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# Research on the Impact of e-Schoolbag on Teachers' Professional Development: from the Perspective of Teachers

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**Abstract:** E-schoolbag, as an important information technology application in the field of education in China, not only promote students' learning, but also have a positive effect on the teaching of teachers. In order to understand the impact of e-schoolbag on the professional development of teachers, this study used the feedback data of 1004 Chinese teachers collected in the 2016 e-Schoolbag package pilot project in S city of China, and analyzed the impact of e-Schoolbag on the professional development of teachers from the perspective of teachers. We mainly examine the two dimensions of teaching ability and information literacy. The results showed that teachers generally think that the application of e-Schoolbag promotes the development of their professional abilities. However, some factors, such as teaching ages and the length of application of e-Schoolbag, may cause certain degrees of effect on teachers' perception of e-Schoolbag on their professional development.

**Keywords:** e-Schoolbag, teachers' professional development, teaching ability, information literacy

## 1. Introduction

The rapid development of information technology has gradually transformed the classroom, and it aims to improve the teaching and learning by optimizing the teaching process. With the rise of "1:1 computing" and "Bring Your Own Device" (BYOD), various types of digital learning applications based on mobile device have become a popular study and practice theme in education in many countries and are seen as an effective way to promote teaching and learning. In BYOD, students bring personal mobile devices to school for learning (Norris & Soloway, 2011). While "1:1 computing" refer to projects where technology is available to all students and their teachers (Bebell & O'Dwyer, 2010; Gu et al, 2017), and students can use mobile terminals (such as laptops and tablets) access the internet, digital learning resources, electronic textbooks, and so on (Guan & Riezebos, 2015). In China, a similar digital learning project is the "e-Schoolbag", which emerged after 2010. E-Schoolbag provides a personal learning environment that integrates electronic textbook reader, virtual-learning tools, and connect the appropriate learning service (Zhu & Yu, 2011).

Different provinces and cities in China have carried out pilot projects of e-Schoolbag at different levels. Many explorations have been made in the application of e-Schoolbag and digital materials, and positive progress and results have been achieved. Moreover, many Chinese researchers have studied the application effect of e-Schoolbag in schools. Most of the studies investigated the impacts on students' academic performance, learning experience and other aspects about the application of e-Schoolbag in specific subject, which is from a perspective of students and teachers, (Zhang et al, 2013; Guan et al, 2014). However, teachers are also the key factors when it comes to integrating the e-Schoolbag into the instruction system (Guan et al, 2014). It is incomplete

and inaccurate if we just consider its impacts on students when we study the application effect of e-Schoolbag in teaching. The existing research on the impact of e-Schoolbag on teachers mainly focuses on teachers' understanding of e-Schoolbag, satisfaction with their use, and acceptance et al. (Zhou et al, 2016; Zhang et al, 2015; Zhang et al, 2015;). However, few researches studied the impact of the application of e-Schoolbag on teachers' teaching ability, teaching methods, teaching thinking, teaching patterns, etc. Some studies have shown that the evaluation of the application effect of e-Schoolbag should be comprehensively in terms of academic achievement levels, skills development in the 21st century, development of information literacy, teachers' professional development, improvement of classroom teaching quality, and reform of school systems. (Tong et al, 2016). Many teachers also clearly expressed their desire to transform the way of teaching and learning with e-Schoolbag, and gradually promote their professional development (Guan et al, 2014). So that we should also consider its impact on the teachers' professional development when we investigate the effect of the application of e-Schoolbag in teaching.

The purpose of this study is to explore the attitude of Chinese teachers about the impact of e-Schoolbag on their professional development, and further analyze the influences of teaching ages and the application time of e-Schoolbag on teachers' perceptions.

## 2. Research Design

### *2.1 Research Methods and Data Sources*

This study used the feedback data of 1004 Chinese teachers collected in the 2016 e-Schoolbag package pilot project in S city of China. Items were set up to investigate the impact of e-Schoolbag on teachers' professional development from two dimensions: teaching ability and information literacy. In the survey questionnaire, the Likert scale was applied, for each topic and the five options count 1 to 5 points, respectively. Validity analysis of the questionnaire used structural validity analysis. KMO is one of the validity test indicators for the main component analysis. If the value is above 0.9, it means that it is very suitable for factor analysis. The SPSS 23.0 analysis found that the KMO value is 0.905, which is greater than 0.5, and also greater than 0.9, indicating that the questionnaire has a good structural validity.

### *2.2 Participants*

The participants are 1004 Chinese teachers, and from elementary, middle, and high schools. In terms of gender distribution, most of them are female, accounting for 85.86%. We divided teaching age into 1 to 5 years (novice teacher) and more than 5 years (senior teacher). Most of the teachers have rich teaching experience, and only 33.07% of the pilots have teaching for less than five years. The teachers surveyed belong to different disciplines and teach mainly in Chinese, mathematics, and English. In the application time of e-Schoolbag, we divided it into 0~2 semesters (short-term) and more than 2 semesters (long-term), and the short-term accounted for 52.69%, and 47.31% for long-term. Basic statistical information of the sample shown in Table 1.

Table 1

*Sample basic information statistics*

| Independent Variable | Groups | Valid Sample | Percentage |
|---|---|---|---|
| Gender | Male | 142 | 14.14% |
| | Female | 862 | 85.86% |
| Teaching age | 1~5 years(novice teacher) | 332 | 33.07% |
| | More than 5 years(senior teacher) | 672 | 66.93% |
| Discipline | Chinese | 333 | 33.17% |
| | Mathematics | 221 | 22.01% |
| | English | 202 | 20.12% |

| | | | |
|---|---|---|---|
| | Others | 248 | 24.6% |
| Application time | 0~2 semesters(short-term) | 529 | 52.69% |
| | More than 2 semesters(long-term) | 475 | 47.31% |

## 3. Results

### *3.1 Teacher's Perception of the impact of e-Schoolbag on Teaching Ability*

In order to know the teachers' perception about the impact of the e-Schoolbag on their own teaching ability, there are seven items in the questionnaire. By counting the scores, we got the mean value of 1004 Chinese teachers under each item.

#### *3.1.1 The Influence of Different Teaching Age*

From the results of mean value statistics and independent sample t-test, we can get the teachers' perception of the impact of e-Schoolbag on their teaching ability with different teaching age. Table 2 shows that as items 1, 3, 5, the senior teachers get lower mean value than the novice teachers, which indicate that senior teachers have a better effect perception than novice teachers do in these three items. For the reverse item 7, the mean value of novice teacher is higher, which shows that the senior teacher feels more that the application of e-Schoolbag increases the preparation burden. Combined with the results of the independent sample t-test, the p-values of five items were all less than 0.05, which means that teachers with different teaching age, whose perception of the effect of e-Schoolbag on teaching ability exist significant differences in these three items.

Table 2

*Teachers' Perception on Their Teaching Abilities with Different Teaching Age*

| Teachers' professional development - teaching ability | Teaching age | N | Mean | SD | p-value |
|---|---|---|---|---|---|
| 1. I can achieve a high-level teaching objectives | 1~5 years | 332 | 2.41 | .883 | .145 |
| | More than 5 years | 672 | 2.39 | .956 | |
| 2. My teaching ability has improved | 1~5 years | 332 | 2.34 | .914 | .042* |
| | More than 5 years | 672 | 2.36 | .987 | |
| 3.My instructional design has improved | 1~5 years | 332 | 2.26 | .923 | .041* |
| | More than 5 years | 672 | 2.33 | .990 | |
| 4. My ability to communicate, discuss, and generalize with students has improved | 1~5 years | 332 | 2.16 | .847 | .020* |
| | More than 5 years | 672 | 2.16 | .923 | |
| 5. I have increased my awareness of mastering the individual learning process and providing individual guidance | 1~5 years | 332 | 2.08 | .877 | .861 |
| | More than 5 years | 672 | 2.06 | .874 | |
| 6. I think the integration of technology and discipline has promoted my professional development | 1~5 years | 332 | 2.14 | .846 | .027* |
| | More than 5 years | 672 | 2.14 | .928 | |
| 7. My workload for preparing lessons have been increased | 1~5 years | 332 | 2.28 | 1.007 | .027* |
| | More than 5 years | 672 | 2.01 | .980 | |

#### *3.1.2 The Influence of Different Application Time*

From the results of mean value statistics and independent sample t-test, we can get teachers' perception of the impact of e-Schoolbag on their teaching ability with different application time. As shown in Table 3, in terms of the mean values of the first 6 positive items, the short-term teachers

higher than long-term teachers, while in the inverse item 7, the short-term teachers get higher mean values. Combined with the results of the independent sample t-test, the P values of the two items are less than 0.05. They are item 4, 6. That reveal that teachers with different application time exist significant differences in these two items in the perception of the effect of on teaching ability.

Table 3

*Teachers' Perception on Their Teaching Abilities with Different Application Time*

| Teachers' professional development - teaching ability | Application time | N | Mean | SD | p-value |
|---|---|---|---|---|---|
| 1. My classroom teaching can achieve a high-level teaching objectives | 0~2 semesters | 529 | 2.51 | .907 | .708 |
| | More than 2 semesters | 475 | 2.27 | .944 | |
| 2.My teaching ability has improved | 0~2 semesters | 529 | 2.47 | .957 | .447 |
| | More than 2 semesters | 475 | 2.23 | .955 | |
| 3. My instructional design has improved | 0~2 semesters | 529 | 2.40 | .953 | .628 |
| | More than 2 semesters | 475 | 2.21 | .977 | |
| 4. My ability to communicate, discuss, and generalize with students has improved | 0~2 semesters | 529 | 2.26 | .909 | .038* |
| | More than 2 semesters | 475 | 2.05 | .875 | |
| 5.I have increased my awareness of mastering the individual learning process and providing individual guidance | 0~2 semesters | 529 | 2.15 | .879 | .093 |
| | More than 2 semesters | 475 | 1.97 | .863 | |
| 6. I think the integration of technology and discipline has promoted my professional development | 0~2 semesters | 529 | 2.23 | .912 | .012* |
| | More than 2 semesters | 475 | 2.03 | .878 | |
| 7. My workload for preparing lessons have been increased | 0~2 semesters | 529 | 2.06 | .960 | .066 |
| | More than 2 semesters | 475 | 2.14 | 1.036 | |

### *3.2 Teacher's Perception of the Impact of e-Schoolbag on Information Literacy*

In order to know the influence of the e-Schoolbag on teachers' information literacy, we set 7 items in the questionnaire. By counting the scores, we got the mean value of 1004 teachers under each item.

#### *3.2.1 The Influence on Information Literacy of Different Teaching Age*

Through mean value statistics and independent sample t-test, we can know that teachers' perception of the impact of e-Schoolbag on their information literacy with different teaching age. Table 4 shows that there are three items that the novice teachers get lower mean value than the senior teachers, which indicates that novice teachers have a better perception than senior teachers in these three items. They are item 5, 6, 7. Combined with the results of the independent sample t-test, the p-values of items 3,5,6 were all less than 0.05, which means that teachers with different teaching age, whose perception of the effect of e-Schoolbag on information literacy exist significant differences.

Table 4

*Teachers' Perception on Information Literacy with Different Teaching Age*

| Teachers' professional development - teaching ability | Application time | N | Mean | SD | p-value |
|---|---|---|---|---|---|
| 1.I have improved the level of computer operations | 1~5 years | 332 | 2.11 | .909 | .614 |
| | More than 5 years | 672 | 2.08 | .928 | |

| | | | | | |
|---|---|---|---|---|---|
| 2.I have improved my ability to obtain information | 1~5 years | 332 | 2.09 | .883 | .111 |
| | More than 5 years | 672 | 2.08 | .942 | |
| 3.When facing with technical problem, I would like to try to solve it by myself | 1~5 years | 332 | 2.14 | .869 | .023* |
| | More than 5 years | 672 | 2.08 | .914 | |
| 4.I can integrate technology into the subjects I teach | 1~5 years | 332 | 2.11 | .884 | .180 |
| | More than 5 years | 672 | 2.10 | .896 | |
| 5.I enjoy finding and applying the techniques and tools which can help my teaching | 1~5 years | 332 | 2.04 | .818 | .033* |
| | More than 5 years | 672 | 2.08 | .885 | |
| 6.I can help other teachers apply technology to teaching | 1~5 years | 332 | 2.22 | .889 | .002* |
| | More than 5 years | 672 | 2.32 | .991 | |
| 7.I can use technology to teach in common teaching process | 1~5 years | 332 | 2.12 | .820 | .090 |
| | More than 5 years | 672 | 2.13 | .907 | |

### 3.2.2 *The Influence on Information Literacy of Different* Application time

From the results of the mean value statistics and independent sample t-test, we can know that teachers' perception of the impact of e-Schoolbag on their information literacy with different application time. As shown in Table5, in terms of the mean value, the short-term teacher are all higher than long-term teachers. Combined with the results of the independent sample t-test, the P values of items 3,4,7 are less than 0.05. That means teachers with different application time exist significant differences in these two items in the perception of the effect of on information literacy.

Table 5

*Teachers' Perception on Information Literacy in Different Application Time*

| Teachers' professional development - teaching ability | Application time | N | Mean | SD | p-value |
|---|---|---|---|---|---|
| 1.I have improved the level of computer operations | 0~2 semesters | 529 | 2.19 | .909 | .421 |
| | More than 2 semesters | 475 | 1.98 | .924 | |
| 2.I have improved my ability to obtain information | 0~2 semesters | 529 | 2.19 | .908 | .505 |
| | More than 2 semesters | 475 | 1.97 | .925 | |
| 3.When facing with technical problem, I would like to try to solve it by myself | 0~2 semesters | 529 | 2.12 | .916 | .013* |
| | More than 2 semesters | 475 | 2.02 | .871 | |
| 4.I can integrate technology into the subjects I teach | 0~2 semesters | 529 | 2.21 | .882 | .011* |
| | More than 2 semesters | 475 | 1.98 | .854 | |
| 5.I enjoy finding and experimenting the techniques and tools which can help my teaching | 0~2 semesters | 529 | 2.16 | .866 | .261 |
| | More than 2 semesters | 475 | 1.96 | .850 | |
| 6.I can help other teachers apply technology to teaching | 0~2 semesters | 529 | 2.38 | .968 | .123 |
| | More than 2 semesters | 475 | 2.19 | .939 | |
| 7.I can use technology to teach in usual teaching process | 0~2 semesters | 529 | 2.21 | .876 | .025* |
| | More than 2 semesters | 475 | 2.00 | .869 | |

## 4. Discussion

### *4.1 Teacher's Perception of the Impact of e-Schoolbag on Teaching Ability*

By analyzing the attitude of teachers' perception of the impact of e-Schoolbag on their teaching ability, we can conclude that teachers have a quite positive attitude toward the improvement in their teaching ability through e-Schoolbag. Teachers generally believe that the application of e-Schoolbag

can help them to complete their teaching tasks better. For teachers with different teaching age, they have different perceptions of the impact of e-Schoolbag on their teaching abilities. Novice teachers think that the application of e-Schoolbag has a positive influence on teaching abilities and instructional design. Senior teachers prefer that using e-Schoolbag can promote them to reach a higher level of teaching objectives, and help them master individual students' learning process better and enhance the awareness of giving individual guidance. However, the senior teachers' perception of the workload caused by e-Schoolbag is deeper than that of novice teachers. This may due to the senior teachers' acceptance and proficiency of information technology. Teachers of different application time of e-Schoolbag also have different perceptions of the impact of e-Schoolbag on their teaching ability. Teachers with short e-Schoolbag application time think that preparation work is a burden. Compared with teachers with a short application time, teachers who have used for a long time have a deeper sense of identity about the e-Schoolbag. They think e-Schoolbag can improve communication and interaction with students and promote their professional development through the integration of technology and disciplines.

### *4.2 Teacher's Perception of the Impact of e-Schoolbag on Information Literacy*

By analyzing the attitude of teachers' perception of the impact of e-Schoolbag on their information literacy, we can conclude that teachers have a quite positive attitude toward the improvement in their information literacy through e-Schoolbag. Teacher with different teaching age have different perceptions of the impact of e-Schoolbag on their information literacy. Novice teachers believe that the application of e-Schoolbag enhances the awareness of integrating assistive teaching tools and techniques into regular classroom. Senior teachers, however, have a deeper perception of using the ability to solve technology-related problems on their own. Teachers of different e-Schoolbag application time also have different perceptions of the impact of e-Schoolbag on their information literacy. Teachers with a long application time have a better perception effect. The application of e-Schoolbag not only enhances their awareness and ability of applying technology-assisted teaching in classroom, but also cultivates the ability to solve technology-related problems independently.

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# Aesthetics of Web and Mobile Interfaces of a Learning Management System: A Comparative Analysis

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**Abstract:** Aesthetics of a Learning Management System (LMS) user interface can be a very powerful tool for supporting learning, yet it is the least considered issue in design. This embedded experimental study researches the differences in perceived aesthetics of web and mobile interfaces of an LMS and the opinions of students about the effect of these differences on their learning. The data was gathered from a total of 128 students of a public university. The data collection instruments where, (i) Visual Aesthetics of Websites Inventory (VisAWI) for collecting quantitative data, and (ii) individual interviews with a sample of 10 students completing the inventory. This study reveals that learning materials presented in mobile devices might need design methods specific for mobile interfaces and it might have a positive impact on student learning.

**Keywords:** VisAWI, Aesthetics in Education, Mobile Learning, Aesthetic Perception, LMS

## 1. Introduction

Following the usage of technologies, the information and all the content presented to the students has shifted onto various sizes of monitors and with different Graphical User Interface (GUI) designs. Design and aesthetics of the presented content have non-negligible effects on the way students perceive information and learn, analyze credibility and usability, and assign value to an online experience (Reyna, 2013). Aguayo et al. (2017) highlights aesthetics as an important factor for mobile learning. The concept of visual pleasure in interfaces has gained attention almost 3 decades ago, and the researchers drove the significance of aesthetics stating that the attention to pure aesthetics was playing a crucial role in enhancing the interfaces to make them more understandable, memorable, and appealing for the users (Gait, 1985). Aesthetic judgment approaches for web page interface are essential for attracting the learners' attention and assembling the students' interest in using the GUI (Zain et al., 2007). Norman (2002) explains the essential positive influence of the aesthetics on cognitive system and competence in problem solving by causing an emotional arousal. Majority of the studies report the positive effects of aesthetics on performance (Douneva et al., 2015; Yang et. al., 2018; Buyukkokten et. al., 2000). Because the aesthetic design of the learning materials especially presented on mobile device screens is neglected, there is a need to differentiate between the online learning platforms in terms of aesthetic appeal. In this study, we compare the perceived aesthetics of the web and mobile user interfaces of a learning management system by investigating students' overall aesthetic judgments. This study questions the need for different aesthetical design principle for smaller screen sizes.

## 2. Literature Review

### *2.1 Definition of Aesthetics*

The concept of beauty lays back to the ancient centuries. Hoyer and Stockburger-Sauer (2012) state that the roots of the word aesthetic derive from "aisthetikos" in Greek language that refers to the perception of sense. Aesthetics also is used for describing beauty. Researchers usually described the term as pleasant taste (Berlyne 1974a; Child 1964; Frith and Nias 1974; & Goetz et al. 1979). Aesthetics, from the beginning of its existence, was open to discussions about its subjectivity and objectivity. The academy perceived the aesthetics as a subjective concept until very recent years, however there are researchers who found objectiveness in the beauty.

### *2.2 Visual Design and Aesthetic Dimensions*

Measuring the aesthetics have been considered as a subjective issue for a long time in the past. However, there are studies on the issue finding the least common denominator that there are objective dimensions to define aesthetics. Lavie and Tractinsky (2004) have developed an aesthetic measurement instrument abbreviated as "MIPVA" for any sort of user faces, which branches the visual perception into two different types of aesthetics: "classical aesthetics" and the "expressive aesthetics" (Oyibo et. al.,2018). For the last couple of years, researchers in the area of human-computer interaction focus on assessing aesthetics of user interface in an automated way by applying computational metrics for the evaluation (Zhu, 2017). In this study, the instrument VisAWI designed by Moshagen and Thielsch (2010) was preferred as the objectivity of other aesthetic instruments were open to criticism whereas evidence for the convergent, divergent, discriminative, and concurrent validity of the VisAWI was provided by the researchers. VisAWI was practical and consistent in use. The aesthetic dimensions of VisAWI are simplicity, diversity, colorfulness and craftsmanship.

Simplicity is considered a dimension of classical aesthetic which mainly concerns about the figural beauty of the user interface elements (Moshagen & Thielch, 2010). Diversity dimension refers to the harmony of varied objects or elements that are present in the user interface. Colorfulness has been considered as having an effect on the people's perceived aesthetics for a long time (Du, 2017). Craftsmanship represents the sophistication, professionalism, and skillful integration of all relevant design principles.

## 3. Research Method

In this study, we compared students' aesthetic perceptions of web and mobile interfaces of the LMS used in Middle East Technical University. The primary intent of this study is to acquire a better understanding on the learner perceptions towards web and mobile versions of the LMS in terms of aesthetics. As the research methodology, embedded experimental design was used to determine the perceptional differences between aesthetics of web and mobile versions of the LMS.

### *3.1 Research Questions*

The following research questions shed light to the entire process of this study.

- R.Q.1 Is there a difference between students' perceived aesthetic dimensions of web and mobile interfaces of the LMS with regard to the Visual Aesthetics of Websites Inventory (VisAWI).
- R.Q.2 What are the overall perceived aesthetics of web and mobile versions of the LMS?
- R.Q.3 What are the students' opinions about the effects of visual aesthetics of the LMS on learning?

### *3.2 Participants of the Study*

Participants of the study were university students from all years, taking 5 different courses offered in the Computer Education and Instructional Technology Department. A total of 130 students varying from freshmen to Master's degree voluntarily participated in this research. Since 17 of the participants had involved in the pilot study at the beginning of the research in order to decide on the

tasks, and test the data collection instruments, their data was removed from the final data set. Remaining 113 students have provided their contributions in the actual study. Besides, 10 students who previously participated in the VisAWI accepted to spare time for the follow-up interview.

### *3.3 Data Collection Instruments*

The visual aesthetic measure VisAWI was used for collecting data on visual dimensions. Moshagen and Thielsch (2010) developed VisAWI due to lack of an appropriate measurement for aesthetics. The researchers state that, majority of the aesthetic measures in the literature uses self-report measures such as single-item measures, ad-hoc developed scales, or single scales that are taken from more general instruments. VisAWI is a simple, consistent, and reliable 7-point Likert scale, 18-question questionnaire that is combined from four main dimensions of visual aesthetics that are simplicity, diversity, colorfulness and craftsmanship.

Following the use of VisAWI, an interview guide was used to further explore the opinions of participants on both web and mobile versions of the LMS about aesthetics.

### *3.4 Procedures*

Before collecting any data it was necessary to prepare tasks out of the most frequently used features of the LMS and each participant needed to perform the tasks to get equal familiarity and experience.

A pilot study was conducted with 17 participants to test the instrument and understandability of the questions, and to explore the interview questions that are collected for supporting the quantitative findings. Four different courses at Middle East Technical University was selected for the actual study. The number of students from different years participating in the study are presented in Table 1.

Table 1

*Academic Year & Gender Crosstab of Participants*

| | Male | % | Female | % |
|---|---|---|---|---|
| 1ST YEAR | 24 | 21 | 13 | 12 |
| 2ND YEAR | 22 | 19 | 12 | 11 |
| 3RD YEAR | 13 | 12 | 14 | 12 |
| M.Sc. | 8 | 7 | 7 | 6 |
| Total | 67 | 59 | 46 | 41 |

### *3.5 Data Collection and Analysis*

The LMS is a version of Moodle system that is aesthetically designed specific to the university. In this study LMS was aesthetically evaluated in terms of aesthetic dimensions presented in VisAWI, which are “simplicity, diversity, colorfulness and craftsmanship”. To further explain and support the findings of quantitative data, the qualitative data was collected via the interview guide.

VisAWI data was analyzed with a paired samples t-test and the aesthetic scores were calculated by finding the mean values of each dimension. To analyze the qualitative data, answers of of individual participants were transcribed, converted into text, and deductive qualitative content analysis was performed. The supportive ideas that were caught in the qualitative data were reported to strengthen the reliability of the quantitative study and were used for explaining the quantitative research outcomes.

## 4. Results and Discussions

### *4.1 Quantitative Data Analysis Results*

In order to compare two user interfaces of the LMS, a paired samples t-test was conducted on SPSS. As the results of t-test illustrates (see: Table 2), the average scores for each aesthetic factor seems to be relatively high.

Table 2

*Paired Sample Statistics*

| | | Mean | N | Std. Dev. | Std. Err. Mean |
|---|---|---|---|---|---|
| Pair 1 | Simplicity_web | 4.89 | 113 | 1.12 | .11 |
| | Simplicity_mobile | 4.52 | 113 | 1.27 | .12 |
| Pair 2 | Diversity_web | 4.11 | 113 | 1.04 | .10 |
| | Diversity_mobile | 3.83 | 113 | 1.12 | .11 |
| Pair 3 | Colorfulness_web | 4.50 | 113 | 1.21 | .11 |
| | Colorfulness_mobile | 4.36 | 113 | 1.15 | .11 |
| Pair 4 | Craftsmanship_web | 4.64 | 113 | 1.07 | .10 |
| | Craftsmanship_mobile | 4.31 | 113 | 1.25 | .12 |

Mean value for the Simplicity dimension for the web screen was reported as 4.89-above the average hence it can be said that the participants have perceived the interface of LMS designed for the web screen clear and structured. Similarly, the participants scored the "Simplicity" mobile user interface as 4.52 which is very slightly lower than that of web version, yet 1 score above the average.

Additionally, mean score for the aesthetic dimension "Simplicity_web" has the highest value among all the other dimensions, while the "Diversity_mobile" dimension has the lowest score amongst all the other aesthetic dimensions. The relatively lower score for the diversity_mobile item can be interpreted as the participants have found the mobile version of LMS layout averagely inventive and dynamic. The overall figure demonstrates that all the aesthetic dimensions have very similar scores for both the web and mobile versions of the user interface. Lastly, looking at the overall picture, it is clear that all the mean scores of web versions are higher than the mobile versions (Table 3).

Table 3

*Paired Samples Results*

| | | Mean | Std. Dev. | Cohen's d | t | df | Sig. |
|---|---|---|---|---|---|---|---|
| Pair-1 | Simplicity_web – Simplicity_mobile | .37 | 1.2 | .30 | 3.22 | 112 | .00 |
| Pair-2 | Diversity_web – Diversity_mobile | .28 | .88 | .32 | 3.42 | 112 | .00 |
| Pair-3 | Colorfulness_web-Colorfulness_mobile | .14 | .99 | .14 | 1.48 | 112 | .14 |
| Pair-4 | Craftsmanship_web-Craftsmanship_mobile | .33 | .86 | .38 | 4.06 | 112 | .00 |

The perceived simplicity aspect of visual aesthetics for web is significantly different than the mobile user interface. The perceived inventiveness and dynamics of visual aesthetics for web is significantly different than the mobile user interface. The perceived colorfulness of visual aesthetics for web is not significantly different than the mobile user interface. This result might mean that the students cannot distinguish between the color composition, choice and combination of web and mobile versions of LMS learning management system. The perceived topicality and sophistication

and professionalism of the interface designed for web is significantly different than that of mobile user interface.

Table 4

*Mean Values of Individual Aesthetic Dimensions*

| | Web | Mobile |
|---|---|---|
| Simplicity | 4.89 | 4.52 |
| Diversity | 4.11 | 3.83 |
| Colorfulness | 4.50 | 4.36 |
| Craftsmanship | 4.64 | 4.31 |

Regarding the Table 4, findings of the study illustrated that;
There was a significant difference between the perceived simplicity of the web and mobile interfaces of the LMS. There was a significant difference between the perceived diversity of the web and mobile interfaces of the LMS. There was no difference between the perceived colorfulness of the web and mobile interfaces of the LMS. There was a significant difference between the perceived craftsmanship of the web and mobile interfaces of the LMS. Students perceived both interfaces aesthetically better than the average. Students found the web interface of LMS better than the mobile user interface. Students find the web interface simpler than the mobile interface. The participants find both web and mobile versions of the LMS aesthetically above the average. The study also revealed that the students perceived both overall aesthetics and individual aesthetic dimensions of web and mobile versions in a different way, despite the responsive design, the same colors, and the same content.

### *4.2 Qualitative Results*

Majority of the students stated that they find web version of LMS aesthetically pleasing. Surprisingly, although the quantitative analysis results show that the students found the craftsmanship, and simplicity of mobile version quite well designed, most of them stated that being obliged to scroll so much makes it hard to access the information, is time-consuming and decreases its sophistical design. The analyzed interviews pointed that the students have found the mobile version of the user interface dense by stating that there were too much content and they needed to scroll too much. By looking at the interviewee statements, finding the content takes more time in mobile user interface compared to the web version. One student stated that he could not find the content easily on mobile user interface, because the interface was too disordered and finding it was time consuming. All the participants articulated that they prefer to use web version of LMS. Except one of the students, all the students articulated that the aesthetics of a user interface affects their learning by either attracting their attention, enhancing their comprehension, motivating them, fastening the learning process, or contributing to their visual memory. The results are also consistent with the literature (Yue et. al, 2017; Bhandari et. al., 2017; Ilhan et. al.,2017). Density of the objects on especially in the mobile version of the interface evokes negative feelings about the learning material. Color preference and color combination perceived as better looking in the mobile version of the LMS.

## 5. Conclusion

Students have found both user interfaces of the LMS better than the average, yet they perceived mobile interface slightly less aesthetical compared to the web interface. Students value the power of aesthetics of the LMS in learning and agree that it contributes to learning by increasing motivation, enhancing comprehension, triggering visual memory, and by organizing information in a meaningful manner (Ilhan, 2017). Students' perceived aesthetics differ based on the device used. The perceived aesthetics of web version of the LMS and mobile version of the LMS were

significantly different although the aesthetic elements were the same for both of the designs, as it was a responsive design. Regarding the results we can suggest that mobile user interface should be treated differently than the web interfaces. Different design principles and aesthetic designs should be proposed for the mobile UI. A suggestion for the future study is to change the evaluated user interface because it is obviously not possible to generalize the findings related with the effect of aesthetics in learning by solely investigating it using one learning material. Web and mobile specific user interfaces of a variety of different web based learning tools can be used.

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