A Comparison Between Moodle, Facebook, and Paper-based Assessment Tools

Students' Perception of Preference and Effect on Performance

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Abstract—Literature abounds with research on the benefits of technology and its effect on students' performance and satisfaction. The use of Learning Management Systems (LMS) such as blackboard, eCollege, Moodle and others are being used throughout the educational sector. Some even incorporate such technology to measure teaching effectiveness and student performance. Furthermore, social websites, like Facebook.com, have become so popular that 85% to 99% of college students use it in one form or another. This research explores the students' perspective on how the effectiveness of tools such as Moodle and Facebook.com as well as paper based learning (traditional learning) on their performance. The paper also looks at different factors, such as gender, major type and age to try to shed light on the preferred tool among students to use for education. When it comes to students' tool preference based on age and gender, we found no significant difference, but when looking at students' majors and time spent in university, we found that Moodle was rated the top, followed by paper-based learning, then Facebook. When viewing students' perception on effect of these tools on performance, we found no statistical significant difference by age or time spent in the university, but did find a significant difference among different genders; where male students showed greater satisfaction than did female students, and statistical significant different among majors.

Keywords—Moodle, Facebook, paper-based assessment, students' perception

1 Introduction

Educational institutions are taking full advantage of technology to create innovative ways to deliver information, knowledge, and services to students. Thanks to

technology, online classes, and the Internet, time and space are no longer considered a limitation (DeNeui & Dodge, 2006*)*. The benefits of using technology in education forced programs to change to fit technology use into the curriculum (Kaynama & Keesling 2000; Strauss & Frost, 1999).

Literature abounds with research on the benefits of technology and its effect on students' performance and satisfaction. For example, a significant positive correlation emerged between the use of online tools and students' examination scores (DeNeui & Dodge, 2006). Using technology can help enhance student performance across all majors (Krentler & Willis-Flurry, 2005). The use of technology in classes is even helping students with special needs meet district benchmarks (Courduff, 2011).

In this study, we focused on two types of tools—Facebook.com and Moodle—and compared students' perception of these tools to the traditional paper-based tool on performance. We also explored the preferred tool (Facebook, Moodle, or paper based material), based on different attributes such as age, gender, school level, and school major.

2   Facebook as a Learning Tool

Facebook is a social website established in 2004. In the fourth quarter of 2016 in its monthly report, Facebook reported 1.86 billion users monthly (Statista, 2017). Facebook is extensively popular among college students (Hargittai, 2007; Jones & Fox, 2009; Matney & Borland, 2009), reporting that between 85% and 99% of college-student use in one form or another.

Literature is filled with examples exploring the benefits of Facebook in education. Using Facebook helped create trust and better collaboration among students (Chang & Lee, 2013). Facebook served as a tool for sharing resources, posting announcements, and conducting discussions (Wang, Woo, Quek, Yang, & Liu, 2013). The success of Facebook as an educational tool depends heavily on its ease of use, social influence, and community identity (Mazman & Usluel, 2010). The use of Facebook as an educational tool is due to its useful qualities such as the ability to use it as for peer feedback (Mason, 2006). (Jong, Lai, Hsia, Lin, & Liao, 2014) noted that Facebook can be used as an educational tool, for the convenience of sharing resources, for the immediacy of posts, and for interactions among its users, among other uses.

In contrast, some researchers have warned against using Facebook as an educational tool (see Selwyn, 2009). For example, students expressed concerns about privacy issues using Facebook (Hew, 2011). The need for parental control might limit the use of Facebook and thus affect student performance (Lee, 2014). Facebook users tend to have lower grade-point averages than those who do not use Facebook (Kirschner & Karpinski, 2010). In one study, students preferred Facebook as a social tool rather than an educational tool, thereby limiting the use of Facebook to socialization and informal learning (Madge, Meek, Wellens, & Hooley, 2009).

3 Moodle as a Learning Tool

Educational institutions use many tools to provide educational content online. Some tools include Blackboard, eCollege, TelEduc, WebCT, Toolbook, TopClass Server Modular Object-Oriented Dynamic Learning Environment, or Moodle. Moodle is an open-source Course Management System. Researchers hold various opinions on the use of Moodle. Some viewed Moodle as a slow, noninteractive system (Avila, Hembra, Mueco & Zamora, 2015) whereas others viewed it as a strong educational tool that provides a flexible infrastructure with the ability to add plug-ins and freely modify its code as an open-source platform (Lopes, 2011).

4 Research Framework

4.1 Research Questions and Hypotheses

This paper explores the relationship between students and learning-tool preference as well as students' perceptions of which tool they believe has the most impact on their performance at the university. The questions this paper aimed to answer follow:

- Is there a difference in students' preference of learning tools?
- What are students' perceptions of the effect of such learning tools (paper based, Moodle, and Facebook) on their performance?
- Is there a correlation between students' preferred tool and its effect on their school performance from students' perspective?

To answer these three questions, we formulated the following hypotheses:

$H1A_0$: There is no statistically significant difference among students' tool preference, based on gender.

H1A: There is a statistically significant difference among students' tool preference, based on gender.

$H1B_0$: There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student gender.

H1B: There is a statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student gender.

$H2A_0$: There is no statistically significant difference among students' tool preference, based on major.

H2A: There is a statistically significant difference among students' tool preference, based on major.

$H2B_0$: There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student major.

H2B: There is a statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student major.

$H3A_0$: There is no statistically significant difference among students' tool preference, based on years spent in school.

H3A: There is a statistically significant difference among students' tool preference, based on years spent in school.

H3B$_0$: There is no statistically significant difference in education level among students' perceptions of the effect of learning tool on performance, based on years spent in school.

H3B: There is a statistically significant difference in education level among students' perceptions of the effect of learning tool on performance, based on years spent in school.

H4A$_0$: There is no statistically significant difference among students' tool preference, based on age.

H4A: There is a statistically significant difference among students' tool preference, based on age.

H4B$_0$: There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student age.

H4B: There is a statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student age.

H5$_0$: There is no statistically significant correlation between students' learning tool and performance.

H5: There is a statistically significant correlation between students' learning tool and performance.

4.2 Methodology

Randomly selected classes throughout Al Ain University of Science and Technology took part in this study. Faculty offered courses with material using three different platforms: paper-based, Moodle, and Facebook. At the end of the semester, students completed a five-item rating-scale survey to evaluate their perceptions of the effect of these tools on their performance. Students responded about a tool by marking 1 = Totally disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Totally agree. The five items are shown below. The name of the tool (Facebook, Moodle, or paper) was listed in the blank space.

− I use _____ for educational purposes.
− I don't mind having my classes held on _____.
− I would get a higher grade if _____ was used in class.
− _____ has many educational tools.
− I can be competitive in the market if _____ is used for education.

Students also completed a scale about their satisfaction with their performance at the university using the same 1 to 5 scale. The performance items were as follows:

− I find learning easy at the university.
− I find my professors helpful.
− I learned a good deal at the university.
− I feel I can compete against other university students in the job market.

In addition to the two rating scales, students provided demographic data on gender, major, year in school, and age. The purpose of the study was to examine students' preferences associated with the tools, as well as their assessment of the relationship between the tools and their performance.

4.3   Data Collection and Screening

Students throughout the university took the survey. The total number of surveys distributed was 306; 277 students returned surveys. Of the 277 surveys returned, we removed three participant surveys from the study due to students having failed to respond to any of the items. Other missing responses were scattered among the data and replaced with the median responses of those participants who did answer the items. Screening resulted in a complete data for 274 students on which we conducted the analysis.

We recoded alphabetic variables (e.g., males = 0, females = 1) and established SPSS variable names, labels, and values. We then screened the data for missing responses. As described earlier, the survey included five-item scales for Facebook, Moodle, and paper-based teaching tools and a five-item scale about performance. We used reliabilities (Cronbach's alphas) to determine if we could combine items into total scores for each scale.

4.4   Data-Analysis Structure

The data analysis occurred in three different ways. First, we presented the overall descriptive statistics for the scores on the Facebook, Moodle, and paper-based instructional tools, as well as the performance measure. We provided these for the overall group and then partitioned by demographic. Second, following the overall descriptive analyses are analyses of variance on the instructional tools and performance for each demographic. For the third analysis, we used correlation to examine the relationship between the performance measure and the measures on Facebook, Moodle, and paper-based teaching tools.

5   Data Analysis

Table 1 provides the means and standard deviations for the three teaching tools and the performance measure. The first row of the table is based on the entire number of students. The means range from 1 to 5 with higher means indicating greater agreement.

As shown in the first row, as a total group, students overall tended to prefer Moodle and paper-based instruction more than Facebook. That is, the mean of 2.61 for Facebook was between disagree and neutral whereas the means associated with Moodle (M = 3.75, SD = .85) and paper-based instruction (M = 3.56, SD = .93) were between neutral and agree. The mean of 3.88 for performance indicates that students, as a group, were satisfied. Although the means show the overall group averages, the

standard deviations indicate that, as individuals, students varied above and below the means, as might be expected.

Observation of the means and standard deviations by demographics shows the same pattern as for the overall group. Moodle and paper-based instruction were preferred over Facebook in all demographic categories, although in some categories Moodle was most preferred, and in others, paper-based tools were most preferred in categories; however, the differences were not large.

Table 1. Overall Student Ratings on Three Teaching Tools and Performance and by Demographics

		Facebook		Moodle		Paper-based		Performance	
Group	*Number*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
All students		2.61	1.06	3.75	0.85	3.56	0.93	3.88	0.76
Gender									
Men	94	2.62	1.14	3.75	0.94	3.63	1.01	4.07	0.82
Women	180	2.59	1.01	3.74	0.80	3.52	0.89	3.78	0.70
Major									
Business administration	85	2.88	0.92	3.94	0.76	3.27	0.94	3.64	0.69
Mass communication	141	2.31	1.12	3.70	0.90	3.66	0.90	4.22	0.64
Pharmacy	36	3.06	0.84	3.57	0.69	3.71	0.93	3.17	0.62
Other	12	2.73	0.75	3.50	1.07	3.80	0.87	3.88	0.74
Year in school									
1st	72	2.17	0.98	3.54	0.94	3.54	0.86	3.84	0.71
2nd	102	2.78	1.01	3.78	0.73	3.60	0.91	3.87	0.77
3rd	60	2.59	0.98	3.92	0.69	3.49	0.86	3.98	0.75
4th	30	3.06	1.22	3.55	1.12	3.27	1.09	3.73	0.85
> 4	10	2.60	1.00	4.40	0.72	4.44	0.93	3.98	0.75
Age									
< 21	113	2.77	0.99	3.86	0.86	3.67	0.93	3.96	0.70
21–25	143	2.52	1.08	3.69	0.80	3.47	0.93	3.80	0.80
> 26	18	2.24	1.09	3.46	1.07	3.48	0.94	4.01	0.76

5.1 Hypothesis Through Analysis of Variance (ANOVA)

We employed an ANOVA to determine if statistically significant differences emerged on the teaching tools and performance measures associated with each of the demographics of gender, major, years in school, and age. To decrease the probability of a Type I error, we used the .01 level as the benchmark for statistical significance rather than the conventional .05 level. We provide the actual probabilities. Thus, a *p*-value of .010 or less is considered a statistically significant difference. For ease of reading, the *F*-ratios and *p* values that were statistically significant at the .010 level are marked in bold type in the tables.

Testing H1. In Table 2, as can be seen by observing the *p*-values, no statistically significant differences emerged between genders with respect to teaching-tool prefer-

ences. Therefore, we accepted H1A$_0$ which states, 'There is no statistical significance in difference among students' tool preference tool based on gender' and rejected H1A which states: 'There is a statistically significant difference among students' tool preference, based on gender'.

Table 2. Means, Standard Deviations, and One-Way Analysis of Variance for Differences Between Gender on Three Teaching Tools and Performance

	Males (94)		Females (180)			
Variable	*M*	*SD*	*M*	*SD*	*F*	*p*
Facebook	2.62	1.14	2.59	1.01	0.04	.849
Moodle	3.75	0.94	3.74	.080	0.03	.864
Paper based	3.63	1.01	3.52	0.89	0.91	.340
Performance	4.07	0.82	3.78	0.70	**9.85**	**.002**

Note. Group Ns are shown in parentheses.

Looking at performance satisfaction, we noticed a difference in performance satisfaction ($F = 9.85$, $p = .002$) by gender. Observation of the means for performance indicated that male students showed greater satisfaction than did female students ($M = 4.07$ and $M = 3.78$ respectively). Therefore, we accepted H1B hypothesis which states, 'There is a statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student gender', therefor we rejected Null Hypothesis H1B$_0$ which states, 'There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student gender'.

Testing H2. The results of the ANOVAs for differences between majors appear in Table 3. Differences arose between majors for Facebook as well as for paper-based instructional tools. In addition, they also differed with respect to satisfaction with performance. In the ANOVAs, the overall *F*-value was based on indicating an overall difference among the means. However, the overall *F* provides no information about which means differ from another. Thus, we conducted a Bonferroni post hoc test to identify which means differed. Concerning Facebook, Business Administration (BA) majors and Mass Communication (MC) major differed such that BA students preferred Facebook ($M = 2.88$) more than did MC students ($M = 2.31$). In addition, Pharmacy (PH) students ($M = 3.06$) preferred Facebook more than did MC students ($M = 2.31$). Therefore, we accepted H2A which states, 'There is a statistically significant difference among students' tool preference, based on major', and rejected H2A$_0$ which states, 'There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student major'. We accepted H2B: There is a statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student major and rejected H2B$_0$, There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student major.

As to students' perceptions on the effect of learning tools on performance based on major, MC students scored statically significantly higher ($M = 4.22$) than BA ($M = 3.64$) and PH students ($M = 3.17$). The difference between students in the Other cate-

gory ($M = 3.88$) and PH students was also statistically significant ($M = 3.17$). There-fore, we accepted H2B which states, 'There is a statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student major' and rejected H2B$_0$ which states, 'There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student major'.

Table 3. Means, Standard Deviations and One-Way Analysis of Variance for Differences Between Majors on Three Teaching Tools and Performance

	BA (85)		MC (141)		PH (36)		Other (12)			
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*
Facebook	2.88	0.92	2.31	1.12	3.06	0.84	2.73	0.75	**8.32**	.001
Moodle	3.94	0.76	3.70	0.90	3.57	0.69	3.50	1.07	2.49	.061
Paper based	3.27	0.94	3.66	0.90	3.71	0.93	3.80	0.87	**4.13**	**.007**
Performance	3.64	0.69	4.22	0.64	3.17	0.62	3.88	0.74	**30.62**	**.001**

Note. BA = Business Administration, MC = Mass Communication, PH = Pharmacy, Group Ns are shown in parentheses.

Testing H3. Table 4 provides the ANOVAs for differences between year in school. For Facebook, the statistically significant differences were between fourth-year students ($M = 3.06$) and first-year students ($M = 2.17$) as well as second-year ($M = 2.78$) students and first-year students ($M = 2.17$). Students seemed to appreciate Facebook as an educational tool as they advanced in their educational career. For Moodle, a significant difference emerged of preference between students in attend-ance more than 4 years ($M = 4.40$) and first-year students ($M = 3.54$). Paper-based differences were between the more than 4-year students ($M = 4.44$) and first-year students ($M = 3.54$). The more than 4-year students also scored statistically signifi-cantly higher than third- ($M = 3.49$) and fourth-year students ($M = 3.29$).

It is very important to note that the sample size for students who have been attend-ing the university more than 4 years was only 10, which is smaller than the other groups. Using the above analysis, we therefore accepted H3A which states, 'There is a statistically significant difference among students' tool preference, based on years spent in school', and rejected H3A$_0$ which states, 'There is no statistically significant difference among students' tool preference, based on years spent in school'.

Table 4. Means, Standard Deviations and One-Way Analysis of Variance for Differences Between Year in School on Three Teaching Tools and Performance

	1st (72)		2nd (102)		3rd (60)		4th (30)		> 4 (10)			
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*
Facebook	2.17	0.98	2.78	1.01	2.59	0.98	3.06	1.22	2.60	1.00	**5.47**	**.000**
Moodle	3.54	0.94	3.78	0.73	3.92	0.69	3.55	1.12	4.40	0.72	**3.77**	**.005**
Paper based	3.54	0.86	3.60	0.91	3.49	0.86	3.29	1.09	4.44	0.93	**3.22**	**.013**
Performance	3.84	0.71	3.87	0.77	3.98	0.75	3.73	0.85	3.98	0.75	.64	.634

Note. Group Ns are shown in parentheses.

Regarding students' perceptions of the effect of tools used in their performance, each year school groups rated their performance high and the overall *F*-ratio was not statistically significant ($F = .64$, $p = .634$). Therefore, we accepted $H3B_0$ which states, There is no statistically significant difference in education level among students' perceptions of the effect of learning tool on performance, based on years spent in school and rejected H3B: There is a statistically significant difference in education level among students' perceptions of the effect of learning tool on performance, based on years spent in school.

Testing H4. Observation of the *p*-values shown in Table 5 indicated no statistically significant differences between age and the three teaching tools as well as performance at the $p = .010$ level or less. However, the overall patterns were the same such that Facebook received lower ratings and Moodle and paper-based instruction received similar but higher ratings. Therefore, we accepted $H4A_0$ which states, There is no statistically significant difference among students' tool preference, based on age, and rejected H4A There is a statistically significant difference among students' tool preference, based on age. Students also rated performance high across the age categories and hence we accepted $H4B_0$, There is no statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student age, and rejected H4B: There is a statistically significant difference among students' perceptions of the effect of learning tool on performance, based on student age.

Table 5. Means, Standard Deviations and One-Way Analysis of Variance for Differences Between Age on Three Teaching Tools and Performance

	Age categories							
	< 21 (113)		21–25 (143)		>26 (18)			
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*
Facebook	2.77	0.99	2.52	1.08	2.24	1.09	2.99	.052
Moodle	3.86	0.86	3.69	0.80	3.46	1.07	2.40	.093
Paper based	3.67	0.93	3.47	0.93	3.48	0.94	1.44	.239
Performance	3.96	0.70	3.80	0.80	4.01	0.76	1.84	.161

Note. Group Ns are shown in parentheses.

Testing H5. Table 6 demonstrates the correlation between performance and the three instructional tools. The first row of the table is of most interest. Students perceived a strong correlation between their performance using two tools: Moodle ($r = .31$, $p < .01$) and paper-based ($r = .17$, $p < .01$). Facebook, in contrast, had a small, near 0 correlation ($r = -0.04$, $p < .01$). Therefore, we accepted H5 which states, There is a statistically significant correlation between students' learning tool and performance, and rejected $H5_0$: There is no statistically significant correlation between students' learning tool and performance.

Table 6. Reliabilities and Intercorrelations Between Performance and Three Teaching Tools Ratings (N = 274)

Variable	Performance	Facebook	Moodle	Paper based
Performance	**.83**	.04	.31*	.17*
Facebook		**.90**	.27*	-.08
Moodle			**.83**	.01
Paper based				**.82**

Note. Reliabilities (Cronbach's alpha) are shown in bold type in the diagonal. *p < .01.

6 Results Discussion

Our research explored the role of gender in determining preferred online tools as well as students' perceptions of the effect of such tools on performance. Although several researchers identified gender as a means to identify learning behavior in online and face-to-face environments (Canada & Pringle, 1995; Crombie, Pyke, Silverthorn, Jones, & Piccinin, 2003), our analysis did not find gender to be a factor when determining preference tool. Nevertheless, in performance, our findings agree with Village and Baker (2013) and Boghikian-Whitby and Mortagy (2016) that gender plays a significant role in academic performance.

Age was another variable we explored in relation to student preference tool and effect on performance. Although researchers reported age to be a good indicator of online-use preference (Thayer & Ray, 2006), we were unable to find any statistical significance for age in educational-tool preference between Moodle, paper-based, and Facebook options. Furthermore, although Lundberg, Castillo-Merino, and Dahmani (2008) noted that age usually reflects maturity and hence the ability to learn more and faster, our results did not find a relationship between students' perceptions of the effect of the online tool on their performance.

In analyzing students with the three main majors (BA, MC, and PH, see Table 3), we noticed that MC students preferred the paper-based instructional tool ($M = 3.66$) more than did BA students ($M = 3.27$). In our opinion, this outcome is due to the notion that the MC program is new and the sampled students had been in this major for 1 or 2 years at most (the program is 2 years young), so students in this program, coming from a high school that uses paper-based tools, still preferred the traditional way of learning, which is paper based. Nevertheless, when assessing MC students' perceptions of the effect of using online tools in their performance, MC students scored statically significantly higher ($M = 4.22$) than BA ($M = 3.64$) and PH students ($M = 3.17$).

As to performance, students perceived paper-based assessments and assessments delivered over Moodle as most effective and having the best chance of improving their performance. A correlation emerged in perceptions of the effect of the three learning techniques (Moodle, Facebook, and paper based) on performance.

The use of technology in education can provide students with an advantage to help them improve themselves. Our findings are consistent with Driscoll, Jicha, Hunt, Tichavsky, and Thompson (2012), who reported a relationship between introducing

technology and improved learning. Throughout the research, students perceived Facebook, as a learning tools, as least effective in buoying their performance. This outcome agrees with many researchers who expressed concerns about the use of Facebook in education in maintaining privacy (Hew, 2011), the effect of parental control in limiting student freedom, and the effect on performance (Lee, 2014). Facebook comes with many distractions that can affect the performance of students with attention-deficit disorder (Paul, Baker, & Cochran, 2012) and lower grade-point average (Kirschner & Karpinski, 2010). With these negative aspects of Facebook, students still perceive the tool as a positive tool that can improve their performance, agreeing with many researchers (Smith, 2009) who agreed that Facebook extends learning beyond the boundaries of classrooms. For example, George, Dellasega, Whitehead, and Bordon (2013) noted that the use of Facebook reduces stress and Deng and Tavares (2013) asserted Facebook use boosts student motivation and confidence.

Moodle was rated highest from students' perspectives. Although Moodle, as a learning environment, provides less interaction among students (except in a few instances like forums), it is based on Web 1.0, which limits the ability to create the participatory culture allowed with tools using Web 2.0 (McLoughlin & Lee, 2007; O'Reilly, 2005). Moodle also offers students the ability to download material, print it, and revert to paper-based copies for learning, causing students to perceive Moodle as the most preferred of the three tools.

7   Conclusion

From students' perspective, there is a significant difference between the three examined learning tools; Moodle, Facebook and paper-based learning. Students found Students found Moodle as their preferred learning tool. Furthermore, even though students perceived Moodle and Facebook as good for improving their performance, they ranked Moodle to be the tool that's most helpful in improving their performance.

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