

# Exploring Effects of Different Roles on Using an E-learning Service

H.J. Yang & L.H. Kuo

*National Kaohsiung Normal University, Taiwan, R.O.C.*

**Abstract.** The purpose of this study was to explore effects of different roles on learning satisfaction. For better hosting a e-learning service, there is a need to understand user's satisfaction of the learning service. Data was collected from an on-line learning system. Based upon course learning activities, each course was assign to a certain role for the learner. There are six types of learning role from all course. 1) Reporter, 2) Listener, 3) Researcher, 4) Reporting Listener, 5) Reporting Researcher, 6) Report Listen Researcher; One-way ANOVA procedure was applied to exploring whether the role difference affects users satisfaction. According to the significant level less than .05, it was concluded that learning satisfaction of different roles are significant different. On the other word, learning roles affect users' learning satisfaction.

## 1 Introduction

### 1.1 E-learning Platform

In this information age, information system provides a flexible communication solution. It also plays an important way for supporting personal learning by establishing well organized educational environment.

E-learning is becoming an increasingly large part of higher education (Anderson, 2014, Duck and Parente, 2014, Kim, 2011). Over 7.1 million college and university students took at least one online course by the end of the fall 2012 semester in the United States (Allen and Seaman, 2014). More than 71% of US colleges and universities offered online courses in 2012(Allen and Seaman, 2013) and one-third of higher education students took at least one online course in 2012 (Allen and Seaman, 2014).

### 1.2 Problem Statement

The purpose of this study was to explore effects of different roles on learning satisfaction. For better hosting a e-learning service, there is a need to understand user's satisfaction of the learning service.

Data was collected from an on-line learning system. Based upon course learning activities, each course was assign to a certain role for the learner. There are six types of learning role from all course. 1) Reporter, 2) Listener, 3) Researcher, 4) Reporting Listener, 5) Reporting Researcher, 6) Report Listen Researcher

## 2 E-learning satisfaction

E-learning has been described as technology-based learning (Ali and Leeds, 2009, Kim, 2011), web-based learning (Bakia et al., 2012), network- and computer-based learning (Angelina et al., 2007), or "instructional environments supported by the Internet" (Bakia et al., 2012). Although each researcher uses different terms to describe the phenomenon of e-learning, the common element in all of the research is that learners need to be familiar with using computer technology and the Internet to take online courses.

E-learning environments in higher education in the United States have been

expanding rapidly (Allen and Seaman, 2014). Online enrollment as a percentage of the total enrollments in U.S. universities was less than 10% in 2002, whereas it reached more than 33.5% in 2012(Allen and Seaman, 2014). The benefit of e-learning is that distance learners can study anytime anywhere at their own pace without the limitations of time and space, a factor which led to the rapid growth of e-learning. However, e-learning is still confronted with a number challenges, such as student readiness for taking an online course and lower retention rates when compared to the traditional face-to-face course.

## 3 Methodology

### 3.1 Data Collection

For better hosting a e-learning service, there is a need to understand user's satisfaction of the learning service. Data was collected from an on-line learning system. Based upon course learning activities, each course was

<sup>a</sup> Corresponding author: [admi@nknuc.nknu.edu.tw](mailto:admi@nknuc.nknu.edu.tw)

assign to a certain role for the learner. There are six types of learning role from all course. 1) Reporter, 2) Listener, 3) Researcher, 4) Reporting Listener, 5) Reporting Researcher, 6) Report Listen Researcher.

Learning Satisfaction is represented as Likert Scale from 1 to 5 as not satisfied to fully satisfied and 3 is the middle value.

### 3.2 One-way ANOVA

One can use the One-Way ANOVA procedure to test the hypothesis that the means of two or more groups are not significantly different.

One-Way ANOVA also offers:

- Group-level statistics for the dependent variable
- A test of variance equality
- A plot of group means
- Range tests, pairwise multiple comparisons, and contrasts, to describe the nature of the group differences

Descriptive statistics are shown in followings:

$$\begin{aligned} \text{Sample size} &= W_q \\ \text{Mean} &= \bar{T}_q \\ \text{Standard deviation} &= S_q \\ \text{Standard error} &= S_q / \sqrt{W_q} \end{aligned}$$

95% confidence interval for the mean:

$$\bar{T}_q \pm t_{W_q-1} S_q / \sqrt{W_q}$$

Where  $t_{W_q-1}$  is the upper 2.5:% critical value for the t distribution with  $W_q-1$  degrees of freedom.

In a ANOVA table, there are three source of variation.

Between (BSS),  $df= k'-1$

$$\sum_{l=1}^k T_l^2 / n_l - G^2 / W$$

Within (WSS),  $df=W-k'$

$$\sum_{l=1}^k SS_l$$

( $s_p^2 D$  for matrix input)

Total (TSS),  $df= W-1$

$$BSS + WSS$$

Mean squares are calculated by dividing each sum of squares by its degree of freedom. The F ratio for testing equality of group means is

$$F = \frac{\text{Mean Square Between}}{\text{Mean Square Within}} = \frac{BSSM}{WSSM}$$

The significance level is obtained from the F distribution with numerator and denominator degrees of freedom.

Establishment of homogenous subsets could be defined by following procedure. If the sample sized in all groups are equal, or the harmonic mean for all groups has been selected, or the multiple comparison procedure is SNK or DUNCAN, homogeneous subsets are established as follows:

The means are sorted into ascending order from

$$\bar{T}_{(1)} \text{ to } \bar{T}_{(k')}$$

Values of i and q such that

$$|\bar{T}_{(q)} - \bar{T}_{(i)}| \leq R_{q-i+1} M_{q,i} (*)$$

Are systematically searched for and

$$\{ \bar{T}_{(i)}, \dots, \bar{T}_{(q)} \}$$

Is considered a homogeneous subset. The search procedure is as follows:

At each step t, the value of i is incremented by 1 (the starting value is 1), and  $q=k'$ . The value of q is then decremented by one until (\*) is true. Call this value qt. If  $qt > qt-1$  and (\*) is true,

$$\{ \bar{T}_{(i)}, \dots, \bar{T}_{q_t} \}$$

is considered homogeneous. Otherwise I is incremented and the next step is done. The procedure terminates when  $i=k$  or  $qt = k$ .

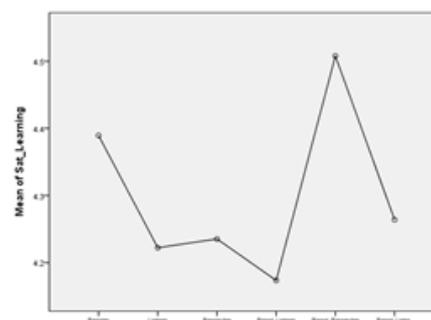


Figure 1. Satisfaction Means plots by each role

## 4 Findings

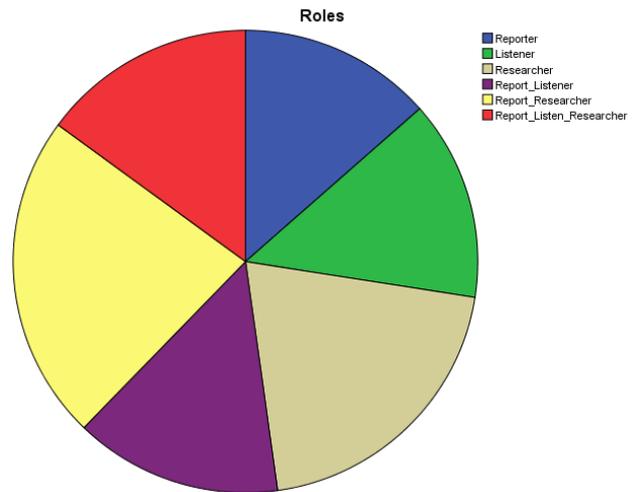
In this session, the findings would be reported in descriptive statistics, and One-way ANOVA.

### 4.1 Descriptive Statistics

In Table 1., the descriptive statistics of role were listed. The overall subjects are 837 with 13.5 % reporter, 14% listener, 20.3% researcher, 14.5 report listener, 22.8 report researcher, and 14.9 report listen researcher.

**Table 1.** frequency and percent of Roles

Roles	Valid	Cumulative		
		Frequency	Percent	Percent
Reporter	113	13.5	13.5	13.5
Listener	117	14.0	14.0	27.5
Researcher	170	20.3	20.3	47.8
Report Listener	121	14.5	14.5	62.2
Report Researcher	191	22.8	22.8	85.1
Report_Listen_Researcher	125	14.9	14.9	100.0
Total	837	100.0	100.0	



**Figure 2.** Learning Role distribution

**Table 2.** Leaning Satisfaction by Roles

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Repoter	113	4.39	.647	.061	4.27	4.51	2	5
Listener	117	4.22	.696	.064	4.09	4.35	1	5
Researcher	170	4.24	.655	.050	4.14	4.33	2	5
Report_Listener	121	4.17	.715	.065	4.04	4.30	1	5
Report_Researcher	191	4.51	.680	.049	4.41	4.60	1	5
Report_Listen_Researcher	125	4.26	.824	.074	4.12	4.41	2	5
Total	837	4.31	.710	.025	4.26	4.36	1	5

Satisfaction is represented as Likert Scale from 1 to 5 as not satisfied to fully satisfied and 3 is the middle value. The learning satisfaction mean for the role of Report Researcher is the highest, 4.51. The standard deviation is .68.

#### 1.1 One-Sample T-Test & One-way ANOVA

For exploring overall satisfaction, one-sample T-Test was applied to compare the mean with middle value, 3, of the Likert Scale. In Table 3, the significance value less than .05. The value of satisfaction is significantly higher than middle value 3.

**Table 3.** One-sample T-Test of Satisfaction

Test Value = 3				
t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
Sat Learning	53.442	836.000	1.312	1.26 1.36

In Table 4, the significant level is less than .05. The test result supports that there exists satisfaction difference among role groups.

**Table 4.** ANOVA table of learning satisfaction

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.554	5	2.511	5.101	.000
Within Groups	409.059	831	.492		
Total	421.613	836			

In Teable 6., Duncan test suggested three subsets. Both Reporter and Report Researcher roles is the highest satisfaction set.

**Table 5.** Homogeneous Subsets by Duncan test

Roles	N	Subset for alpha = 0.05		
		1	2	3
Report Listener	121	4.17		
Listener	117	4.22	4.22	
Researcher	170	4.24	4.24	
Report Listen Researcher	125	4.26	4.26	
Reporter	113		4.39	4.39
Report Researcher	191			4.51
Sig.		.343	.075	.167

**Table 6.** Post Hoc Tests using Scheffe for multiple comparisons

Multiple Comparisons							
Dependent Variable: Sat Learning							
(I) Roles	(J) Roles	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		
					Lower Bound	Upper Bound	
Scheff e	Reporter	Listener	.167	.093	.660	-.14	.48
		Researcher	.154	.085	.658	-.13	.44
	Report Listener	Reporter	.216	.092	.356	-.09	.52
		Report Researcher	-.118	.083	.846	-.40	.16
	Re-port Listen Researcher	Reporter	.125	.091	.863	-.18	.43
		Listener	-.167	.093	.660	-.48	.14
		Researcher	-.013	.084	1.000	-.29	.27
		Report Listener	.049	.091	.998	-.25	.35
	Report Researcher	Reporter	-.286*	.082	.035	-.56	-.01
		Listener	-.042	.090	.999	-.34	.26
Researcher		-.154	.085	.658	-.44	.13	
Report Listener		.013	.084	1.000	-.27	.29	
Report Listener	Reporter	.062	.083	.990	-.22	.34	
	Researcher	-.273*	.074	.019	-.52	-.03	
	Listener	-.029	.083	1.000	-.30	.25	
	Report Researcher	-.029	.083	1.000	-.30	.25	
Report Researcher	Reporter	-.216	.092	.356	-.52	.09	
	Listener	-.049	.091	.998	-.35	.25	
	Researcher	-.062	.083	.990	-.34	.22	
	Report Listener	-.334*	.082	.005	-.61	-.06	
Re-port Listen Researcher	Reporter	-.090	.089	.961	-.39	.21	
	Listener	.118	.083	.846	-.16	.40	
	Researcher	.286*	.082	.035	.01	.56	
	Report Listener	.273*	.074	.019	.03	.52	
Re-port Listen Researcher	Reporter	.334*	.082	.005	.06	.61	
	Listener	.244	.081	.105	-.03	.51	
	Researcher	-.125	.091	.863	-.43	.18	
	Report Listener	.042	.090	.999	-.26	.34	
Report Researcher	Reporter	.029	.083	1.000	-.25	.30	
	Listener	.090	.089	.961	-.21	.39	
	Researcher	-.244	.081	.105	-.51	.03	
	Report Listener						

\*. The mean difference is significant at the 0.05 level.

In Table 6, those comparisons with significant level less than .05 are:

- Listener to Report Researcher at .035
- Researcher to Report Researcher at .019
- Report Listener to Report Researcher at .005

## 5 Conclusions

The purpose of this study was to explore effects of different roles on learning satisfaction. For better hosting a e-learning service, there is a need to understand user's

satisfaction of the learning service. Data was collected from an on-line learning system. Based upon course learning activities, each course was assign to a certain role for the learner.

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