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ANALYSIS OF VARIANCE ANOVA AND CORRELATION MATRIX FOR M-LEARNING AMONG UNIVERSITY STUDENTS

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Ammar Wisam Altaher
Kazan Federal University, PhD Student in the
Department of programming technologies,
Respublika Tatarstan, Russia
smart.computing@yahoo.com

ABSTRACT. This study attempts to find out students' expectations from mobile learning (m-learning) applications. A questionnaire on students' preferences in m-learning applications was used). The data of this report were collected from the primary sources in the Institute of Computational Mathematics and Information Technologies - Department of Programming Technologies between 20th of February and 25th of March 2017. The Research survey was conducting among students of higher institutions in Kazan Russia in (Kazan federal university). A self-administered questionnaire was designed and distributed to the research population in question to obtain quick and direct responses. The survey involved a distribution of a total of 135 questionnaires after seeking the consent of the respondents out of which 124 were correctly filled and analyzed. Correlation Matrix, Chi Square, Symmetric Measures test, Simple Linear Regression was done in this study, Analysis of Variance ANOVA analysis was used on the collected data. The results showed that the availability and easy usage of mobile applications are among the most preferred characteristics of applications. Surprisingly, entertaining feature was the least expected feature by students.

Keywords: mobile learning, programming, m-learning systems, education process, higher education

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1. INTRODUCTION

1.1. Empowering educational practitioners through the orchestration of mobile devices, software, and pedagogical design

Scholars (e.g., Gao, Liu, & Paas, in press; Liu et al., 2012) have gradually reached a consensus that exerting the maximum effect of information technology in the educational field requires reconciliation of the connection among the components of technology (hardware and software), educational context and missions (e.g., learning and teaching processes in different settings), and users (teachers and students) in order to overcome many of the limitations present in the field. Scholars (Dillenbourg, Nussbaum, Dimitriadis, & Roschelle, 2013; Dimitriadis, Prieto, & Asensio-Perez, 2013) came to agree that the efforts of building harmonious relationships among those components to enable compatible, efficient, and effective technology-enhanced teaching and learning environments may be called orchestration. To achieve orchestration in mobile integrated education requires the pursuit of at least two directions for research and practices. The first is strengthening the functions and expanding the applicability and breadth of learning-oriented software. For example, the research analyzed in

this study paired many different learning-oriented software programs with educational activities (e.g., reciprocal teaching, inquiry learning, and formative assessment) that have already proven effective. That software may be modified to provide the functionality of authoring tools that allow teachers to flexibly arrange their own teaching and learning flows in the classroom.

The second direction is strengthening professional teacher-development programs for mobile-enhanced instruction. Most review research into the use of mobile devices for education has emphasized that one of the largest obstacles to implementing effective mobile learning programs is insufficient preparation of the teachers (Frohberg et al., 2009; Penuel, 2006).

The essence of effective professional development for technology-enhanced inquiry proposed by Gerard et al. (2011) is also applicable to mobile learning programs. Teachers should be encouraged to modify already developed mobile-integrated education programs, and to gradually customize them into their own personalized program rather than simply designing their own program around the use of technology. The latter approach implicitly leads teachers to technology-adapted instruction,

which means that the educational practices of the teachers may be restricted by the functions of technology, and may make it difficult for teachers to change their existing beliefs and habits. In contrast, customizing existing research-based mobile learning programs not only transfers researchers' visions and experiences for the use of technology to teachers, but also minimizes the time teachers spend on formulating new ideas and performing trial-and-error iterative procedures (Penuel et al., 2007). To facilitate the transition of researchers' vision, experiences, and skills to school teachers, it is also helpful to involve university-level researchers as mentors or collaborators. Diverse functions and types of hardware and software are available for mobile devices, but conversely the complexity is also high, and hence designing and using them can readily impose additional overhead on teachers. The plethora of technological knowledge and resources that are available to researchers for educational technology means that their participation in a program can result in their knowledge and experience greatly assisting the teachers' autonomy in implementation.

Another note-worthy fact is that, despite the importance of teachers' professional development during their adoption of and adaptation to mobile-device based teaching (Newhouse, Williams, & Pearson, 2006; Penuel & Yarnall, 2005), the investigations into increasing the education of teachers regarding the use of mobile devices have been extremely limited.

Therefore, more in-depth experimental research is needed into how teachers reconcile mobile hardware and software, lesson content, teaching methods, and educational goals.

2. RESULTS AND DISCUSSION

Would you agree that having course materials such as slides, lecture notes, and practice quizzes available on your mobile phone would be beneficial to your study process * Do you prefer mobile devices to be used for learning rather than regular desktop PCs?

*Table 1: Cross tabulation course materials * prefer mobile devices to be used for learning rather than desktop PCs*

		Do you prefer mobile devices to be used for learning rather than regular desktop PCs?			**Total**
		Yes	No	I'm not sure	
Would you agree that having course materials such as slides, lecture notes, and practice quizzes available on your mobile phone would be beneficial to your study process	Not Sure	3	1	0	**4**
	Completely Comfortable	99	18	3	**120**
Total		**102**	**19**	**3**	**124**

2.1 Correlation Matrix

Mobile device supporting Wap technology (Phone category) VERSUS perception level of mobile learning.

Table 2: Correlations

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.585[a]	2	.037
Likelihood Ratio	7.452	2	.024
Linear-by-Linear Association	4.925	1	.026
N of Valid Cases	124		

** Correlation is significant at the 0.01 level (2-tailed

Describes the range and strength of associations, as well as positive and negative associations. Also describes the Pearson correlation (r), the significance level (p), and the sample size (n).

The Pearson's correlation is used to find a correlation between at least two continuous variables. The value for a Pearson's can fall between 0.00 (no correlation) and 1.00 (perfect correlation)

The sig value of 0.476 is above the significance level of 0.0.1 indicating that the relationship is statistically significant or considered reliably different from zero. Thus confirming that a significant positive linear relationship exists between Smart phone device supporting wap technology (Phone category) and usefulness level of mobile learning with some cloud features.

In conclusion, an increase in the level of the phone that supports wap technology been used by the students is associated with a corresponding positive perception of the usefulness and beneficial nature of mobile learning with cloud features.

Table 3: Case Processing Summary

		I'm currently planning on developing a mobile WAP base application.			Total
		Very useful	Useful	I don't know	
In which category does your current phone belong	Smart phone	10	2	0	12
	4	50	55	7	112
Total		60	57	7	124

Table 4: Chi-Square Tests

		In which category does your current phone belong	Do you think it will be useful to use some cloud app (like DropBox) linked with your education style to (open- edit – share - save) your education document.
In which category does your current phone belong	Pearson Correlation	1	.065**
	Sig. (2-tailed)		.476
	N	124	124
Do you think it will be useful to use some cloud app (like DropBox) linked with your education style to (open- edit – share - save) your education document.	Pearson Correlation	.065**	1
	Sig. (2-tailed)	.476	
	N	124	124

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is .68.

Table 5: Symmetric Measures test

		Value	Approx. Sig.
Nominal by Nominal	Phi	.230	.037
	Cramer's V	.230	.037
N of Valid Cases		124	

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

The p – value (Asymp sig) of the test is 0.037 which is below the chosen 5% (0.05) level of significance. Therefore the null hypothesis (Ho) is rejected. Therefore it can be concluded that at the 5% level of significance, there is a positive relationship by using mobile learning for enhancement process of education.

In statistics, a **likelihood ratio** test is a statistical test used to compare the fit of two models, one of which (the null model) is a special case of the other (the alternative model). The test is based on the likelihood ratio, which expresses how many times more likely the data are under one model than the other. Can then be used to compute a p-value, or compared to a critical value to decide whether to reject the null model in favors of the alternative model.

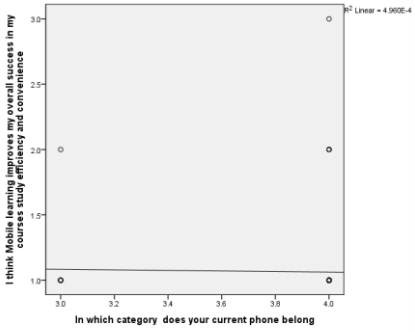

Figure 1: Scatter plot of relevant variables

Value (X) axis: Independent Variable = Mobile device supporting wap technology (Phone category)

Value (Y) axis: Dependent variable = Perception level of mobile learning

R^2 = Coefficient of determination

The Scatter Plot above reveals a positive linear relationship between Mobile device supporting wap technology (Phone category) and Perception level of mobile learning.

That is a better phone technology supporting wap is associated with a higher level of perception of usefulness of the mobile learning application in an incremental manner.

2.2. Diagnostics of the regression analysis

Table 6: Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.193[a]	.037	.029	.621

a. Predictors: (Constant), How often will you use the application
b. Dependent Variable: Do you think it will be useful to use some cloud app (like DropBox) linked with your education style to (open- edit – share - save) your education document.

Table 7: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.823	1	1.823	4.735	.031[b]
	Residual	46.975	122	.385		
	Total	48.798	123			

ANOVA[a]

a. Dependent Variable: Do you think it will be useful to use some cloud app (like DropBox) linked with your education style to (open- edit – share - save) your education document.
b. Predictors: (Constant), How often will you use the application

This is the table that shows the output of the ANOVA analysis and whether there is a statistically significant difference between our group means. Sig value will help you determine if your condition means were relatively the same or if they were significantly different from one another. We can see that the significance value is 0.031 (i.e., $p = .031$), which is below 0.05. And, therefore, there is a statistically significant difference in the mean length of useful to use some

cloud application and use the application. This is great to know.

Table 8: Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.148	.189		16.672	.000
	How often will you use the application	.361	.166	.193	2.176	.031

a. Dependent Variable: Do you think it will be useful to use some cloud app (like DropBox) linked with your education style to (open- edit – share - save) your education document.

The Q-Q plot provided by SPSS can be used to assess the normality of data. For this job, it is equivalent to a P-P plot, a P-Q plot, a Q-P plot, a "normality plot," a "normal probability plot," a "normal quintile plot," and so on.

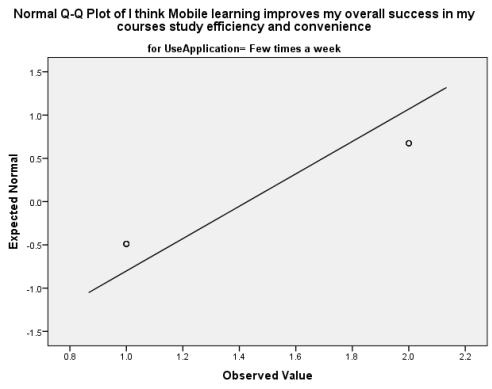

Figure 2: Normal Q-Q Plots

3. CONCLUSION

Lecturers can promote student's acceptance of m-learning by adding value to their traditional teaching methods using m-learning. Furthermore, the quality of service offered by m-learning systems needs to include user-friendliness, meeting of all students' needs, and up-to-date service as this will attract more students to use m-learning.

Learning environment in Russia has been continuously revised from time to time. The Ministry of Education, in Russia has been given the responsibility to enhance and develop the level of educations in the country.

With increased popular access to information and knowledge anywhere, anytime, the role of education, perhaps especially formal education, is challenged and the relationships between education, society, and technology are now more dynamic than ever. With mobile technology breaking social strata barriers in India and elsewhere, the time has come to embrace the new avenues in educational pedagogy in the form of m-learning.

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