.454 | .927 | .878 |
| Feedback3 | 5.22 | 1.648 | .590 | .905 |
| Time1 | 5.68 | 1.445 | .951 | .349 |
| Time2 | 5.67 | 1.464 | .937 | .859 |
| Time3 | 5.22 | 1.629 | .601 | .816 |
| HighExpect1 | 5.88 | 1.178 | .736 | .713 |
| HighExpect2 | 5.53 | 1.431 | .775 | .542 |
| HighExpect3 | 5.63 | 1.364 | .448 | .679 |
| Diversity1 | 5.07 | 1.573 | .696 | .707 |
| Diversity2 | 5.22 | 1.558 | .815 | .781 |
| Diversity3 | 5.45 | 1.459 | .846 | .567 |
| Outcome1 | 5.48 | 1.425 | .866 | .671 |
| Outcome2 | 5.70 | 1.370 | .927 | .470 |
| Outcome3 | 5.65 | 1.499 | .868 | .775 |

## Construct Reliability and Validity

Construct reliability was assessed using three indicators, Cronbach's alpha, standardized regression weights and squared multiple correlations [Bollen, 1989], and composite reliability scores of each factor [Chin, 1998b]. *First*, Cronbach's alpha coefficients were all above the recommended level of 0.70 (Table 4) [Nunnally, 1978]. *Second*, a Confirmatory Factor Analysis (CFA) was conducted in AMOS to assess the reliability of measurement items. All measurement items were indicators of their corresponding latent factor in the CFA model. After estimation, the overall model-fit appeared satisfactory (CFI =.971 and RMSEA=.053). As shown in Table 3, all measurement variables had high standardized loadings on its corresponding latent factor and each latent factor explained a significant amount of variance in each of its indicators, indicating that all measurement items were reliable indicators of its corresponding latent factor. *Third*, as shown in Table 4, all constructs except measures of HighExpectation had a composite reliability close to or higher than 0.90, indicating that measures had acceptable construct reliability.

Table 4: Cronbach's $\alpha$, Composite Reliability, AVE, and Construct Correlations

| Factor | Cronbach's $\alpha$ | Composite Reliability | AVE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-FacCont | .834 | 0.915 | 0.751 | 0.867 | | | | | | | |
| 2-CoopStu | .868 | 0.919 | 0.791 | 0.625 | 0.889 | | | | | | |
| 3-ActLearn | .860 | 0.899 | 0.782 | 0.628 | 0.675 | 0.884 | | | | | |
| 4-Feedback | .837 | 0.900 | 0.757 | 0.626 | 0.456 | 0.541 | 0.870 | | | | |
| 5-Time | .858 | 0.903 | 0.783 | 0.617 | 0.461 | 0.540 | 0.936 | 0.885 | | | |
| 6-HighExpect | .720 | 0.839 | 0.639 | 0.610 | 0.526 | 0.564 | 0.597 | 0.593 | 0.799 | | |
| 7-Diversity | .833 | 0.947 | 0.749 | 0.652 | 0.584 | 0.661 | 0.660 | 0.664 | 0.640 | 0.865 | |
| 8-Outcome | .916 | 0.915 | 0.857 | 0.668 | 0.580 | 0.603 | 0.623 | 0.622 | 0.664 | 0.751 | 0.926 |

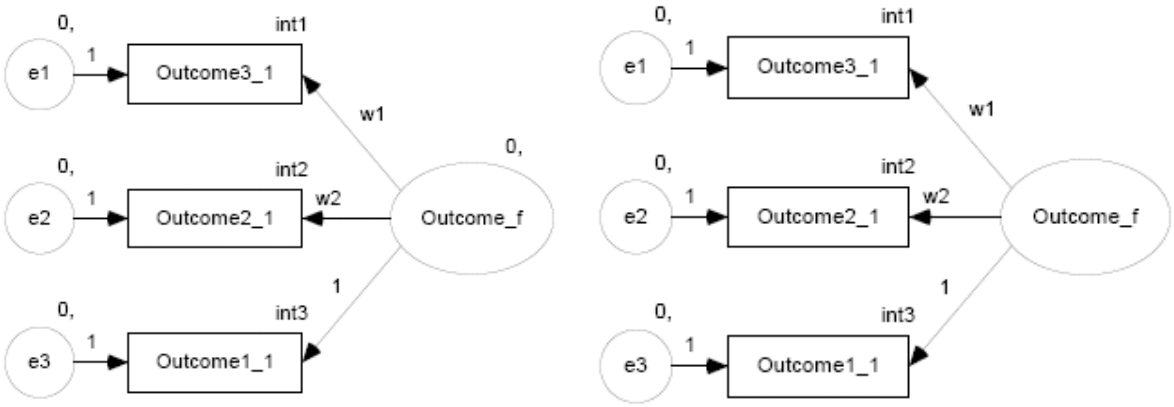
Table note: The numbers to the right are correlations of constructs, except the diagonal numbers, which are the square root of AVE (average variance extracted). All square root of AVE of constructs are higher than their correlations with other constructs, indicating good construct validity.

Construct validity, both convergent and discriminant validity, was also tested using CFA in AMOS. Convergent validity, in addition to reliability of items and composite reliability discussed above, can also be assessed by the average variance extracted (AVE). AVE stands for the amount of variance that a construct captures from its indicators [Chin, 1998a] and is recommend to be higher than 0.50 [Chin, 1998a; Hu et al., 2004]. Table 4 shows the AVE value for each construct, ranging from 0.64 and 0.86, well above this requirement. Discriminant validity is assessed by the square root of AVE compared to construct correlations. In Table 4, the square root of each construct's AVE (diagonal number) is higher than its correlations with other constructs, indicating that each construct is more closely related to its own measure than to the measures of other constructs [Chin, 1998a; Gefen and Straub, 2005; Majchrzak et al., 2005].

In summary, although construct HighExpectation's Cronbach's alpha and composite reliability were not as high as expected, its other indicators suggested that its measurement was acceptable. In all, the results derived for the measurement model demonstrate reliability, satisfactory convergent and discriminate validity for all constructs.

## Testing Hypotheses

To test H1, we compared latent means of the learning outcomes factor across multiple groups in AMOS. The F2F group was used as a reference group where the mean value of outcomes was set to zero. Models for the hybrid and online groups were constructed where the mean values of the outcome were set free for estimation. All other parameters were held constant across three models. The AMOS models are shown in Figure 1.




Reference model: F2F group Model for Online and Hybrid groups

Figure 1: Multiple Group Analysis of the Comparison of Latent Means of Learning Outcome

After estimation, the overall model-fit appeared satisfactory. The CMIN (minimum value of discrepancy, used in equivalent to $\chi^2$ in SEM) test yielded a value of 22.621 (d.f.=8, p=.004). Although the ($\chi^2$) test was significant, such value was very likely inflated because of the large sample size (n=1233) [Bollen, 1989]. Therefore, CFI (comparative fit index) and RMSEA (root mean square error of approximation) were more reliable for model assessment. The CFA analysis had a CFI value of .995 and RMSEA value of .039. A rule of thumb for judgment on model-fit is that CFI should be close to 1.0 to demonstrate good fit and a value of .95 and above are considered acceptable [Bentler, 1990, 1992; Hu and Bentler, 1999]. A reasonable value of RMSEA should be under .08, indicating an acceptable model [Browne and Cudeck, 1993]. Judged by these model assessment criteria, our model fitted the data well.

Compared to the latent mean value for learning outcomes in the F2F courses, the factor mean value of outcomes in the Online courses was slightly lower but not significant (estimate=-.020, p=.859) and the factor mean value of outcomes in the Hybrid courses was slightly higher but not significant (estimate=.045, p=.555). In other words, there was no significant difference in learning outcomes of F2F, hybrid, and online courses. Therefore, H1 was not supported.

To test H2, an AMOS model with causal indicators was constructed and tested. Figure 2 shows the model in AMOS where each latent factor of learning process had an impact on the latent factor of learning outcome. The estimated model showed satisfactory overall model-fit with both CFI (.969) and RMSEA (.054) above the acceptation criteria. All factors of learning process had a significant regression path on learning outcome except Feedback (p=.929) and TimeOnTask (p=.941). This result showed that feedback from faculty and time given on tasks did not have significant impact on learning outcomes.

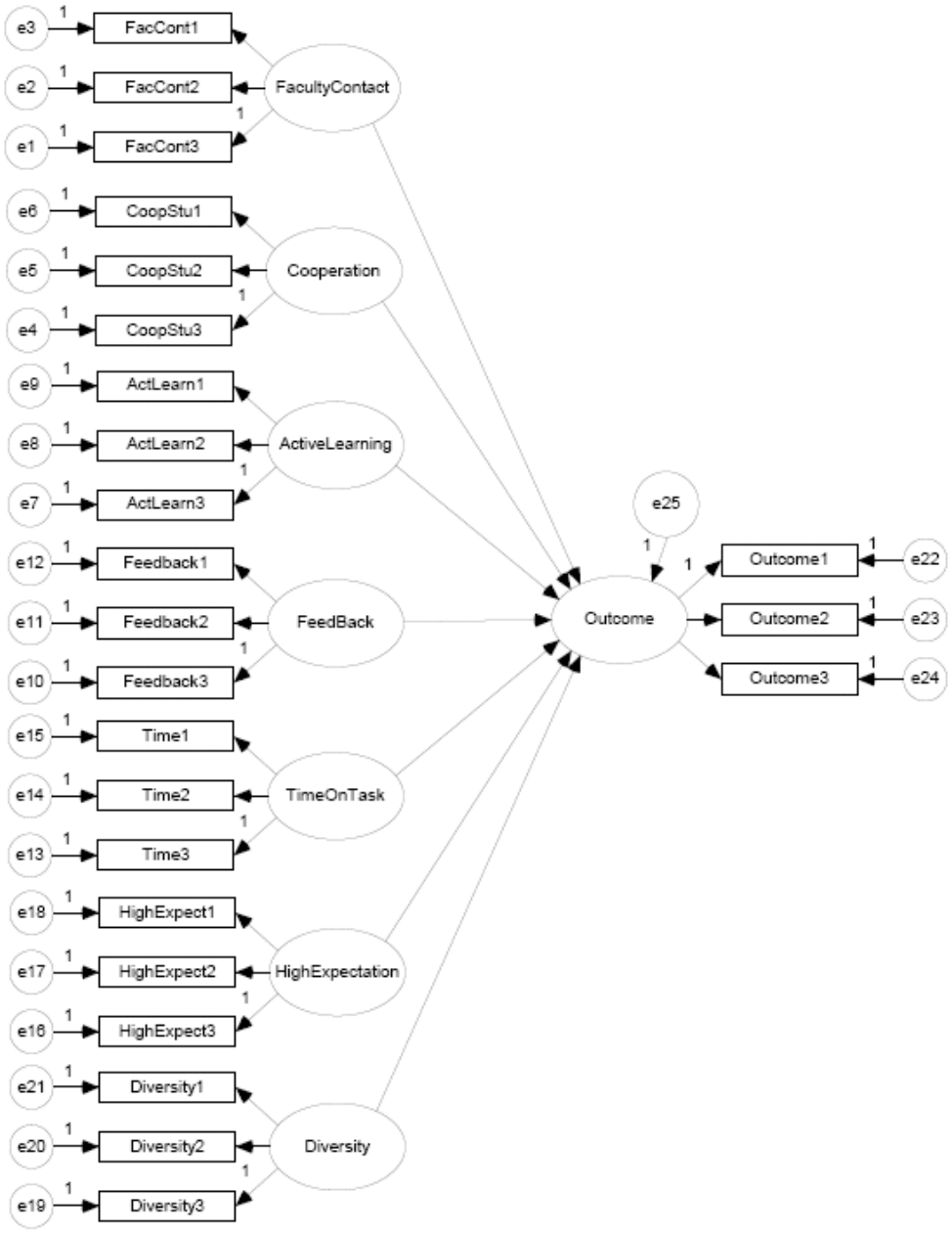



Figure note: For the purpose of clarity, correlations among factors are not shown in the figure.

Figure 2: AMOS Model: Impacts of Learning Process Factors on Learning Outcome

Table 5: Regression Weights on Outcome

| | F2F N=477 | | Hybrid N=560 | | Online N=196 | |
|---|---|---|---|---|---|---|
| Factor | Estimate | P | Estimate | P | Estimate | P |
| FacCont | .085 | .443 | .169 | .012 | .169 | .174 |
| CoopStu | -.046 | .675 | .084 | .257 | .048 | .585 |
| ActLearn | -.189 | .091 | .012 | .889 | -.096 | .408 |
| Feedback | -.040 | .856 | -.344 | .389 | -.040 | .932 |
| Time | -.083 | .684 | .346 | .394 | .229 | .627 |
| HighExpect | .783 | .003 | .610 | *** | .823 | .005 |
| Diversity | .677 | *** | .436 | *** | .562 | .003 |

Could instructional method have any impact on the relationship between learning process and learning outcome? To explore the answer to this question, a post hoc analysis was performed using multiple group analysis in AMOS. Each instructional method, F2F, hybrid, and online had its own group model using the corresponding group data. The estimated model had a CFI value of .959 and a RMSEA value of .037, indicating that the model fitted the data well. The results are summarized in Table 5. High Expectation and Diversity had significant impacts on learning outcome across all three instructional methods (groups). In addition, Faculty Contact had a significant impact on outcome (p=.012) in and only in the hybrid group.

## V. DISCUSSION

Surprisingly, our study did not find any significant difference in learning outcomes among the three instructional methods. Such result echoed some of the voices in prior research. For example, Russell [2001] reviewed an extensive amount of studies and found no significant difference in learning outcomes between technologically-based teaching methodologies and traditional classroom environments. Furthermore, in contrast to many reports highlighting the effectiveness of web enhanced learning, O'Malley and McGraw [1999] reported that students actually felt like they learned less in online courses.

The distance and Web-based courses at ABC University can be considered as asynchronous interactive [Ryan, 2001], in that they allow users to participate with the instructor and other students but not necessarily at the same time. Prior research studies indicated that asynchronous e-learning does not appear to be well suited to technical education [Cappel and Hayen, 2004]. Other authors suggested that the jury is still out on the "usability" of online courses compared to traditional classroom teaching [Johnson and Hegarty, 2003]. Our study added yet another piece of supporting evidence to the notion that learning outcomes are not dependent on the instructional method alone and there should be other factors that play an important role.

In our study, four out of the seven factors in student learning process, cooperation among students, active learning, prompt feedback and time on task, had non-significant impact on outcomes. In reference to cooperation among students, a number of studies have reported that students prefer the social interaction afforded by a traditional classroom environment when compared with videoconferencing [Knipe and Lee, 2002] and online learning [Peters, 2001; Soloway and Harris, 1999]. Active learning did not show a significant impact on outcomes. This finding was supported by Hativa and Birenbaum [2000] who found that students do not associate active learning as their preferred method of instruction. Our study also failed to find supportive evidence that prompt feedback enhanced learning.

Faculty contact had a significant impact on learning outcome but only in the hybrid courses. Although faculty-student contact was believed to improve student learning, our study fail to find such empirical support. Such position is taken by several other authors in their studies. The lack of personal faculty contact between faculty and students in distance education environments has

been reported as an issue with students [Knipe and Lee, 2002; Peters, 2001; Soloway and Harris 1999]. Cross [1999] suggested that it is not the amount of student-faculty contact but rather the quality of the contact that is important. Researchers such as Gorham [1988] also expanded the concept and suggested to include other forms of interaction between the instructor and the student that open communication and personal contact.

Our study showed that high expectation and accommodation of diversity had significant impacts on learning outcomes. *First*, the level of effort by the instructor in the course design, feedback and interaction with the students communicates his or her expectations for the class. Making all of the course materials online makes the student more accountable for doing the work. Work reviewed by their peers and/or posted online will encourage a higher level of effort since most students want to be viewed positively by their peers and the academic community. *Second*, the multi-media capabilities of online course management systems afford the instructor a multitude of opportunities to provide materials that support various learning styles to accommodate diversity in learning. *Further*, online research capabilities available to most students provide the instructor the opportunity to allow the student to research topics of interest to them. *Finally*, many technologies are available for students with various disabilities. However, it is incumbent on the instructor to create assignments that take advantage of these new technologies to address different learning styles, technological expertise, and cultures.

## VI. CONCLUSION

As an empirical validation of the Seven Principles framework, our study has found mixed findings. First, no significant difference in learning outcomes among the three instructional method groups (F2F, hybrid, and online) was found. Second, high expectation and accommodation of diversity had significant impacts on learning outcomes. Third, faculty contact had a significant impact on learning outcome but only in the hybrid courses. We recommend instructors to focus less on the instructional method but more on the delivery of education. Our future research will explore the theories on instructional delivery and test influencing factors in different learning contexts.

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## APPENDIX: SURVEY

**Background Information:**

- Year of Birth
- Gender (Male, Female)
- Ethnicity (Caucasian/White, African American, Native American, Asian, Hispanic, Other)
- Education Level (Associate's degree, Current undergraduate student, Bachelor's degree, Master's degree, Doctorate degree (M.D., J.D., Ph.D., Other)
- Employment (Unemployed, Full time employee, Part time employee)
- Computer Skills (None, Beginner, Intermediate, Advanced)

**Instructional Methodology**

Based on your experience, please select one and only one of the three types of courses you have taken in the past, and answer the rest of the questions in the survey based on your choice.

- Online distance course - which is conducted totally online through WebCT.
- WebCT enhanced course - which combined "face-to-face" classroom instruction and WebCT course management functionality, e.g. online course materials, syllabus, quizzes, etc.
- Traditional face-to-face course - which doesn't involve WebCT activities.

**Learning Process**

(All questions were answered on a 7-point Likert scale, 1: Strongly disagree, …, 7: Strongly agree)

1) Faculty Contact

| | |
|---|---|
| FacCont 1 | In general, I had good access to my instructor(s); they were available when I needed them |
| FacCont | I did not feel like I was just a number to my instructor(s) |

| | |
|---|---|
| 2 | |
| FacCont | My instructor(s) and I were able to communicate effectively |
| 3 | |

2) Cooperation among Students

| | |
|---|---|
| CoopStu1 | I had the opportunity to work with other students |
| CoopStu2 | I felt like I was part of the class(es) |
| CoopStu3 | The environment was conducive to communicating easily with the other students |

3) Active Learning

| | |
|---|---|
| ActLearn1 | The learning environment was conducive to working on projects and exercises |
| ActLearn2 | The learning environment was conducive to conducting research |
| ActLearn3 | The learning environment was conducive to presenting my work to the instructor and other students |

4) Prompt Feedback

| | |
|---|---|
| Feedback1 | I received timely feedback on my quizzes and homework assignments |
| Feedback2 | Exams and papers were graded and returned in a timely manner |
| Feedback3 | My instructor(s) encouraged discussion regarding my progress in the course |

5) Time on Task

| | |
|---|---|
| Time1 | It was clear to me when assignments were due and tests were scheduled |
| Time2 | The time commitment required to do well in class was communicated by the instructor(s) |
| Time3 | I typically spend a lot of time preparing for classes |

6) High Expectations

| | |
|---|---|
| HighExpect 1 | The instructor(s) typically set high academic standards for the course(s) |
| HighExpect 2 | The instructor(s) recognizes excellent performance by the students |
| HighExpect 3 | There are typically negative consequences to not completing the course assignments on time |

7) Accommodation of Diverse Talents and Ways of learning

| | |
|---|---|
| Diversity1 | The course assignments were designed to accommodate the students diverse backgrounds |
| Diversity2 | I was generally able to received help in the areas that I was weakest in |
| Diversity3 | The learning environment was conducive to my way of thinking and learning |

**Learning Outcomes**

(All questions were answered on a 7-point Likert scale, 1: Strongly disagree, …, 7: Strongly agree)

| | |
|---|---|
| Outcomes1 | These courses were very enjoyable |
| Outcomes2 | I gained considerable knowledge and skills from the courses |
| Outcomes3 | The information received was generally applicable to my education goals and career |

## ABOUT THE AUTHORS

**Dr. Shu Schiller** is an Assistant Professor in the Department of Management Information Systems and Operations Management at Wright State University. Her research interests include virtual reality and its applications in consumer behavior and team collaboration, virtual teams and communities, online customer services and communication, instant messaging, web-enhanced teaching and learning, Information Systems (IS) theories, and qualitative IS research. Her recent publications have appeared in the journals of Small Group Research, Journal of Virtual Worlds Research, Journal of Information Systems Education, and Information Systems Frontiers.

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