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مقدمه: در حال حاضر، کتابخانه‌های تحت‌ال牀ی و دانشگاه‌های مشغول تعیین معیارهای جدید برای توصیف خدمات خود می‌باشند تا درجه‌بندی‌هایی را بتوانند به جای تمرکز صرف بر شاخص‌های دیگر رساندند. پژوهش‌های گذشته با هدف تعیین کیفیت خدمات کتابخانه‌های دانشگاه علوم پزشکی ارتش با استفاده از مدل لیب‌کوال انجام گرفته است.

روش: این پژوهش به‌صورت پیمایشی و ابزار گردآوری اطلاعات پرسشنامه لیب‌کوال است. نسخه اصلی پرسشنامه لیب‌کوال در مطالعه غفاری و کرانی در سال 1392 استفاده شد که با توجه به ایجاد تغییرات جزئی در پرسشنامه مذکور توسط پژوهشگران این مطالعه، مجدداً ضریب اثباتی (α) = 0/95 تأیید و پایایی و روایی پرسشنامه توسط استادی و متقاضیان این حوزه تأیید گردید. ضریب اثباتی (α) = 0/95 تأیید گردید. جامعه پژوهش را کارکنان گروه خدمات کتابخانه‌های مرکزی، پزشکی و دندانپزشکی دانشگاه علوم پزشکی ارتش در سال تحصیلی 1392-1393 تشکیل می‌دهد که بر اساس فرمول کوواران، تعداد 161 نفر به‌عنوان نمونه از لیست دانشجویان به‌عنوان انتخاب شدند. نتایج نشان دهنده تأیید و ترویج خدمات کتابخانه‌های مرکزی، پزشکی و دندانپزشکی دانشگاه علوم پزشکی ارتش بود که به پرسشنامه‌ها پاسخ دادند. برای تحلیل داده‌ها از نرم‌افزار SPSS نسخه 16 استفاده شد.

نتایج: با کاهش نشان داد که در ارزیابی کلی کتابخانه‌های دانشگاه علوم پزشکی ارتش تأثیر مثبتی داشته‌اند. با کاهش‌نامه‌های تحت‌ال牀ی و خدمات دریافتی و جوایز داده شده، این نتایج به جلوگیری از افزایش نیاز به خدمات دریافتی تأکید می‌کنند.

کلیدواژه‌ها: ارزیابی کیفیت خدمات، کتابخانه‌های دانشگاه علوم پزشکی ارتش با استفاده از مدل لیب‌کوال
Quality Assessment of the Library Services at the AJA University of Medical Sciences Libraries Using LibQUAL Model

Mojgan Mohammadimehr¹, Sayed Majed Hashemi², Sanaz Zargar Balaye Jame³, Mohammad Ali Shayesteh Moghanlou⁴

¹Department of Microbiology, Education development center, AJA University of Medical Sciences, Tehran, Iran
²Faculty of Educational Science and Psychology, Shahid Chamran University, Ahvaz, Iran
³Department of Public Health, School of Medicine, AJA University of medical sciences, Tehran, Iran
⁴MSc of Educational Management, Telecommunication Company of Tehran, Tehran, Iran

ABSTRACT

Introduction: Academic and research libraries are currently trying to define new criteria that describe their services—they are moving towards more outcome-based assessment instead of relying merely on input, output, or resource metrics. The purpose of the present study is to evaluate the quality of services provided by the libraries of AJA University of Medical Sciences using the LibQUAL model.

Methods: This study is a survey research, for which data were collected through the LibQUAL questionnaire. This questionnaire (in Persian) was used in a study conducted by Ghaffari and Korani in 2011, with Cronbach’s alpha of 0.95. Reliability and validity had to be assessed again after minor changes were made in the questionnaire by the researchers. Validity and reliability of the questionnaire were confirmed and Cronbach’s alpha for the questionnaire was determined to be 0.85. The statistical tests applied in this research included paired samples t-test and the one-way analysis of variance (ANOVA). Using the stratified random sampling method and Cochran’s formula, 261 students were selected from lists of students in each department in the academic year 2013–2014. A total of 190, 53, and 12 users from the medical school library, library of the school of nursing, and library of dentistry school respectively participated in this study. Statistics indices were calculated using the SPSS 16.0 software. P-values less than 0.05 were considered to be statistically significant.

Results: The results showed that there were statistically significant differences between the mean of users’ maximum expectations levels and the services actually received in libraries, based on a comprehensive evaluation of the libraries in AJA University of Medical Sciences (P<0.001). In the dimension of ‘library as a place’, the mean of services received is higher than the mean of the users’ minimum expectations in all three libraries. P-values between the mean of services received and the minimum expectations in the medical school library, the library of the school of nursing, and the library of the school of dentistry were less than 0.001, 0.009, and 0.008 respectively.

Conclusion: The mean of services received in the three libraries of AJA University of Medical Sciences was approximately equal to the users’ minimum expectations and the quality of services in these libraries is acceptable.

Keywords: LibQUAL, Model, Quality Assessment, Library, AJA University of Medical Sciences
Introduction

Academic libraries—as services institutes—play a central role in education and research and are considered to be influencing factors for the development of countries. Thus, optimization of their services is necessary for the development of the country. To improve the services of libraries, it is necessary to measure the level of services provided to those who visit libraries and their minimum and maximum expectations. This helps to not only understand the current situation but also plan for improving services and making required changes based on the realities of the situation [1]. Given the advances in technology, regular increase in information, and changes and enhancements in information transfer formats, the expectations of library visitors are constantly changing and usually increasing [2]. Managers, administrators, and librarians should know whether or not they can set the service quality improvement trend to match the trend of increasing level of expectations. On the other hand, libraries often impose exorbitant costs on the parent institution for financing information sources and managing the library and buildings. Thus, top managers in the parent institution should know whether or not their efforts are cost-effective and whether or not they could meet the needs of the users [3,4]. The accountability and efficacy of library services are important for both the authorities of the parent organization and the libraries’ administrators; measuring them can provide better understanding of library services in the future. However, measuring the quality of services requires a proper tool [5].

The Servqual model—also called the Gap Analysis Model—developed by Parasuraman and Zeithaml is one of the models used for measuring the quality of services provided by service organizations [3]. After the model was introduced, many studies were conducted to localize the application of this model for certain organizations. Among other studies, the studies conducted by the Association of Research Libraries (ARL) led to the development of a new model—named LibQUAL [5,6]. This model was specifically designed for measuring the quality of services provided by libraries. The results of all these studies indicate this model’s strong ability to measure the quality of services. The LibQUAL model—used for measuring the quality of library services—has been recognized as a standard instrument by many scientific societies and libraries. Moreover, continuous modifications and comprehensiveness make it a very useful way to measure the quality of libraries’ services [1].

This instrument is widely used; by 2005, data regarding users’ expectations and their perception of services received had been gathered from about 340,000 users in more than 500 organizations. Besides the United States, Canada, Australia, England, Ireland, and Scotland, the LibQUAL instrument has been also used in several languages in many other countries [2]. In a study conducted by Nicula and Laster [5], six specialized libraries related to professional military science education were investigated using the LibQUAL model. Military officers and postgraduate students participated in this study. The results of the study show that the level of services received in terms of all dimensions is higher than the minimum expectations of users. While the personal control dimension received the highest score, the effect of services was considered to be the weakest dimension. Services of these libraries were generally assessed as good [5]. Probst also implemented the LibQUAL model in the Penn state library. The results of this study reported general satisfaction with the quality of this library’s services and satisfaction of users’ expectations in all dimensions. This library’s services, in comparison with other research libraries, are of much higher quality. While the quality level of the information control dimension received the highest score, the dimensions of the provision of resources and services through the library website, the maintenance and development of equipment, and the level of print and electronic resources, were somehow weak compared to other dimensions [7,8].
A study conducted by Ghaffari and Korani investigated the quality of services of libraries in Kermanshah University of Medical Sciences. The study was based on a sample of 195 users of the libraries at Kermanshah University of Medical Sciences. The results of the study indicated that the mean of overall services of the libraries at Kermanshah University of Medical Sciences was positive with respect to the adequacy gap of services. It means that the libraries could meet the minimum expectations of their users. However, the superiority gap of services received a negative score, meaning that there is still a large gap between the current level of services and meeting user expectations at the desired level of services. In addition, in the dimension of affect services, unlike in two other dimensions, the libraries could provide minimum acceptable services for users in an adequate way [9].

In a study conducted by Mardani and Moghaddam, the quality of services of libraries in Tehran University of Medical Sciences from the point of view of users and librarians was assessed using the LibQUAL scale. The study population consisted of 231 users and 30 librarians of the libraries of Tehran University of Medical Sciences. The results of the study showed that the assessment of quality of current library services by users was lower than that by the librarians and there was a bigger difference in the subscale of information control. Also, there was a large gap between the services of the libraries under consideration and user expectations about the most desired level of services. Librarians had a proper understanding and perception of their users’ expectations and there was only a narrow gap between users’ expectations and librarians’ perception of their needs and expectations [10].

The quality of libraries in the AJA University of Medical Sciences—established more than 20 years ago—has not yet been assessed. Their status in terms of user viewpoints and expectations, which is needed for future decision-making and planning based on realities, is not clear. Top managers in parent organizations may use the results of the current study for planning the investments necessary to improve the level of the libraries’ services and to spend the budget more efficiently and effectively. Using the results of the current study, university management, library administrators, and librarians may get a better understanding of user expectations and their viewpoint about services in order to optimize the libraries’ services. Finally, users may enjoy better services resulting from planning and investments based on realities and needs. Thus, given the importance of the issue, the current study aims to investigate the level of services perceived by users as well as the minimum and maximum levels of expectations of users in every library in Aja University of Medical Sciences using the LibQUAL model. By identifying current gaps regarding the desired service delivery, necessary suggestions for closing the gaps can be provided.

**Methods**

This study was conducted by taking a survey of all students—797 in all—in the academic year 2013–2014 at the AJA University of Medical Sciences. Using the stratified random sampling method and Cochran formula, 261 students were selected from the list of students in each faculty. Then, 198, 58, and 14 questionnaires were distributed among students in the medical school library (medical and paramedical students), the library in the school of nursing, and the library in the school of dentistry respectively. Of these, 190, 53, and 12 questionnaires respectively were returned (255 returned questionnaires in all). The library service quality assessment questionnaire (the LibQUAL scale) was used to investigate the desired questions and gather data. The LibQUAL questionnaire consists of 22 items pertaining to three dimensions—‘user’s perception of services’, ‘library as a place’, and ‘information control’. Respondents rated each item on a nine-point Likert scale, in which Point 1 represents lowest satisfaction and Point 9 represents highest satisfaction with the services. This questionnaire was used in a study conducted...
in Persian by Ghaffari and Korani [9] in 2011, with Cronbach’s alpha of 0.95. The reliability and validity were assessed again after minor changes were made in the questionnaire by the researchers. The Cronbach’s alpha coefficient was calculated to ensure the reliability of the study; reliability of the scales was deemed to be acceptable as Cronbach’s alpha for the questionnaire was 0.85. The validity of the questionnaire was assured as it has been used in local and international studies and has also been validated by three experts in three fields—medical education, health information technology, and librarianship. All students of AJA University of Medical Sciences in the academic year 2013–2014 were considered for the study.

In this study, ethical considerations were taken into account. Administrative approval was granted for conducting the study at the university and verbal consent was obtained from participants after providing adequate information about the aim of the study. Participants were assured that their participation was voluntary and their responses would be treated with confidentiality. Statistical indices were calculated using the SPSS 16.0 software. The paired samples t-test was used to compare the difference between the users’ expectations and the level of services received and ANOVA was used to determine whether there are significant differences among the libraries. P-values less than 0.05 were considered to be statistically significant.

**Results**

Of 255 students, 246 (96.5%) respondents were male. Of the respondents, 80 (31.4%) were studying in medical school, 110 (43.1%) in paramedical school, 53 (20.8%) in nursing school, and 12 (4.7%) in the school of dentistry.

The means of 22 items at three levels—minimum expectations, maximum expectations, and perceived services—as well as difference between the maximum and minimum expectations of services received are shown in Table 1. The research questions have been investigated as follows.

**First question:** Are there statistically significant differences between the three levels—‘users’ maximum expectations of libraries’ services’, ‘services received’, and ‘users’ minimum expectations of libraries’ services’—in the libraries at the AJA University of Medical Sciences?

As Table 1 shows, in the evaluation of three dimensions of services of medical and dentistry libraries from the users’ viewpoint, the mean of services received was higher than the mean of users’ minimum expectations (3.59 and 3.69 respectively). The mean of services received in the library of the dentistry school (3.69) was higher than in the other libraries. In addition, in the school of nursing, the mean of services received was less than the users’ minimum expectations (3.37). According to the results of the t-test (Table 2), there was no statistically significant difference between the mean of users’ minimum expectations level and services received in libraries based on the total evaluation of libraries in AJA University of Medical Sciences (P=0.1). However, there were statistically significant differences between the mean of users’ maximum expectations level and services received in libraries based on the total evaluation of libraries in AJA University of Medical Sciences (P<0.001). Table 2 clearly shows this difference.

**Second question:** Are there statistically significant differences between the users’ minimum expectations, the level of services received, and the users’ maximum expectations in the dimension of ‘user’s perception of service’ in each library in AJA University of Medical Sciences?

As Table 1 shows, while the services received in the library of the school of nursing in the dimension of user's perception of service received the lowest mean score (3.29), the same dimension for the library of the school of dentistry received a higher mean score (3.55) than the two other libraries. According to the results of the t-test shown in Table 2, there was no statistically significant difference between the mean of users’ minimum expectations level and perceived
Table 1: The mean and standard deviation of services dimensions and total evaluation in libraries of AJA University of medical sciences

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<td>Users’ maximum expectations</td>
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<td>Level of services received</td>
<td>Dentistry</td>
</tr>
<tr>
<td>Users’ perception of services</td>
<td>3.42</td>
<td>1.6</td>
</tr>
<tr>
<td>Users’ maximum expectations</td>
<td>7.07</td>
<td>2.5</td>
</tr>
<tr>
<td>Level of services received</td>
<td>3.32</td>
<td>1.6</td>
</tr>
<tr>
<td>The gap between the services received and the users’ minimum expectations</td>
<td>-0.10</td>
<td>-</td>
</tr>
<tr>
<td>The gap between the services received and the users’ maximum expectations</td>
<td>-3.75</td>
<td>-</td>
</tr>
<tr>
<td>Library as a place</td>
<td>Users’ minimum expectations</td>
<td>3.31</td>
</tr>
<tr>
<td>Users’ maximum expectations</td>
<td>6.99</td>
<td>2.5</td>
</tr>
<tr>
<td>Level of services received</td>
<td>3.90</td>
<td>1.9</td>
</tr>
<tr>
<td>The gap between the services received and the users’ minimum expectations</td>
<td>0.60</td>
<td>-</td>
</tr>
<tr>
<td>The gap between the services received and the users’ maximum expectations</td>
<td>-3.08</td>
<td>-</td>
</tr>
<tr>
<td>Information control</td>
<td>Users’ minimum expectations</td>
<td>3.34</td>
</tr>
<tr>
<td>Users’ maximum expectations</td>
<td>7.44</td>
<td>2.6</td>
</tr>
<tr>
<td>Level of services received</td>
<td>3.43</td>
<td>1.7</td>
</tr>
<tr>
<td>The gap between the services received and the users’ minimum expectations</td>
<td>0.09</td>
<td>-</td>
</tr>
<tr>
<td>The gap between the services received and the users’ maximum expectations</td>
<td>-4.01</td>
<td>-</td>
</tr>
<tr>
<td>Total evaluation of libraries services dimensions</td>
<td>Users' minimum expectations</td>
<td>3.36</td>
</tr>
<tr>
<td></td>
<td>Users' maximum expectations</td>
<td>7.17</td>
</tr>
<tr>
<td></td>
<td>Level of services received</td>
<td>3.52</td>
</tr>
<tr>
<td></td>
<td>The gap between the services received and the users' minimum expectations</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>The gap between the services received and the users' maximum expectations</td>
<td>-3.65</td>
</tr>
</tbody>
</table>

**Table 2:** Paired samples t-test of service dimensions and total evaluation of service quality in libraries of AJA University of Medical Sciences

<table>
<thead>
<tr>
<th>Dimensions of Services</th>
<th>Levels of Services</th>
<th>Paired differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Libraries</td>
<td>Mean and standard deviation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Users' perception of services</td>
<td>The services received and the users' minimum expectations</td>
<td>Medical school</td>
</tr>
<tr>
<td></td>
<td>Nursing school</td>
<td>12.66±2.54</td>
</tr>
<tr>
<td></td>
<td>Dentistry school</td>
<td>14.88±2.66</td>
</tr>
<tr>
<td></td>
<td>The services received and the users' maximum expectations</td>
<td>Medical school</td>
</tr>
<tr>
<td></td>
<td>Nursing school</td>
<td>13.72±34.69</td>
</tr>
<tr>
<td></td>
<td>Dentistry school</td>
<td>14.75±31.66</td>
</tr>
<tr>
<td>Library as a place</td>
<td>The services received and the users' minimum expectations</td>
<td>Medical school</td>
</tr>
<tr>
<td></td>
<td>Nursing school</td>
<td>5.74±2.09</td>
</tr>
<tr>
<td></td>
<td>Dentistry school</td>
<td>5.88±5.50</td>
</tr>
<tr>
<td></td>
<td>The services received and the users' maximum expectations</td>
<td>Medical school</td>
</tr>
<tr>
<td></td>
<td>Nursing school</td>
<td>6.83±19.43</td>
</tr>
<tr>
<td></td>
<td>Dentistry school</td>
<td>9.45±17.75</td>
</tr>
</tbody>
</table>
services within the dimension of ‘user’s perception of service’ of libraries in AJA University of Medical Sciences. P-values of the medical school library, the library of the school of nursing, and the library of the school of dentistry were 0.39, 0.14, and 0.55 respectively. However, there were statistically significant differences between the mean of users’ maximum expectations level and perceived services within the dimension of ‘user’s perception of service’ in the libraries in AJA University of Medical Sciences (P<0.001 for all three libraries).

Third question: Are there statistically significant differences between the users’ minimum expectations, the level of services received, and the users’ maximum expectations in the dimension of ‘library as a place’ in each library at AJA University of Medical Sciences?

According to the data given in Table 1, within the dimension of ‘library as a place’, the mean of services received in the three libraries (the medical school, the school of nursing, and the school of dentistry) is higher than the mean of the users’ minimum expectations (3.90, 3.75, and 4.01 respectively). However, the mean of services received in the libraries is less than the mean of the users’ maximum expectations. According to the t-test in Table 2, there are statistically significant differences between the means of services received and users’ maximum and minimum expectations. P-values of the mean of services received and the minimum expectations in the medical school library, the library of the school of nursing, and the library of the school of dentistry were less than 0.001, 0.009, and 0.008 respectively.

Fourth question: Are there statistically significant differences between the users’ minimum expectations, the level of services received, and the users’ maximum expectations in the dimension of ‘information control’ in each library in AJA University of Medical Sciences?

On measuring the dimension of ‘information control’ in services of medical
and dentistry libraries from the users’ viewpoint, the mean of services received was found to be higher than the mean of users’ minimum expectations (3.43 and 3.61 respectively). The mean of services received in the library of the school of dentistry was higher than that of other libraries (3.61). In the library of the school of nursing, the gap between the mean of services received and the mean of users’ minimum expectations is negative (−0.25). The means of services received in three libraries are less than the mean of users’ maximum expectations (Table 1). According to the t-test result shown in Table 2, there are no statistically significant differences between the means of users’ minimum expectations level and perceived services within the dimension of ‘information control’ in the libraries at AJA University of Medical Sciences (the medical school library: 0.43; nursing school: 0.15; and dentistry school: 0.37). However, there were statistically significant differences between the mean of users’ maximum expectations level and perceived services within the dimension of ‘information control’ in libraries in AJA University of Medical Sciences (P<0.05).

**Fifth question:** In general, is there a statistically significant difference in terms of service quality among the libraries of the AJA University of Medical Sciences?

The ANOVA test was used to answer this question. The data from the analysis of the variance test in Table 3 shows that at the 0.05 level of significance, there is no statistically significant difference in terms of service quality among the libraries of the AJA University of Medical Sciences (F(1,254) =1.8 and P=0.168). Thus, there is no statistically significant relationship between service quality in the libraries of the AJA University of Medical Sciences.

### Table 3: Variance analysis of service quality in libraries of AJA University of Medical Sciences

<table>
<thead>
<tr>
<th>Source of variance</th>
<th>Sum of squares</th>
<th>Degrees of freedom (df)</th>
<th>Mean squares</th>
<th>F-Ratio</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between group</td>
<td>2850.62</td>
<td>2</td>
<td>1425.31</td>
<td>1.8</td>
<td>0.168</td>
</tr>
<tr>
<td>Within group</td>
<td>199941.01</td>
<td>252</td>
<td>793.417</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>202791.63</td>
<td>254</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Discussion and Conclusion**

The results of the study indicate that, based on the general service measurements, the libraries in the AJA University of Medical Sciences are able to meet the users’ minimum expectations. The provision of services with higher than minimum acceptable quality shows that the performance of the mentioned libraries in terms of delivering the services has been relatively successful and the libraries’ users are satisfied with the services, at least at a minimum acceptable level. Also, the results showed that the service quality of libraries in AJA University of Medical Sciences is far less than the users’ maximum expectations level; the libraries could not improve the quality of services to meet the users’ maximum level of expectations. The findings of this study are consistent with those of the studies conducted by Ghaffari and Korani [9], Esfandyari [11], Hariri and Afnani [12], and Hamzavi et al. [13], who also concluded that the quality of current services of libraries in the studied universities is at an average level. Also, in comparison with the findings of international studies, it can be concluded that the quality of services in the libraries investigated in the current study is relatively lower than those in international studies. This positive difference ranges between 0.12 for Lund institute of technology in Sweden [2], 0.46 for medical sciences libraries in the United States [6], 0.48 for Glasgow University [8], and 0.49 for medical sciences libraries in the United States [3]. These differences may be due to some factors such as limited availability of print journals, essential books, and electronic information resources. As the results show, among the libraries investigated in the current study, while the situation of the library of the school of dentistry was better in meeting its users’ expectations, the library of the school
of nursing could not meet the users’ minimum acceptable services. The differences between the means of services received and maximum expectations were negative in all three studied libraries. The findings of other local and international studies also show a negative gap between library services and users’ maximum expectations. However, an important issue is that the gap between services received and the users’ maximum expectations in the studied libraries is too large (−3.65, −3.85, and −3.65). These gaps in some academic libraries in other countries are as follow: −0.85 in the University of Alabama [14], −0.85 in medical sciences libraries in the United States in 2003 [3], and −0.87 in 2004 [5], −0.88 in a study by Gotten in Ohio University [15], −1.8 in the University of Glasgow [8], and −1.18 in Binghamton University [3]. As these findings show, the observed gap in libraries of the university of medical sciences in the current study is larger than those of academic libraries outside Iran. It is worth noting that, in addition to librarians’ training, financial resources dedicated to improving the quality of services in libraries can have an important role in this regard. According to the findings from the second question of the research, the performance of libraries in AJA University of Medical Sciences within the dimension of ‘user’s perception of service’ is acceptable but not excellent. This finding is consistent with the finding of a study conducted by Esfandyari [11] and Hariri and Afnani [12], which indicates that the quality of current services of libraries is at an average level. As the dimension of ‘user’s perception of service’ received mean scores less than other two dimensions, this finding is not consistent with that of the study conducted by Ghaffari and Korani, in which they concluded that the quality of libraries in Kermanshah University of Medical Sciences within the dimension of ‘user’s perception of service’ is better than in the other two dimensions [9]. If we consider studies conducted outside Iran, the findings of the current study are consistent with studies conducted by Hitchingham and Kenney [16], Probst [7], and the Association of Research Libraries [3,6,8]. This could be due to the special circumstances of students living in the dormitory, which leads to a better evaluation of the library as a place for study. The performance of the library of the school of dentistry within the dimension of ‘information control’ is better than the other two libraries. The results of the t-test show that while there is no statistically significant difference between the mean of services received and the mean of users’ minimum expectations, the difference between the mean of services received and the mean of users’ maximum expectations is statistically significant. Though these findings are consistent with those of a study conducted by Esfandyari [11], they are not consistent with the results of studies conducted by Mohammadbeigy and Hasanzadeh [17], Hariri and Afnani [12], Hashemian, Alemokhtar, and Hasanzadeh [19], and Mardani and Moghaddam [10]. If we consider studies conducted outside Iran, the findings of the current study are consistent with studies conducted by Hitchingham and Kenney [16], Probst [7], and the Association of Research Libraries [3,6,8]. In this context, the most important aspect would be to create motivations for librarians by implementing appropriate practices and general courses to create a participatory system that leads to creativeness and improvement, which in turn help satisfy the expectations of users in this area. The performance of the libraries in AJA University of Medical Sciences in the dimension of ‘library as a place’ is better than other two dimensions, since these libraries could provide their current services at a higher quality level than the users’ minimum expectations. Furthermore, while the findings of the current study are consistent with those of the studies conducted by Esfandyari [11], Mohammadbeigy, and Hasanzadeh [17], and Tahmasebi & Nooshinfard [18], they are not consistent with those of studies conducted by Ghaffari and Korani [9], Hariri and Afnani [12], Hashemian, Alemokhtar, and Hasanzadeh [19], and Mardani and Moghaddam [10]. If we consider studies conducted outside Iran, the findings of the current study are consistent with studies conducted by Hitchingham and Kenney [16], Probst [7], and the Association of Research Libraries [3,6,8].
findings of the current study are observed to be consistent with studies conducted by Hitchingham and Kenney [16], Probst [7] and the Association of Research Libraries [3,5,7]. Given that the library of AJA University of Medical Sciences is the only library providing services to medical science students, it should be rich in print and non-print sources. Various studies on domestic and foreign libraries emphasize that libraries should spend most of their budget on financing information sources. However, the current study shows that AJA University of Medical Sciences has not paid much attention to this issue.

The low response rate from female subjects, employees, and faculty members eligible for completing the questionnaire can be considered as a limitation of this study, which may cause difficulty in generalizing the results to all faculty members.

Based on the above, in order to improve the service quality of libraries in AJA University of Medical Sciences, it is recommended that the provision of requirements to increase the accessibility to electronic information resources, preparing the updated print resources in libraries, and the educational programs for librarians to improve the quality of the services, are essential issues which should be considered.

According to our results, in general, the mean of services received in the three libraries of AJA University of Medical Sciences is approximately equal to the users’ minimum expectations and the quality of services in these libraries is acceptable. It is hoped that by providing the required facilities according to users’ expectations and needs, the libraries can provide better services to students. Also, the important role of human relations in improving the quality of services makes librarians’ training programmes more essential.

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Conflict of interest

We have no financial interests related to the material in the manuscript. Also, we have no conflicts of interest.

This manuscript has not been previously published or submitted. No other papers using the same data set have been published. All authors listed have contributed sufficiently to the study to be included as authors, and all those who are qualified to be authors are listed as authors.

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Author’s Contribution

Mohammadimehr M and Hashemi SM conceived the study and developed the methods. Shayesteh MA and Zargar Balaye Jame S collected the data. Zargar Balaye Jame S and Mohammadimehr M analysed the data. Hashemi SM wrote the first draft of the manuscript. All of the authors contributed to the revision of the manuscript and have read and approved the final version.

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ارائه مدل و ارزیابی سیستم پیشنهاددهنده سازوکارهای هوشمندسازی مدارس

چکیده

مدیره: امروزه هوشمندسازی مدارس به واسطه پیاده‌سازی و اجرای سیستم‌های هوشمند، پیشرفت‌هایی چشمگیری داشته است. نوآوری و تحول‌هایی که سیستم‌های مناسب، نقش عمده‌ای در میزان موفقیت مخاطبان آموزشی گوناگون دارد. مدیران مدارس نیز به نیاز به سیستم‌های هوشمندسازی مدارس با توجه به آن بازده فراوانی امکان‌های مدرسه خود را ارتقا بخشند. هنگامی که این پژوهش طراحی و سیستم پیشنهاددهنده هوشمندسازی برای کارکردهای در تعيین سطح فعلي آموزش، آزمون‌های روش‌های پیشنهاداتی برای ارتقای سطح کیفی مدارس می‌باشد.

روش: این پژوهش از نوع علم طراحی و توصیفی بیپایشی است. جامعه آماری آن نفراتی است که به جامعه آماری اماکن آموزشی شامل کلاس‌های مختلف مدارس کشور. در هدف پژوهش، مطالعات پیشین مربوط به معیارهای مؤثر در هوشمندسازی مدارس بررسی و دسته‌بندی شد. با استفاده از مدل بلوغ و سایر مدل‌های مؤثر بر کیفیت یادگیری، سوالاتی در مدل‌های شناختی شده رسم شدند. به منظور ارزیابی عملکرد سیستم پیشنهاددهنده، پرسشنامه‌ای بر اساس مدل QUIS تدوین و از طریق آزمون‌های امروزی تهیه و مختل‌های از نظر صاحب نظر و صاحب نظر با استفاده از نرم‌افزار SPSS محاسبه شد. تحلیل داده‌ها با نرم‌افزار IBM SPSS آزمون‌های کلاسمایغوف- اسپسیستوپ دوگانگان انجام شد.

نتایج: نتایج نشان داد که این سیستم برای پیاده‌سازی در راستای ارتقای سطح کیفی هوشمندسازی مدارس در پایان اجرا و باید جزئی از پرویزمانهای این سیستم به دسته‌بندی ویژه‌ای مزایا و ضعای مشابهت سطح نمرات در بازار ارزیابی کد

نتیجه‌گیری: در این پژوهش با توجه به معياريت مورد نياز آموزش، مدل ارائه شده، سیستم خودروی پیشنهاد سازوکارهای هوشمندسازی مدارس طراحی و در نهایت این سیستم پیشنهاددهنده ارتباط شد.
Model Design and Evaluation for Recommender System of Smart Schools Implementation Mechanisms

Fereshteh Motahari, Saeed Rouhani, Mohammad Amin Zare

1MA, IT Engineering, Mehr Alborz Institute of Higher Education, Tehran, Iran
2Assistant Professor, Department of IT Management, Faculty of Management, University of Tehran, Tehran, Iran
3Lecturer, Department of IT Management, Mehr Alborz Institute of Higher Education, Tehran, Iran

ABSTRACT

Introduction: The implementation of smart schools has significantly progressed in current times due to the execution of intelligent systems. School administrators are also seeking the implementation of smart schools so that they can improve their educational process efficiency. The purpose of this research was to design a system recommending smartening mechanisms for use at the current level, and provide recommendations for improving the quality of schools.

Methods: This is a design science and survey research. The surveyed population consisted of experts in implementing smart schools in the country. Based on convenience accidental sampling method, 32 experts were elected. In this study, previous works on effective factors for the implementation of smart schools were reviewed and categorized. Using the e-learning Maturity Model and Capability Maturity Model, some questions were prepared and accordingly, the decision tree was drawn in the identified areas. For proper assessment of performance of the recommender system, a QUIS-based questionnaire was developed and experts’ opinions were collected through it. For greater certainty and assessment of the face and content validity, the relevant opinions were used. The questionnaire’s reliability was calculated using Cronbach’s alpha coefficient (92%). Data analysis was performed using SPSS version 21 and descriptive statistics (mean and SD) as well as inferential statistics (Kolmogorov–Smirnov and Pearson correlation coefficient tests).

Results: The results showed that this system had great potential for improving the implementation quality of smart schools such that the weighted average grades rose above the mean (3.95 to 4.187 of 5) in the assessment.

Conclusion: With regard to the required training criteria, a model was presented and an expert system was designed to recommend mechanisms for implementing smart schools. Finally, this recommender system was evaluated.

Keywords: Artificial Intelligence, Education, Schools, Decision Tree
Introduction
The necessity of using systems recommending mechanisms for implementing smart schools has been proven for updating scientific content and improving the quality of education. In today’s world of rapid growth, an increased volume of knowledge and information, rapid aging of teaching material, and swift change and unpredictability of science necessitates education and e-learning rather than traditional education [1]. In addition, many of the traditional training methods are inefficient and slow and do not have enough power to convey new concepts to learners. It is therefore necessary to use modern tools created by technologies in this field. One of these tools is information and communication technology (ICT), which has offered many services and advances in the field of education and learning [2]. Using new technologies, the Smart School project helps to change the old ways and achieve supreme research-based goals of education [3]. Smartening schools is a new teaching approach, which has resulted in fundamental changes in the teaching-learning process by combining IT and curriculum. In fact, smartening schools is one of the key achievements of IT development in the education sector. This has not only proved effective in the learning environment, but has also been followed by new developments and fundamental reforms in the educational system [4].

Smart School is an e-learning organization designed with the aim of systematic preparation of students to participate in teaching-learning activities and school management. In such schools, providing e-learning services to the students is carried out in-person, and through distance learning. At the same time it maintains a physical environment of a school, teachers, and students, backed by an intelligent educational system and an integrated and comprehensive approach [5]. The Smart School is a system with an almost real position and management based on computer technology, network, and electronic content with an intelligent evaluation system and is different from virtual schools [6].

In Smart Schools, students have access to vast information from the web, and in addition to their teacher, they communicate with other teachers and students. Compared to traditional schools, these schools make more use of information technology. The content is presented in an electronic form and the teacher is a guide. In such schools, the problems of traditional teaching methods and educational problems, such as the lack of computer literacy and information literacy are solved with the help of new technology [4].

Given that each school has various capacities regarding technical infrastructure and equipment, staffing, content, software, etc., an appropriate mechanism should be offered for smartening it. Expert systems are intelligent computer programmes that use knowledge as well as inference and deduction methods to solve problems requiring human skills [7].

The expert system answers questions about specific problems through human deductive inference in knowledge areas where it is specialist. Expert systems must be able to explain their reasoning and conclusion processes for the end users [8]. Due to the ability of expert systems to respond to questions in varying degrees of confidence and the absence of complete information, they are an appropriate tool for use in uncertain conditions or multifaceted environments [9].

A recommender expert system offers appropriate suggestions using the available information and analysing user behaviour and characteristics [10]. Obviously, these systems cannot offer suggestions without having sufficient correct information. Hence, one of the fundamental issues is gathering information on different levels of smart schools. Designing an expert system, which can propose the best and most correct mechanism based on available equipment and facilities in various educational systems, seems necessary. Implementation of expert systems will also provide valuable information...
in making correct decisions about improving the mechanism of implementing smart schools and future planning. The aim of this study was to design a recommender expert system, according to the capacity of each school and provide appropriate smartening mechanisms and suggestions for improving its intelligence level.

Raybad believes that by relying on inductive methods of learning based on training examples, we can build expert systems that are able to work with the most basic knowledge. This knowledge is derived from basic educational examples and the experience gained from collecting new instances during activities. These new examples provide the basis for future learning and generalization steps which are organized as knowledge representation structures [11].

Using batch analysis, Iranmanesh provided software with specifications of expert systems that can break down the big problem of curriculum into several independent problems which involve fewer lessons and professors. In this way, the possibility of using mathematical programming models with reduced constraints and variables is provided [12].

Aram et al. proposed a new approach which develops the knowledge base of an expert system by analysing the electronic problem-solving behaviours of teachers and releases the obtained knowledge. As a result, strict adoption and implementation of the system as a mentor becomes practical for the students and helps them to improve their ability to solve electronic problems [13].

In his study, Aram identified the variables affecting the achievement level of students. Important and influential variables included the General Points Average (GPA), intelligence, learning, and interest. In this study, an expert system was designed after assessing educational progress dimensions. To design the expert system, we needed to identify the aspects of academic achievement assessment. Therefore, four main variables were considered to evaluate the students in this system. VP Export software was used to do the pilot test [14].

Using Bayesian network, Abbasi presented a method for evaluating and analysing the level of understanding, knowledge, and skills of students in solving problems. Using average k clustering algorithm, the students were placed at four levels (students with very weak, weak, medium, and high levels of understanding, knowledge and skills) so as to provide them with appropriate recommendations and reports on the progress of students [15].

Sheikhan Sudani designed a system which provided the student with educational content regarding the student’s learning style and finally designed a test to assess the student’s learning. In order to interact with the student during the training and test, a rule-based expert system was developed in which fuzzy concepts and uncertain factors were used [16].

In his study, Qarabaghi designed an expert system based on nine elements of the Klein Pattern. In this system, the data was first fuzzified and then, the defined rules were entered to the expert system. Defuzzification was done after combining data in the final output system and was used as a basis for judgment [17].

Criteria effective on the recommender system input: were extracted from the literature. The criteria included technical infrastructure and equipment, software, content, human resources, management, and the teaching-learning process. Figure 1 shows the criteria and sub-criteria effective on the recommender system input after confirmation from experts.

Capability Maturity and E-learning Maturity Models: In order to determine the smart levels of schools, two models of e-Learning Maturity and Capability Maturity were used. The Capability Maturity Model is organized in five levels. Multiple sub-criteria are intended at each level of the capability maturity model. It judges the maturity level of the process and introduces key practices or steps required to enhance the functionality or efficiency of the mentioned processes [18]. This model is shown in Figure 2.

E-Learning Maturity Model is in
accordance with the model proposed by Stephen Marshall and Geoff Mitchell [19]. The framework of the e-learning maturity model is given in Table 1. Researchers believe that the Capability Maturity Model and models originating from them can be used in maturity modelling [20,21]. In this study, it was necessary to make some changes to the E-learning Maturity Model to use it. It was thus proportioned...
according to the characteristics of smart schools. The names of the maturity level were selected according to the general names of the Capability Maturity Model. In describing each of the summary and analysis levels of Capability Maturity and E-learning Maturity Models, expert opinions were used. Continuous approach was used to apply the maturity model. In the continuous approach, each process is evaluated separately. Through this approach, it is possible to determine the maturity level for each process and compare the processes of a school with other schools. Based on the raised discussions, the following questions are considered:

1. What smartening solutions should be taken for each school?
2. What are the main criteria for implementing smart schools?
3. What are the various solutions for implementing smart schools based on their attributes?
4. Which model can be used to design the expert system recommending mechanisms for smartening up schools?

**Methods**

This is an applied research due to its goal. This study was conducted in two research and operational phases. Therefore, this is a descriptive survey. The Delphi method was used to confirm the system input criteria. This research is quantitative-experimental regarding data analysis.

Cluster sampling was done in a completely random manner from 16 school districts active in the implementation of smart schools. The selected people included a manager and an expert from each district. The population included 32 people who were selected because of their familiarity with the concept of smartening as well as being involved in the implementation of smart schools.

Sampling method was targeted judgment. The research sample in the evaluation and validation part of the recommender expert system consisted of 32 experts out of whom 66% were male and 34% were female. About 25% had doctoral degrees, 41% held master’s degrees, and 34% had a bachelor’s degree. For data collection, library methods such as books, valid scientific papers, and non-library methods like interviews with experts, distribution and analysis of questionnaires were used.

The research process was as follows with the study of internal and external documents and records related to the research and interviews with experts. The sets of criteria were defined in six categories of technical infrastructure and facilities, software, content, human resources, management, and teaching-learning processes. The questionnaire was used for evaluation and validation of the recommender expert system. The designed questionnaire was based on the QUIS model. For insuring the validity of the measurement instrument and assessing the content and face validity, opinions of the relevant experts were used. The reliability of the questionnaire was determined as 92% by calculating Cronbach’s alpha.

In order to analyse the research data, descriptive statistics (mean and SD) and inferential statistics (Kolmogorov–Smirnov and Pearson correlation coefficient) were used in the significance level of 0.05 using SPSS version 21.

**Systemic model:** A systemic model of this study involved the preparation and extraction of raw knowledge, design, and production of the recommender system and user interface. The architecture of the recommender system

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad hoc processes</td>
<td>Initial</td>
</tr>
<tr>
<td>Obvious subject for e-learning</td>
<td>Repeatable</td>
</tr>
<tr>
<td>Processes for development</td>
<td>Defined</td>
</tr>
<tr>
<td>Quality assurance of e-learning resources and student learning outcomes</td>
<td>Managed</td>
</tr>
<tr>
<td>Continuous improvement</td>
<td>Optimized</td>
</tr>
</tbody>
</table>
is shown in Figure 3.

Extracting knowledge includes the processes of acquisition, organization, and claiming the knowledge of experts as well as library study. The knowledge base and system working memory contain the information obtained in the data acquisition phase and stored in the system using machine language. This knowledge base is generally composed of three main parts: 1) Rules; 2) Statements and 3) Actions.

The required rules were extracted using the decision tree. Statements were created by combining two methods of process maturity level and e-learning maturity level; and operations were done based on the continuous method. In rule-based expert systems, the inference engine determines which law should be implemented by existing facts. Of the two general methods of inference, the leading one was used in this recommender expert system as a problem-solving strategy. The inference engine is a technique through which the expert system solves the problems. Using its own logic and rules, this model determines the maturity level of the school and proposes the mechanisms necessary to enhance the quality level. A major part of the systemic model is engineering knowledge. The main goal of knowledge engineering is extraction and classification of the expert’s knowledge so as to apply it effectively and efficiently to the expert system.

System Evaluation and Validation Model: The Evaluation and Validation Model of the recommender expert system was a questionnaire based on the QUIS model which used the comments of experts. The questionnaire consisted of two parts: the first part included demographic information and the second part included questions for measuring users’ satisfaction of interacting with the recommender expert system based on QUIS standard model [22] as a valid instrument for the assessment and validation of this system. Twenty six questions were designed, six of which were in the first part and the rest in the second part. The questions designed in the second part were placed in the following four categories:

1. General response of the users (five questions)
2. Information display (six questions)
3. Recommender system guide (five questions)
4. Features and capabilities of the recommender system (four questions)

Building the recommender expert system: in order to complete the recommender expert system, the rules on which this system is based must be defined. The decision tree was used to extract the rules. A decision tree is a tree where

![Figure 3: Systemic model](image-url)
the samples are classified in such a way that they grow downwards from the roots and eventually reach the leaf nodes. Each internal or non-leaf node is identified with a characteristic feature. This feature raises a question in relation to the proposed expert system. Based on the Capability Maturity Model and E-learning Maturity Model of the decision tree, the input was separately drawn for six influential criteria. X1 to X6 values were respectively obtained for each of these criteria, including infrastructure and equipment, software, content, human resources, management, and teaching-learning process. To extract the rules of the decision tree based on the continuous approach, the average of selected options was used. In the continuous approach, each process is separately evaluated and it is possible to determine the maturity level for each process. It is also possible to compare the processes of a school with other schools. Around 274 rules were obtained through the decision tree.

The recommender expert system was designed using the programming language Visual Web Developer Express. This programming language is considered as one of the most popular tools provided by Microsoft as a simpler alternative to the full version Visual Studio. In this recommender expert system, six main variables of X1 to X6 and an X_Total variable were defined as the main variables of the programme such that the obtained variables at any level are placed in them. All rules extracted from the decision tree were codified in the Visual Web Developer Express software. These rules were written as follows.

If (condition 1), then

Operation 1

End If

The expert system implemented the intended rule based on the question answered by the user. The obtained level was determined based on the criteria of technical infrastructure and equipment, software, content, human resources, management, and teaching-learning process. Based on the obtained levels, the general level of the school is obtained by the following formula

School level=(school level in terms of technical infrastructure and equipment + school level in terms of software + school level in terms of content + school level in terms of human resources + school level in terms of management + school level in terms of learning–teaching process)/6.

School smartness level is displayed on the dashboard in the recommender expert system output. Finally, decision tree and the values obtained in each criterion are determined separately. The next coding step includes providing smartening mechanisms. At this stage, the user will receive the mechanisms to promote smartening level by the system after understanding the smartness level of his school. By determining the level of each criterion, the mechanisms that will promote the level of that criterion will be recommended by the system to the user. The user can then be promoted to the next level by observing the proposed mechanisms. After displaying the mechanisms, the user can print the list of solutions in each of the mentioned criteria by selecting the print option. Figure 4 shows a view of the proposed expert system. This system is developed according to the decision tree, which has five levels (based on five criteria) and each level has five stages (based on Capability Maturity Model). The combinations of those criteria and these maturity stages have produced 274 rules (R₁, ..., Rₙ).

Results

To test the normality of the assessment variables, the Kolmogorov–Smirnoff test was used. The test results showed that the significance level is larger than 0.05. Hence, all criteria are normally distributed. The results are shown in Table 2.

To investigate the correlation between the expert system evaluation criteria, the significance level of each criterion was calculated separately with other criteria at 0.05. The results showed that the correlation coefficient between criteria had a probability less than the significance level of 0.05. So, there is a significant positive correlation
between these criteria. Correlation between the criteria was calculated using Pearson correlation coefficient and the results are shown in Table 3.

The weighted average of evaluation criteria was calculated separately. The weighted average of the criteria in order of importance included the information display, recommender system guide, features and functionalities of the recommender system, and general response of the users. Figure 5 shows the weighted average of the evaluation criteria of the recommender expert system.

The analysis results are summarized in Figure 6. On the one hand, the average scores of each criterion and on the other hand, the relationships between criteria are shown. As specified, the correlation coefficient between the studied criteria is positive and significant at the level of 0.05. Results of the assessment of the recommender system showed that all indicators of the designed system have gained an above average score.
Discussion and Conclusion

Today, the rapid progress of information technology and e-learning has resulted in an increasing smartening of schools. It is evident that providing the mechanisms effective in implementing smart schools is essential. In this study, with regard to the required educational criteria, an expert system has been designed which can offer mechanisms for implementing smart schools.

The study of the criteria for smartening schools in different scientific sources and recent research has been case specific and sporadic. Abdul Wahabi et al. investigated the criteria effective in smartening schools regarding attitude, culture, management, financial resources, performance, and computer literacy [3]. Khezrlu studied the criteria of technical infrastructure and equipment, and teaching-learning process [23]. KeOng et al. also examined the technical infrastructure and equipment, software, and human resources [24].

In this study, after a careful study and collection of all criteria effective in implementing smart schools, some criteria were selected as the input of the system recommending solutions. The criteria...
included six main criteria and 14 sub-criteria which were extracted from the literature and expert opinions and considered as the input of the expert system. The main criteria included technical infrastructure and equipment, software, content, human resources, management, and teaching-learning process.

In this study, a multi-level maturity model has been suggested and customized for the classification of smart schools. This has added new criteria to the research literature. The model includes the initial, repeatable, defined, managed, and optimized phases. The criteria of technical infrastructure and equipment, software, content, human resources, management and teaching-learning process were studied in it.

Based on the maturity model, a recommender expert system was designed and implemented. Users of this system are the managers or officials of implementing smart schools who will smarten up their school in two separate stages. In the first stage, according to the existing criteria, the current smartness level of the school will be determined. In the second stage, appropriate functional mechanisms will be recommended for promoting the smartness level. In fact, this system greatly helps school administrators and experts in decision-making and functional planning. Then, based on the smartness level of the school, mechanisms to improve smartness levels are recommended by the software. In designing the recommender expert system, the relationship between the user and the system has been considered as the relationship between the user and the expert. In other words, presentation and exchange of the required smartening information between the expert system and the user are of high power.

To design the recommender expert system, Raybad [11] relied on inductive methods of learning; Abbasi [15] used Bayesian network, Sheikhan Sudani [16] used fuzzy concepts and certainty factor; and Aram [14] made use of VP Export software. In this study, a series of rules were extracted to design the recommender expert system with the use of the decision tree inspired by Capability Maturity and E-Learning Maturity Models and was designed with the programming language Visual Web Developer Express. Compared to previous studies, the most important advantage of this programming language was the online expert system and
its user friendliness.

The system was validated according to the requirements of real users. It was experimentally evaluated and validated by the experts after being designed and placed on the internet. Accordingly, these people gave their opinions by filling a comprehensive questionnaire covering all aspects of this system. Finally, the average weight of each criterion was calculated. Evaluation and validation results showed that this system has high potential and functionality in decision-making and executive planning for implementation of smart schools in the best way possible. According to them, the highest averages respectively included the criteria of information display, recommender system guide, features and functionalities of the recommender system, and the overall response of users.

It is recommended that the implementation of this software should be executed in an educational place, such as a school or an educational institution to determine its applicability level. It is also recommended that future researchers implement the new technologies of the educational system in the recommender expert system because in the new educational system, learning technologies are considered as the main basis of education.

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Conflict of Interest

This research has no potential conflict of interest and did not gain any third party sponsorship.

Author’s contribution

Idea: Dr. Saeed Rouhani; Study concept and Model design: Fereshteh Motahari and Mohammad Amin Zare; System Development: Fereshteh Motahari; Analysis and interpretation of data: Fereshteh Motahari, Mohammad Amin Zare and Dr. Saeed Rouhani. Drafting of the manuscript: Fereshteh Motahari; Critical revision of the manuscript: Fereshteh Motahari and Dr. Saeed Rouhani.

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چکیده

مقدمه: با رشد آموزش الکترونیک در دهه اخیر، جستار در زمینه ارزیابی و استانداردهای آموزش الکترونیکی در جهت بهینه‌سازی و ارتخای تدمیری، این پژوهش با توجه به ضرورت ارزیابی کیفیت در سیستم‌های آموزش الکترونیکی، از دیدگاه فراگیران و با هدف ارزیابی چند بعدی کیفیت دوره‌های آموزش الکترونیکی با رویکرد فراگیر محور انجام شد.

روش: این پژوهش از نظر ماهیت و هدف کاربردی و از نظر روش گردآوری داده‌ها، توصیفی و پیمایشی بود. جامعه آماری کلیه دانشجویان کارشناسی ارشد آموزش الکترونیکی در دانشگاه‌های تهران در سال‌های 97-93 بودند و نمونه، ۲۰۱ نفر از این دانشجویان در سال ۹۳ بودند که به‌طور تصادفی ساده انتخاب شدند. گزارش‌های ارزیابی شده با بررسی ساختار محقق، برای بررسی عوامل مؤثر بر رضایت فراگیران در دوره‌های آموزش الکترونیکی صورت گرفت. روانی از این با کسب نظرات سه نفر از استادان گروه علوم تربیتی و پایداری، قطعی کردن فراگیران عمدی شد (alpha = 0.81). برای تحلیل داده‌ها از مدل تحلیل سیستم استفاده شد که تأثیرات کلی و ضریب انگشتان و تأثیرات غیر مستقیم اثرات فراگیران، اثر غیرمستقیم بر رضایت فراگیران بررسی و ضمن تحلیل آمار مستقیم مجزا مورد بررسی قرار گرفت. نتایج نشان داد که با در دست داشتن نمرات استاندارد مربوط به متغیرهای تأثیرگذار بر رضایت فراگیران، می‌توان میزان رضایت آن‌ها از کیفیت دوره‌های آموزشی الکترونیکی را برآورد کرده و مدل بین‌بندی پاسخگویی بر ارزش خوبی از داده‌های تایید واقعی داشته است.
Multi-dimensional Quality Evaluation Modelling of E-learning Courses from Learners’ Perspective

Bahman Saeidi Pour1, Hanieh Shahsavari2

1Assistant Professor, PhD of Educational Administration, Department of Educational Science, Tehran Payame Noor University, Tehran, Iran
2PhD Student of Planning for Distance Education, Department of Educational Science, Tehran Payame Noor University, Tehran, Iran

ABSTRACT

Introduction: With the growth of e-learning in recent decades, research on the evaluation of e-learning standards sought to optimize and make e-learning effective. This study was conducted on the necessity of quality evaluation of e-learning systems from the learner’s perspective, having the purpose of multi-dimensional quality evaluation modelling of e-learning courses using learner-based approach.

Method: With respect to nature and purpose, the present study is an applied research, and with respect to the data collection method, it was a descriptive and survey type of research. The population of the study comprised all the students pursuing an MA in e-learning at Tehran University in 2013–14. Samples including 201 [F1] students were selected using a simple random method in 2014. Data was collected using a researcher-made questionnaire to analyse the factors that influence the satisfaction of learners in e-learning courses. The questionnaire was validated by three professors of Education Sciences, while stability achieved using the Chronbach’s alpha method (α=81%). To analyse data the path analysis model was used. The dominant influential components of learners’ satisfaction were introduced, and a causal model was designed. The influential factors for learners’ satisfaction and the factors’ impact on the dependent variables were analysed. Finally, the suggestive fitting model was measured using Lisrel software version 8.5.

Results: According to the obtained fitting indexes for the components, the indexes were very appropriate. The relationship between variables in the model of learners’ satisfaction represented the significance of the relationship between the factor (learners’ satisfaction) and latent variables (first-grade factors) at the level of 0.01%.

Conclusion: The results showed that, based on standard scores related to the variables that influence learners’ satisfaction, it is possible to estimate learners’ satisfaction with e-learning using a good-fitting model and real-world data.

Keywords: Modelling, Quality, Evaluation, E-learning Courses, Learner approach

*Corresponding author: Hanieh Shahsavari, PhD Student of Planning for Distance Education, Department of Educational Science, Tehran Payame Noor University, Tehran, Iran. Email: hanieh.shahsavari@gmail.com

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Introduction

E-learning is considered a new method in modern education, and application of e-learning systems has increased over the years. However, the rate of failure in these courses is significant at the same time. Nevertheless, there is little information as to why users leave e-learning courses. There are many studies to ensure the quality of e-learning courses, but only a small number of these studies analyse the quality of such education from the learners’ perspective. In fact, the increasing use of the internet as a platform for rapid delivery of information, the increasing importance of distance education due to spatial limitations, and the individual process of education have prompted universities to use their resources in creating e-learning courses. On the other hand, continuously developing e-learning systems has become a challenging task for those who offer such courses [1].

The quality of e-learning courses should be created with cooperation of learners and the providers of these courses at the time of teaching and learning in an electronic environment [2]. Therefore, the views of learners regarding the quality of e-learning courses and correct understanding of the courses with definitions should be ensured. Unfortunately or fortunately, however, quality is a value-based concept that might be defined differently by different beneficiaries [3]. For example, governors may evaluate the quality of e-learning courses based on the results of their socio-economic benefits, while educational institutions that offer these courses might be more interested in managing strategies, analysis of expenses, benefits, learners’ satisfaction, course completion, the rate of graduation, as well as training regarding different aspects of teaching. Though the views of the different beneficiaries of e-learning courses are valuable, understanding learners’ views is just as important, since learners are the main beneficiaries of every type of education including e-learning [4]. The quality of e-learning courses is a complex and multi-dimensional topic, and due to the differences of this type of teaching from traditional face-to-face education, the quality of these courses should be evaluated using specific and standard criteria [5]. E-learning course components include factors such as asynchrony of interactions, access to wide scientific resources, learners’ needs for consultation and support, motivation, interaction, cooperation, and learners’ stronger commitment compared to the traditional education system, which makes measurement and ensuring quality a difficult task [6].

On the other hand, scientists believe that many institutions offering e-learning courses fail to reach their main purpose, i.e., learning; therefore, quality evaluation, analysis, and promoting e-learning courses should be their main goals [7]. In the process of development and enriching e-learning, there should be a clear theoretical framework for designing and performing this type of education. In fact, the best strategy is to have a wide approach, which means that learners’ requirements should be processed precisely as determined assumptions during or prior to designing any e-learning, so that the development of e-learning should be directed towards learners’ needs and preferences. But orientation to e-learning needs a stronger conceptual framework of e-learning systems. In this respect, two purposes are considered—investigating the dimensions of an e-learning system and learners’ satisfaction. Thus, the present paper investigates the dimensions and influential components of the quality and efficacy of e-learning courses that result in learners’ satisfaction and provides a comprehensive complementary theoretical framework.

“Guaranteeing quality in higher education is not possible without evaluating it.” Providing a relatively complete definition of evaluation, Kiamanesh defines it as “the process of collecting and systematic interpretation of evidences which finally results in a value judgment expecting a specific activity.” This definition includes four key
elements. The first element is systematicity, which represents a degree of attention and programming for data collection. The second element is the interpretation of evidences, while the third is evaluating a value that promotes the evaluation of descriptive amount. The fourth element—“expecting a specific action”—indicates that evaluation is conscious in order to achieve something in the future [8]. Especially in higher education, evaluation could include student evaluation, faculty membership, lesson planning, as well as other general inputs and processes of educational system such as e-learning. In addition, evaluation helps in supervising the quality of applying each process so as to use the output evaluation guide in a proper direction. Therefore, using evaluation, it is possible to provide valuable information about social profit, the appropriateness and efficacy of a process, product, or a programme like e-learning in order to offer suggestions for action and to rationalize decision-making. However, the most important purpose of evaluation in higher education is to help to improve and reinforce university education quality and, as planners believe, modifying the university system is a necessary and inevitable matter [9]. Therefore, to analyse the quality of e-learning in higher education, it is possible to use evaluation in order to improve e-learning and guarantee its quality. Regarding the quality and codification of standards for quality evaluation, it is possible to reach an agreement that this issue is not possible simply due to differences in variables that interfere in education. In addition, in many cases there is no agreement on such variables. Many influential factors of education are not known, but such factors should not lead to a neglect of the codification of related standards [10].

E-learning creates grounds, concepts, and new subjects that are different from traditional learning environments. This form of learning occurs in a wide range of technology-based activities comprising different forms of learning and teaching that are distinct from traditional environments. Therefore, evaluating e-learning programmes in the case of online learning and teaching is necessary and inevitable.

Satisfaction is a condition of content or pleasure, such as when a person performs a job or acquires something that is suitable to him/her. In the literature, satisfaction refers to a set of personal understandings or views towards factors that influence a specific condition [11]. In respect of mutual relationship between human beings and computers, satisfaction or pleasure of the user can be defined by reflecting on the effects of mutual interaction [12]. It means that the user’s satisfaction is a perceptual set in the result of experiences related to such interactions formed by elements and influential factors [13]. In the case of the pleasure and satisfaction of an e-learning user, it is used for reflecting on the form of comparison in line with the dimensions and needs of that course or lessons [14].

Quality in the field of e-learning includes the designing experiences of e-learning, implicit experiences of learners, and criteria for learning outcomes. Many studies dealt with ensuring the quality of e-learning courses, but a limited number of these studies investigated the quality of this type of education from the learners’ point of view. Most of these works studied the quality of e-learning courses from the view of the course providers, evaluators, governments, and experts [4]. Therefore, it is necessary that with the growing popularity of such courses, dimensions of quality evaluation be processed entirely on the basis of comprehensive studies with a rich conceptual framework. In the past, many researchers trying to measure users’ satisfaction showed that this structure is a complex one and that their components can be discussed from a broader perspective. Before 1980, users’ satisfaction was discussed using terms such as visual attraction, efficacy, and effectivity [15], but from the beginning of 1980s many e-learning researchers started their systematic studies to find a wide set of factors necessary for users’ satisfaction. For example, Pearson and Baily created
a tool with 39 components to measure users’ satisfaction with e-learning courses. Elson, Barodi, and Ayouz suggested a tool that entitles users’ satisfaction information composed of three sections—electronic processing of information, staff, and services [16]. Dal and Turkzadeh designed a questionnaire using 18 components in the form of 5 main frameworks—system content, system efficacy, form of reports, simple application, and time limitations of system—to measure the rate of final user’s satisfaction [17]. To a great extent, new scales that were codified in the previous decades were based on the stated components. In fact, the application of e-learning courses was along with development in creation of scales for measuring learners’ satisfaction with these courses that is itself taken from the scales of teaching quality regarding educational psychology. Anyway, the result was not sufficient because each of these scales lacked important aspects of general satisfaction with e-learning. According to Arbagh, the main factors for learners’ satisfaction with e-learning courses include application and efficacy, simple application, flexibility interaction with other learners, and the type of applied technology [18].

In this regard, Pisoli posited the following factors as the main factors for satisfaction—completeness, motivation, simplicity of application, attitude towards technology, anxiety related to computer/technology, ethical beliefs, technology control and its type, self-efficacy, accessibility, mentality and objective, quality, stability, and frequent application [19]. MacLeaon and Delon discussed success standards of e-learning in the sextet dimensions of system quality, information quality, quality of services, educational tools, learners’ satisfaction, and the advantages and disadvantages of e-learning. Learners’ satisfaction dimension, their general satisfaction, enjoyable experiences, general successes, and suggesting the courses to others were also discussed [20].

The present study aimed to offer a conceptual model to measure the quality of e-learning courses from the learners’ perspective. Accordingly, a comprehensive model involving a number of dimensions regarding the evaluation of e-learning courses from the point of view of learners is proposed. The present study provides a synthesized model comprising seven main dimensions and 30 components related to it (Figure 1).

The first dimension (learner) consisted of three main components—basic knowledge of computer, self-efficacy in using the internet, and the possibility of controlling the learning process.

The second dimension (educational features) comprised timely delivery of sufficient content, proper timing, order and sequence, diversity in the methods of offering subjects, motivation, evaluation, and rapid feedback to learners.

The third dimension included interaction and establishing communication—learners’ interaction with each other, learners’ interaction with teachers and other providers of courses, formation of discussion, discourse sessions, and flexibilities of interactions regarding temporal and spatial dimensions.

The fourth dimension (supporting) included the following—responsibility and accessibility of teachers and providers of the courses, consultation and support, transparency, clarity about the course structure and its purposes, appropriate support and services with respect to the needs of learners, and features of the course.

The fifth dimension (technology) comprised technological quality of the offered period, variety of media, simple application, accessibility, efficacy, feedback, and technological coordination with the purpose of the course.

The sixth dimension included the application of different methods for measurement and evaluation, consideration of speed conditions in applying the results of evaluation for modification, and completing processes and transparency in informing and reporting in this area.

The seventh dimension (management) involved managers’ commitment to providing
Learner
1. Basic knowledge of computer,
2. Self-efficacy in using internet and
3. Possibility of controlling the learning process.

Management
1. Manager’s commitment to providing a learning environment,
2. Creating conditions of evaluation and supervising and
3. Continuous improving of learners’ and workers’ satisfaction,
4. Modification of performance in this area and finally financial supply of the courses of e-learning.

Evaluation
1. Application of different methods for measurement and evaluation,
2. Consideration of speed condition in applying results of evaluation for modification and
3. Completing processes and transparency in informing and reporting

Technology
1. Technological quality of the offered period,
2. Variety of media
3. Simple application
4. Accessibility,
5. Efficacy,
6. Feedback and
7. Offered technological coordination with expected purpose of the course

Interaction and establishing communication
1. Learners’ interaction with each other,
2. Learners’ interaction with teachers and other providers of the courses,
3. Formation of discussion and
4. Discourse sessions and flexibilities of interactions regarding temporal and spatial dimensions.

Supporting
1. Responsibility and accessibility of teachers and providers of the courses,
2. Consultation and support,
3. Transparency and clearness about structure of the course and its purposes,
4. Appropriate support and services with the needs of learners and features of the course.

Educational features
1. Timely and sufficient content,
2. Proper timing,
3. Order and sequences,
4. Diversity in the methods of offering subjects,
5. Motivating purposes,
6. Evaluation and rapid feedback to the learner.

Figure 1: Basic model for learners’ satisfaction
a learning environment, creating conditions of evaluation, continuous improvement of learners’ and workers’ satisfaction, modification of performance in this area, and investment in the e-learning courses.

After reviewing studies regarding the evaluation of e-learning courses from the learners’ point of view, the most important research hypotheses were codified as follows:

1. Learners’ features influence their satisfaction with e-learning courses.
2. Educational features of the course influence learners’ satisfaction with e-learning courses.
3. Interaction and communication influence learners’ satisfaction with e-learning courses.
4. Support influences learners’ satisfaction with e-learning courses.
5. Application of technology influences learners’ satisfaction with e-learning courses.
7. Management influences learners’ satisfaction with e-learning courses.

Methods

In terms of its nature and purpose, this research is an applied research; in terms of the data collection method, it is a descriptive and survey study. The population of the study comprises 420 students pursuing an MA in e-learning at Tehran University in the academic year 2013–14. To specify the sample size, Cochran’s formula was used and in 95% confident and P-value 5%. The sample consisted of 201 students. For data collection, the researcher prepared questionnaires with 32 items that covered the seven dimensions and components of the proposed model regarding the evaluation of e-learning courses from the learners’ perspective. After analysing content validity, an approval factorial analysis was administered to analyse the structural validity, and the stability of the questionnaire was determined using Cronbach’s alpha.

To measure content validity, three professors of educational sciences checked the primary questionnaire, and necessary modifications were done according to their ideas, so that the questionnaire was able to specify 73% of variances for research variables. The results of the application of factorial analysis for estimating structural validity showed that the structure of the seven factors regarding differentiation between questions and correspondence with principles was appropriate. To specify stability of the questionnaire, Cronbach’s alpha using SPSS 16.0 was used. The result of Cronbach’s alpha for the questionnaire was 81%.

Data was acquired from answers of respondents to the quality of e-learning courses that were designed according to a five-point Likert scale, and then the data was analysed using LISREL software version 8.5 and SPSS 16.0. Based on the coefficients and assumed structural relationships, the suggested pattern was tested. The path analysis used in the research is a generalization of ordinary regression that can represent direct, indirect, and general impacts of each independent variable on the dependent variables and interpret relationships and correlations between them using a logical reason.

Results

Figure 2 shows the result of the approval factorial analysis; the seven-factor pattern of the structure for learners’ satisfaction with e-learning courses includes application of technology, educational features of the course, evaluation, support, interaction, learner management, and appropriate fitting.

In the factorial matrix each column represents one factor. The values of each column stand for the factorial load of each variable with one factor. The value of the special load of each factor is the determined variance equal to its square factorial load (E: Eigen value).

In second-grade approval factorial analysis the latent variable was learners’ satisfaction. The items (Pers: Perspective components) for each of the variables were represented in the following diagram:

Applying technology (7 items), items of educational features of the course (6 items), evaluating items (3 items), supporting items (4...
items), interaction items (4 items), management items (4 items), and user items (4 items). The latent variables of learners’ satisfaction were used in the approval factorial analysis.

According to Figure 2, the items of latent variables in the first-order factorial analysis were significant and fitting indexes approved such a significant. Relationships between variables in the model of learners’ satisfaction represent the rate and significance of the relationships between the factor (learners’ satisfaction) and its latent variables (first-order factors).

Table 1 shows the fitting index of the research model. Most of the indexes in this table represent appropriate fitting of the main model of the study. Since the X2 test as a fitting statistic is sensitive to the sample size, the test is significant when the sample size is greater.

Different researchers have considered using the following fitting indexes of the model, such as RMSEA: The Root Mean Square Error of Approximation less than 0.08, CFI: Comparative Fit Index, GFI: Goodness of Fit Index, and Adjusted Goodness-of-Fit Index: AGFI greater or less than 0.90 as the sign of fitting. Therefore, due to the fitting index for

<table>
<thead>
<tr>
<th>Fitting wellness index</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMIN/DF (less than 0.05)</td>
<td>3.43</td>
</tr>
<tr>
<td>P (less than 0.05)</td>
<td>0.116</td>
</tr>
<tr>
<td>(Chi Square) (less than 0.03)</td>
<td>1779.605</td>
</tr>
<tr>
<td>CFI (more than 0.9)</td>
<td>0.789</td>
</tr>
<tr>
<td>NFI (more than 0.9)</td>
<td>0.881</td>
</tr>
<tr>
<td>GFI (more than 0.9)</td>
<td>0.846</td>
</tr>
<tr>
<td>RMSEA (less than 0.08)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

![Diagram of second-order approval factorial analysis of the model for learners’ satisfaction](image-url)
each component, the indexes generally benefit from proper appropriateness.

Table 2 shows that all the paths of the research model are significant, because the criteria for significance of these paths are less than the threshold of 0.001 with 99% confidence. Moreover, we can conclude that all the research hypotheses were approved.

**Discussion and Conclusion**

The purpose of this study is the dimensional evaluation modelling of e-learning courses using a learner-based approach. Our findings showed that the paths of the research model were approved. It means that with access to standard scores related to influential variables on learners’ satisfaction, it is possible to evaluate their satisfaction from the courses of e-learning and the proposed model had a proper fitting with real-world data.

Though the discussed dimensions and their components were previously proposed individually in different studies in the area of systems such as information, psychology, and education, they are considered the most important e-learning variables. However, the general consideration of the influential factors from one learner’s perspective obliged the researcher to use a complementary approach for analysis of influential factors that influence learners’ satisfaction with a system of e-learning.

The potential benefits of quality standards of the course included the experience of better learning, satisfaction, and more educational growth of learners, though e-learning is yet to be generally accepted to support the standards of quality [21]. The codified standards lack sufficient details to be used as specific indexes of quality [22]. But according to the results of the study and testing hypotheses, there was a significant relationship between learners’ satisfaction and all the seven components including features of the course, characteristics of learners, interaction and communication, support, technology application, evaluation, and management in the conceptual framework of the study. However, by linking the results of the present study with the results of previous studies, it is possible to test the results and support them.

According to Pisoli, the main factors in this area include completion, motivation, simple usage, attitude towards technology, anxiety related to computer/technology, ethical beliefs, controlling technology, in addition to self-efficacy, accessibility, mentality or objectivism, quality, stability, and frequent application [19]. On the other hand, Arbagh considered factors including flexibility of media, practicality and effectiveness, variety of media, instructors’ previous experiences, direct and straight virtual behaviours, and interactions [20]. Hang and Holton considered factors that included gender, age, learning style, basic computer knowledge, cooperation with instructors, cooperation with other learners, activities related to educational courses, and

<table>
<thead>
<tr>
<th>Table 2: Path coefficients of the research model</th>
<th>Standard coefficient</th>
<th>Hypothesis</th>
<th>SE</th>
<th>Critical ratio C.R.</th>
<th>P value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learners' satisfaction &lt;--- application of technology</td>
<td>0.395</td>
<td>H1</td>
<td>0.148</td>
<td>3.551</td>
<td>***</td>
<td>Approved</td>
</tr>
<tr>
<td>Learners' satisfaction &lt;--- learner</td>
<td>0.494</td>
<td>H2</td>
<td>0.209</td>
<td>4.662</td>
<td>***</td>
<td>Approved</td>
</tr>
<tr>
<td>Learners' satisfaction &lt;--- interaction</td>
<td>0.493</td>
<td>H3</td>
<td>0.150</td>
<td>5.038</td>
<td>***</td>
<td>Approved</td>
</tr>
<tr>
<td>Learners' satisfaction &lt;--- management</td>
<td>0.394</td>
<td>H4</td>
<td>0.067</td>
<td>7.007</td>
<td>***</td>
<td>Approved</td>
</tr>
<tr>
<td>Learners' satisfaction &lt;--- support</td>
<td>0.534</td>
<td>H5</td>
<td>0.067</td>
<td>7.960</td>
<td>***</td>
<td>Approved</td>
</tr>
<tr>
<td>Learners' satisfaction &lt;--- educational features</td>
<td>0.660</td>
<td>H6</td>
<td>0.092</td>
<td>8.746</td>
<td>***</td>
<td>Approved</td>
</tr>
<tr>
<td>Learners' satisfaction &lt;--- Evaluation</td>
<td>0.486</td>
<td>H7</td>
<td>0.085</td>
<td>6.474</td>
<td>***</td>
<td>Approved</td>
</tr>
</tbody>
</table>

***It shows that p is less than 0.001; *SE: standard error
allocated time to each period [21].

Using the seven dimensions as learners’ preferences in e-learning, Ahlerz considered support by course providers, cooperation and interaction, effective technology, costs, expectations and advantages, information transparency related to the course providers, course structure and its transparency, and educational features of the course [2].

Jang studied the seven dimensions of evaluating the quality of e-learning including interaction, staff support, strategies of guaranteeing the quality of institution, informing, activities related to learning, learners’ support, as well as the success of the course and institute [22].

Wang relied on the criteria of evaluating learners through effectiveness of teaching and previous criteria regarding learners’ satisfaction, and performed a study on learners of e-learning courses. The results showed that 17 applicable criteria for measuring and evaluating users’ satisfaction can be classified as follows: personalized content or the personalization of the population of learners and practical. Content dimension includes components including updated, sufficient, proper, and practical information. The second dimension or personalization includes components of controllability of the learning process and the possibility of registering the performance of learners. The third dimension involves the population of learners including simplicity of communication and discourse with other learners or teachers, access to shared information. The fourth item of being practical includes four components of simple application, supporting and helping users, simplicity in receiving and understanding, and performance stability [23]. Research in the area of e-learning systems is an interdisciplinary issue in which researchers with scientific backgrounds in computer, information systems, psychology, education and educational technology for evaluating such systems did their best. It is interesting that previous studies from one to several dimensions were in line with the result of present study. E-learning imparted through the traditional education frameworks aims at a learner-based system that provides many advantages for learners especially in the case of cost, benefit, time, and flexible access to education [7]. E-learning in Iran is a new industry in educational technology and virtual learning. But Iranian educational institutions and centres, especially universities, use proper patterns with educational and cultural structures regarding designing e-learning environments according to international standards. In fact, by developing e-learning, higher education can also test assumptions used in traditional education. Though discussion about the evaluation and standards of e-learning is a recent phenomenon, some standards were needed for optimizing e-learning and designing its dimensions effectively [24]. Probably higher education demands the most pressure for quality standards. In higher education, higher quality education means that services and products of e-learning (courses and degrees) provide proper experiences that are updated and in line with learners’ requests [25].

Finally, in recent decades evaluation has come to be considered as an integral aspect of e-learning systems in academic circles, leading to growing studies. Promotions in the field of studies resulting from evaluation effectively influence and guarantee the future of e-learning. Quality assurance based on learners’ satisfaction components leads to positive and effective results in line with successful e-learning and education, and finally to developments in the field of modern education.

With respect to the above-mentioned issues, there are suggestions that need to be taken into account:

1. It is suggested that institutions specifically implement e-learning courses with a view to guaranteeing the quality of the courses and involve experts who are active in this field.

2. Universities and virtual learning centres try to apply quality assurance standards by emphasizing learner-centred approach and attracting learners’ satisfaction in order to
reform their educational processes based on the standards.

3. The evaluation of e-learning needs to be converted from paper to executing dimensions at all stages of education to train experts in this field.

4. Fundamental investment and allocation of credits are required to provide appropriate technology and equipment for different types of learning in e-learning centres.

5. Multiple interactions in e-learning and comprehensive strengthening of its execution should be emphasized by the executors of courses.

6. The differences between and the individual needs of learners, diversifying methods, equipment, and the e-learning environment need to be considered.

**Conflict of Interest**

This research has no potential conflict of interest and did not gain any third party sponsorship.

**References**

19. Arbaugh JB. Virtual classroom characteristics and student satisfaction with internet-based MBA courses.


چکیده

کاربرد فناوری اطلاعات و ارتباطات در نظام های آموزشی یک برنامه و جریان آموزشی مقدم است که مقدم بر کاربرد آن باید تلاش شود عوامل مؤثر بر تمایل استفاده از این پدیده شناسایی شوند. هدف از این مطالعه، عوامل شغلی و روان شناختی مؤثر بر تمایل استفاده از فناوری اطلاعات و ارتباطات در بین دبیران شهر شیراز می‌باشد.

روش: بر پایه حاضر از نوع تحقیقات گزارشی و روش آن برزنی و طرح پژوهشیی است که جامعه آماری شامل دبیران شهر شیراز می‌باشد. حجم نمونه با استفاده از فرمول کوکرال تعیین شد. پرسشنامه‌ها به صورت مبتنی بر اصول‌های تحقیقات آموزشی و با توجه به ضرایب آلفای کرونباخ و روایی پرسشنامه به صورت صوری (از نظر محققان و پایایی آن با ضریب آلفای کرونباخ (0/69) قرار گرفتند. تحلیل داده‌ها با استفاده از نرم‌افزار لیزرل نسخه 8/8 و روش معادلات ساختاری انجام شد.

نتایج: متغیرهای تناسب فناوری- شغل، هنجرده، نیازمندی سودمندی، ادرار، سهم اهداف و ارتباطات تنها گزارش‌کننده که هنگام ذهنی (0/04)، بیشترین اثر مستقیم و تناسب فناوری- شغل (0/03) بیشترین اثر غیرمستقیم از نظر ضریب گزارش‌کننده و 15 نفر از اساسی فناوری اموزشی (0/09) مورد تأیید قرار گرفتن. تحلیل داده‌ها با استفاده از نرم‌افزار لیزرل نسخه 8/8 و روش معادلات ساختاری انجام شد.

نتیجه‌گیری: نتایج نشان داد که مدل پیش‌بینی شده می‌تواند اطلاعات مفیدی را برای مسئولان اموزش و پرورش در مورد اهداف عوامل شغلی و روان شناختی که به صورت مستقیم و غیرمستقیم بر تمایل استفاده از فناوری اطلاعات و ارتباطات در بین دبیران تأثیرگذار است ارائه نماید.

کلیدواژه‌ها: فناوری، عوامل شغلی و روان شناختی، تمایل، دبیران
Psychological and Job Factors Influencing the Intention to Use Information and Communication Technology Among Teachers

Mohammad Hassan Seif1, Soghra Zarei2*, Saeed Talebi3, Ahmad Rastegar4

1Doctor of Educational Planning (Distance), Assistant Professor, Payame Noor University, Tehran, Iran
2Master of Educational Research, Department of Education, Payame Noor University, Tehran, Iran
3Doctor of Educational Planning (Distance), Assistant Professor, Payame Noor University, Tehran, Iran
4Doctor of Educational Planning (Distance), Assistant Professor, Payame Noor University, Tehran, Iran

ABSTRACT

Introduction: The usage of information and communications technology (ICT) in educational systems is a flowing and active educational programme. However, prior to its usage, an attempt should be made to identify the factors influencing such a phenomenon. This study aims to identify the psychological and job-related factors affecting the intention to use ICT among teachers in Shiraz.

Method: The present study is applicable from the research type perspective, descriptive from the procedure perspective, and correlative from the research design perspective. The sample includes all teachers in Shiraz. To determine the sample size (n = 255), stratified-cluster random sampling and Cochran’s formula were used. Several questionnaires were completed by the participants, such as subjective norm, task-technology fit, perceived ease of use, perceived usefulness, and intention to use. Validity (in terms of content) and reliability of the questionnaires were confirmed by comments from experts and professors and Cronbach’s alpha coefficient (0.69) respectively. Data analysis was done using structural equation modelling with LISREL software (version 8.8).

Results: Task-technology fit, perceived ease of use, intention to use, and subjective norm variables directly or indirectly affect the intention to use ICT. Among these, subjective norm variable has the highest direct impact (0.33) upon the intention to use ICT, while, task-technology fit variable has the highest indirect impact (0.08). Moreover, the highest and lowest total effects on the aforementioned variable are associated with the impact of task-technology fit (0.39) and perceived ease of use (0.27) respectively.

Conclusion: The findings indicate that the predicted model could provide useful information for the educational authorities with respect to the importance of job-related and psychological factors that directly or indirectly affect the intention to use ICT among teachers.

Keywords: Technology, Psychological factors, Intention, Teachers
Introduction

Nowadays, information and communication technology (ICT) can be used as a powerful means to promote the quality and efficiency of education. Ever-increasing development of ICT-based means and the rapidness of its adaptation with the requirements of people have led to the establishment of a new form of creative, active, and pervasive learning/interactive environment. Moreover, researches indicate that educational innovation and development in the education and training system may fail to attain collaboration and acceptance of teachers. Today’s world has focused its attention on the learning of cutting-edge science and the vast knowledge of ICT. Taking advantage of all the facilities and technologies at hand is assumed to be a prerequisite of fulfilling the objectives of educational centres and schools. Therefore, using technology in the learning process is deemed to be a fundamental component [1].

ICT is known to be a constructive and supplementary component of the educational system. Therefore, it is used by teachers for diversifying the teaching methods, providing a continuous and automated training process, shortening the teaching time, shortening the education period, taking into account the personal talents, individualizing the education, and coping with the problems of collective education [2]. In a world increasingly equipped with ICT, traditional methods of teaching-learning may be no longer efficient [3]. In this condition, teachers are the main agents who can successfully insert and implement ICT in the education system. Indeed, teachers can establish changes between the learner and technology. They are also the key to effective usage of technology in the teaching process [4]. At this point, the role of various factors in enabling the effective use of technology by teachers may be revealed. Awareness of factors influencing the use of ICT in teaching and sufficient competency for its application play a significant role in the integration of technology into the curriculum [5].

Based on the investigations carried out, there are a variety of methods and models for investigating the factors influencing the acceptance of ICT. Technology Acceptance Model (TAM), first put forth by Davis, is one the most valid models among these [6]. This model is adopted from the Theory of Reasoned Action, which is one of the influencing factors in the acceptance of ICT by users [7]. The aforementioned model includes quantitative indicators such as external variables, perceived usefulness, perceived ease of use, attitude, behavioural tendencies, and real usage.

Figure 1 demonstrates TAM and the relevance of the variables to one another.

Davis et al. indicate that use of technology may be affected by personal tendencies, while perceived usefulness contributes to the tendency of the individuals to use the given technology. Perceived usefulness can be defined as ‘the extent [to which] a person believes his/her working performance may be promoted by using a specific system’ [8].

The perceived ease of use is the second and the most important factor that affects people’s intention to use technology [7]. This factor is related to the perception in the mind of users about the ease of using the available IT in the workplace for performing their tasks. In fact, the less effort needed to learn and use a technology, the more likely it is to be used by teachers [9].

In the present study, TAM (presented by Davis et al.), task-technology fit (TTF) variable

![Figure 1: Technology Acceptance Model [8]](image-url)
adopted from the TTF model by Thompson and Goodhue [10], and the subjective norm variable adopted from Theory of Reasoned Action by Ajzen and Fishbein [11] were selected as the conceptual and theoretical framework, to be used as a causal model. The conceptual model and the research study are presented in the following sections according to the structure outlined in Figure 2.

TTF is a scale based on which a technology may help an individual to perform his/her tasks [12]. Subjective norm is the extent to which an individual believes that people who are important to him think he should or should not do the desired behavior [11]. Some studies also investigate the related factors. In a study carried out by Abbassi and Irani, it was found that there is a direct relation between the subjective norm, intention to use technology, perceived usefulness, and perceived ease of use [13]. The results of the study by Usoro et al. indicate that TTF has a significant relation with perceived ease of use, perceived usefulness, and intention to use technology [14].

The results of the study presented by Min Ma et al. show that TTF and perceived ease of use directly have a significant impact on the perceived usefulness [15]. In their research, Siang and Santoso show that perceived ease of use directly has a significant impact on the intention to use ICT [16].

Regarding the emphasis on the use of ICT by school teachers in the teaching-learning process, in Section 7 of the Act approved by Steering Committee of Information and Communication Technology in Education, all educational programmes and curricula of teacher-training at all educational levels are required to use IT. The content of programmes is required to be revised to fit the use of IT in education and training. The use of ICT for in-service training of teachers and investment for the preparation of attractive and effective educational materials to train teachers for applying ICT in education and training have to be taken into account. Further research has to be done on the factors influencing the tendency to use ICT. Regarding the emphasis on this subject matter, the present research was carried out among teachers of Shiraz city during the academic year 2014–2015.

Methods

Because the present study aims to investigate the factors influencing the intention to use ICT among the teachers of Shiraz city, it is applied from the perspective of purpose. The present study is descriptive and correlative from the perspective of research method, because it aims to investigate the factors and variables related to the intention to use ICT and to determine their relations, and also due to the fact that it seeks to determine the type and degree of correlation between the variables.
The statistical population of the study includes all teachers of four districts under the Department of Education in Shiraz city in two high school grades (I and II), during the academic year 2014–2015 (n=5824). Afterwards, stratified cluster random sampling was used to choose a sample from the given population as the statistical sample. To this end, two districts (1 and 2) were selected among the four districts under the Department of Education. Using stratified random sampling (based on gender and educational level—high school grade I and II), 255 teachers were selected as the sample. The aforementioned sample size was determined by Cochran's formula.

In this study, variables are classified into three groups—predictive, criterion, and mediator. The intention to use ICT was considered to be the criterion variable. TTF fit adopted from the TTF model by Thompson and Goodhue (1995) and the subjective norm variable adopted from Theory of Reasoned Action by Ajzen and Fishbein (1975) were considered as the predictive variables. Perceived usefulness and perceived ease of use, adopted from the model presented by Davis et al. (1989), were selected as the mediator variables. In the present study, data collection was done through a questionnaire. Since different variables were used and had to be integrated for designing each model, a separate questionnaire was dedicated to each variable. Questionnaires used in this study include subjective norm scale questionnaire (five questions) by Hartshorne, TTF questionnaire (10 questions) by Vatanasak Dakul et al., perceived ease of use questionnaire (nine questions) by Lu and Hsu, perceived usefulness questionnaire (six questions) by Kim et al., and intention to use questionnaire (four questions) by Sarmiento. All these questionnaires use a seven-point Likert scale (strongly agree, agree, somewhat agree, no idea, somewhat disagree, disagree, strongly disagree) [17–21].

The questionnaires were standard. As there was a relatively good correlation between the variables used in the present study and the structural validity of the questionnaire has been previously confirmed by various researchers, content validity was used to determine the validity of the measurement tool and to examine the extent to which the tool used in the study may evaluate the properties of the study under scrutiny (i.e., the existing variables in the model). The aforementioned questionnaires have been repeatedly used by various researchers. Moreover, according to the judgment of experts and skilled professors, the questions in the questionnaires exactly measure the variables studied in the research. Hence the content validity of the measurement tool can be confirmed with a relatively high confidence. To determine the reliability of the measurement tool—considered to be a technical feature of the tool—and to evaluate whether the tool provides similar results in similar conditions, Cronbach’s alpha was used. In this study, the values of Cronbach’s alpha for subjective norm, TTF, perceived ease of use, perceived usefulness, and intention to use variables were 0.72, 0.83, 0.75, 0.73, and 0.69 respectively. The values mentioned above imply that the measurement tool has a relatively high reliability. Moreover, structural equations and path analysis (by Lisrel v. 8.8 and SPSS v.16 software) were used for data analysis and hypothesis testing.

The participants of the study are school teachers of Educational Districts 1 and 3 in Shiraz city (in high school grades I and II). All participants completed the questionnaire voluntarily and with conscious consent. Participation in the study offered neither benefit nor financial loss to the aforementioned participants. More importantly, researchers undertook to maintain the confidentiality of the data given by participants. The applicable results of the study will be presented to Departments of Education to be used for planning purposes.

Results

As the very crux of the study is the analysis of the correlation path among variables. Correlation matrix of the research variables is presented in Table 1.
According to Table 1, among the variables presented in this study, TTF (0.21), perceived usefulness (0.19), perceived ease of use (0.18), and subjective norm (0.15) respectively have the highest to lowest correlation coefficient with the intention to use ICT. All the aforementioned coefficients are statistically significant (P<0.01).

Table 2 demonstrates the direct impacts of variables on one another. This section deals with the direct impacts of variables on the basis of the data presented in Table 2. Among the variables presented in this study, the highest and the lowest direct impacts were, respectively, impact of subjective norm on intention to use ICT (0.33) and the impact of TTF on the perceived usefulness (0.13).

In this study, all the direct impacts of variables were significant at 0.01 level, except for the impact of subjective norm on the perceived usefulness (0.14) and the impact of TTF on the perceived usefulness (0.13), which were significant at 0.05 level.

Table 3 indicates the indirect impacts of variables on the intention to use ICT. As seen in the data presented in the table above, the highest and the lowest indirect impacts were, respectively, the impact of TTF on the intention to use ICT (0.08) and the impact of perceived ease of use on intention to use ICT (0.03).

**Table 1:** Correlation matrix of variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tr>
<td>Intention to use</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task-technology fit</td>
<td>0.21</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>0.19</td>
<td>0.42</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>0.18</td>
<td>0.53</td>
<td>0.24</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.15</td>
<td>0.34</td>
<td>0.18</td>
<td>0.39</td>
<td>1</td>
</tr>
</tbody>
</table>

*P<0.01

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized parameter</th>
<th>The standard error of estimate</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact of subjective norm on:</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>0.14</td>
<td>0.02</td>
<td>2.18</td>
<td>0.03</td>
</tr>
<tr>
<td>Intention to use</td>
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<td>7.99</td>
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<tr>
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<tr>
<td>Perceived ease of use</td>
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<td>0.03</td>
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<td>0.0009</td>
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<td>2.24</td>
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<td>0.02</td>
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*P<0.01; *P<0.05

<table>
<thead>
<tr>
<th>Variables</th>
<th>Standardized parameter</th>
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<th>P</th>
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<tr>
<td>Indirect impact of subjective norm on: intention to use</td>
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<td>0.01</td>
<td>2.04</td>
<td>0.028</td>
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<td>0.01</td>
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</tbody>
</table>

*P<0.01; *P<0.05
to use ICT and the impact of perceived ease of use on the intention to use ICT.

In this study, the indirect impact of TTF on the intention to use ICT (0.08) is significant at 0.01 level, while the indirect impact of subjective norm on the intention to use ICT (0.04) and the indirect impact of perceived ease of use on the intention to use ICT (0.03) are both significant at 0.05 level.

The overall impact is another estimated parameter, obtained from the combination of direct and indirect impacts. In some cases, variables have only direct impact or only indirect impact on one another. In such cases, the overall impact equals the indirect impact or direct impact. For example, in this study, perceived usefulness has only a direct impact on the intention to use ICT. Therefore, the overall impact of this variable on the intention to use ICT equals the direct impact. Table 4 lists the variables having both direct and indirect impacts on one another.

Regarding the data given in Table 4, the highest and lowest overall impacts were, respectively, the impact of TTF on the intention to use ICT (0.39) and the impact of perceived ease of use on the intention to use ICT (0.27). Furthermore, all the overall impacts of variables on the intention to use ICT were significant at 0.01 level.

The comparison of overall, direct, and indirect impacts and the measurement of the amount of explained variance of each endogenous variable are other features of path analysis. Table 5 reports the estimation of standardized coefficients of direct, indirect, and overall impacts on the intention to use ICT and its explained variance, in order to allow the comparison of direct, indirect, and overall impacts of variables on the intention to use ICT.

As observed in Table 5, the perceived usefulness variable has no indirect impact. Among the variables presented in this study, the highest direct impact on the intention to use ICT is the impact of subjective norm (0.33), which is significant at 0.01 level. The indirect impact of the aforementioned variable on the intention to use ICT is 0.04, and hence its overall impact on the intention to use ICT is 0.37. The explained variance of intention to use ICT is 0.96 in this research.

Fitness indices were used to investigate the model fitness. Among the various fitness indices available, the following were reported in this study: the ratio of chi square to its degrees of freedom.

<table>
<thead>
<tr>
<th>Table 4: The overall impacts of the research variables on one another</th>
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<tbody>
<tr>
<td><strong>Variables</strong></td>
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<tr>
<td>Overall impact of subjective norm on: intention to use</td>
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<tr>
<td>Overall impact of task-technology fit on: intention to use</td>
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<tr>
<td>Overall impact of perceived ease of use on: intention to use</td>
</tr>
</tbody>
</table>

"P<0.01

<table>
<thead>
<tr>
<th>Table 5: Standardized coefficients of direct, indirect, and overall impacts on the intention to use ICT and its explained variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
</tr>
<tr>
<td>On intention to use of:</td>
</tr>
<tr>
<td>Subjective norm</td>
</tr>
<tr>
<td>Task-technology fit</td>
</tr>
<tr>
<td>Perceived ease of use</td>
</tr>
<tr>
<td>Perceived usefulness</td>
</tr>
</tbody>
</table>

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of freedom ($x^2/\text{df}$), comparative fit index (CFI), goodness-of-fit statistic (GFI), adjusted goodness-of-fit index (AGFI), and root mean square error of approximation (RMSEA). Table 6 presents the fitness features of the proposed model.

On the basis of these data, the fitted model for the whole sample was presented using the standard coefficients (Figure 3).

**Discussion and Conclusion**

The obtained results show that, among the variables considered in this study, the highest direct impact on the intention to use ICT is the impact of subjective norm. Therefore, with respect to the impact of subjective norm on the intention to use ICT, it can be argued that employees are one of the most prominent groups affecting the people within the organization. In other words, their way of thinking and their performance may affect the performance of individuals. This, precept, is assumed to be a social pressure to do or not do a task, or the tendency or lack of tendency to do a given task. Persons tend to show the behaviours appealing the people who are important to him, even when the results are not favourable. Therefore, people, by nature, tend to be in line with people of their own interest. School teachers, due to their close relation with their colleagues and their involvement in the teaching process, are also under one another’s influence. Moreover, the views of colleagues have significant impact in the intention of people to use ICT. Thus, subjective norm directly has a significant role on the intention to use ICT. The results of the study are in conformity with the results presented by Andrews et al. and Yilmaz [22,23].

With respect to the impact of subjective norm on the perceived usefulness, it can be argued that when teachers believe that it is deemed by their students, friends, colleagues, supervisors, and top management that teachers have to use ICT in their teaching, the perception of teachers about the benefits of such matter may increase in response to the encouraging and compelling social information. Hence, they may be more likely to use ICT in their teaching, and consequently to improve their job performance, performance relationships, and effectiveness as well. In this regard, it is

| Table 6: GFI features of the model predicting the intention to use ICT |
|--------------------------|------------------|
| **Characteristic**       | **Estimated**    |
| Ratio of chi square to its degrees of freedom | 2.36 |
| P value                  | 0.063            |
| Comparative Fit Index    | 0.98             |
| Goodness-of-Fit statistic| 0.98             |
| Adjusted goodness of fit index | 0.97 |
| Root Mean Square Error of Approximation | 0.036 |

![Figure 3: The fitted model for the whole sample with standard coefficients](image-url)
recommended that successful colleagues share their personal experiences and techniques in terms of the use of ICT in the process of teaching-learning and encourage the promotion of the culture of using ICT in education and its usefulness among other colleagues. The results of this study are consistent with the results presented by Khorasani et al., Macharia, and Nyakwende [24,25].

Furthermore, the highest overall impact among the variables is found to be the impact of TTF on the intention to use ICT. Therefore, with respect to the direct and indirect impacts of TTF on the intention to use ICT, it can be argued that if there is a proportion between the tasks done by teachers and the technology used by them, and also if the required education about how to use technology is provided to the teachers, the intention to use ICT may subsequently increase. On the contrary, if there is no proportion between the components mentioned above, the intention to use ICT among teachers may decrease. However, when learning to use ICT is easy, the required education about how to use technology is provided for the teachers, there are regular updates about technology, and there is sufficient cooperation among teachers with regard to using technology, the proportion between the technology and job may subsequently increase and may consequently lead to an increase in the perceived usefulness. On the other hand, if the use of technology is not perceived as an easy task, the perceived usefulness may subsequently decrease. Moreover, when there is a proportion between the technology and the teaching process, there may be a positive sense towards the perceived usefulness among teachers. This in turn may lead to more usage of technology. In this regard, the contents of courses, methods, implementation, and evaluation should be prepared and presented through computers, and the requirements to meet this objective should be taken into account. These results agree with the findings of Klopping & McKinney [9] and Theng et al. [26].

With regard to the direct and indirect impacts of perceived usefulness on the tendency to use ICT, it can be argued that when teachers believe that use of technology would not involve much mental effort, time, or complexity, they would be more likely to use it. On the other hand, when the use of ICT is perceived by teachers as a task requiring a lot of effort and preliminary measures, it may reduce their intention to use ICT and consequently lead to their resistance against its insertion into the educational system; they would prefer instead to use traditional methods as before. To strengthen the belief about the ease of use of ICT among teachers, the Department of Education needs to familiarize teachers with the usage of technology and try to increase their computer skills by holding educational classes. Moreover, the perceived ease of use may have an indirect impact on the tendency to use ICT, through the perceived usefulness. In other words, when teachers believe that using computers is difficult, incomprehensible, or unclear and that it may require more mental effort, they may find the usage of technology inefficient and would have no intention to use it. Therefore, the materials of educational courses are recommended to be provided in such a way that teachers are familiarized with electronic education with/without educational technology and understand the ease of using ICT in education and the teaching-learning process. More to the point, the ICT providers and policymakers in the Department of Education should take into consideration the documentation related to the application of different types of technologies in teaching and learning and also the ease of using ICT. These results are in agreement with the results of Komar Sharma & Komar Chandel, Wu, Cheng, Yen, & Huang, Yuen & Ma [27-29] but are in contradiction with the result presented by Kirmizi, Khalifa, & Shen [30,31].

With regard to the direct impact of perceived usefulness on the intention to use ICT, it may be rational to conclude that when teachers believe that the use of technology may improve the quality of their teaching and teaching performance, may increase the effectiveness of their teaching, may accelerate the speed of their task implementation, and consequently may lead them to access more precise, more up-to-date, higher quality,
and broader job-related information, they will undoubtedly have more intention to use ICT. However, when teachers feel that using technology may have no effect on their teaching performance and may even interrupt it, their intention to use ICT may decrease, and they may subsequently show high resistance against the insertion of technology into teaching process or even reject it. Therefore, it is recommended to demonstrate the benefits of technology in teaching by holding workshops, and to increase the intention to use technology in teaching by comparing the traditional teaching method with its technology-based counterpart and explaining the benefits of the latter. The results are consistent with the findings presented in [32-34] but are contradictory to the results presented by Rose & Fogarty [35].

Moreover, future researchers are advised to focus on various factors considered in research done in other countries that could not be taken into account in the present study, e.g. user resistance, performance, experience, tools, organizational support, perception of behavioural control, power gap, uncertainty avoidance.

In this study, TAM was used with other variables added. Other models and new influencing factors that affect the intention to use technology are recommended to be used in future works.

Acknowledgement

The authors greatly appreciate all school teachers of educational districts 1 and 3 in Shiraz city (in high school grades I and II) for their participation and their cooperation in completing the given questionnaire.

Conflict of Interest

None declared.

Author’s contribution

Seif and Zarei: development of the main idea and article writing; Seif and Zarei: data analysis; Talebi: methodology; and Rastegar: editing.

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تأثیر دوره پزشکی مبتنی بر شواهد بر دانش و توانایی‌های عملی دستیاران بالینی از دیدگاه آنها

چکیده
پزشکی مبتنی بر شواهد به معنای کاربرد متعهدانه بهترین شواهد عینی برای اتخاذ تصمیمات تشخیصی و درمانی دقیق، آگاهانه و منصفانه برای بیماران است. این رویکرد، تلاشی من کن‌با برای تقویت توانایی طرح‌سازی، مهارت‌های جستجوی اطلاعات، برگزیدن بهترین شواهد و مستندات در دسترس و ارزیابی نتایج آن و بکارگیری نتایج تحلیل و تقدیم مستندات و شواهد، کیفیت تصمیم‌گیری‌های بالینی را بهبود بخشید. پژوهش حاضر با هدف بررسی تأثیر دوره‌های پزشکی مبتنی بر شواهد بر دانش نظري و توانایی‌های عملی دستیاران بالینی انجام شده است.

روش: تحقیق حاضر با رویکرد کمی، به روش نیمه‌کیفی با استفاده از پرسشنامه‌های استفاده شده، نرم‌افزار SPSS و آمار توصیفی تحلیل شد. پژوهش حاضر در زمانی انجام شد که دانش‌آموختگان دوره‌های پزشکی مبتنی بر شواهد بالینی می‌توانند بهترین تصمیم‌گیری‌های بالینی را اتخاذ کنند.

نتایج: گزارش‌های دوره در افزایش رضایت و توانایی عملی دستیاران تأثیر مثبتی داشت. همچنین دوره برای دانش‌آموختگان دوره مورد تمرین و تذکر که از نظر میزان توانایی عملی و توانایی عملی دستیاران تأثیر مثبتی داشت. نتایج معمولی داشتند.

کلیدواژه: پزشکی مبتنی بر شواهد، امتیاز دستیار بالینی، دانش، توانایی عملی
Clinical Residents' Viewpoints on their Knowledge and Practical Capabilities: The Effect of an EBM Course on Focus

Zahra Karimian1*, Javad Kojouri2, Asiyeh Salehi3, Behdad Amiri4

1PhD in Higher Education Administration, Assistant Professor of Center of Excellence for Electronic Learning in Medical Sciences, Medical School, Shiraz University of Medical Sciences, Shiraz, Iran
2MD. Full Professor of Cardiology Department, Faculty of Medicine, Shiraz University of Medical Science, Shiraz, Iran
3Ph.D, Population and Social Health Research Program, Menzies Health Institute Queensland, Griffith University, Australia
4MA, English Language educational Department of Fars Province, Shiraz, Iran

ABSTRACT

Introduction: Commitment to evidence-based medicine (EBM) means the informed and fair use of the best evidence for accurate diagnosis and treatment decisions for patients. This approach attempts to improve the quality of clinical decision-making. The current study aimed to investigate the effects of EBM training courses on the theoretical knowledge and practical skills of clinical residents.

Methods: A quantitative method based on a quasi-experimental single group design was used in this study. Two researcher-made questionnaires and one test were used as the major instruments for evaluating the satisfaction, knowledge and practical capabilities of participants. The content validity of the questionnaires was confirmed by five educational experts in medical education and clinical practices, and the reliability was calculated through Chronbach’s alpha (r=0.92 and 0.93). The questionnaires were distributed among all 110 junior clinical residents who participated in the EBM workshop; 62 residents completed the questionnaire. The gathered data was analyzed through SPSS version 14 using paired t-test and Pearson's correlation.

Results: Participants took a high level of satisfaction (means of all items were higher than the cut-off points) from the evidence-based medical course. Participants’ knowledge and practical abilities were significantly broadened as a result of attending the EBM course (P<0.01). In addition, a positive significant correlation was found between the knowledge scores and practical ability scores of residents who participated in the EBM course (r=84%).

Conclusion: More emphasis needs to be placed on developing the practical skills of residents in the EBM course. It is also essential that clinical ward residents be required to make clinical decisions based on evidence-based medicine.

Keywords: Evidence-Based Medicine, Education, Residents, Knowledge, Practical Capabilities
Introduction

Evidence-Based Medicine (EBM) is a research-oriented approach developed in 1992 by Guyatt et al. at McMaster University, Canada. Despite its short history, this approach has been adopted by medical faculties worldwide [1]. The EBM approach applies the best objective evidence to provide qualified and accurate diagnostic and/or therapeutic decisions for patients [2]. EBM attempts to improve the quality of clinical decision-making through developing and reinforcing students’ questioning ability, information searching skills, critical evaluation of evidence, and utilization of the results obtained from analysis and criticism of documents and evidence [3,4]. EBM applies valid and up-to-date scientific evidence to make clinical decisions more objective and reduces the impact of problems originating from subjective views, obsolete information, and linear and non-critical deductions [1].

EBM is a concept recently adopted into the tertiary education in medical sciences in Iran [5]. In the general orientations of the Iranian National Comprehensive Health Map, the health instruction system was revolutionized to privilege human capital and support the elites as well as innovators so that the health services are represented by erudite, capable, efficient professionals who play a major role in enhancing individual and societal health [5]. In addition, the Human Development Index (HDI) established the new medical education approaches by focusing on student-based learning methods and reinforcing the meta-cognitive capacities of medical students, including analytical and critical thinking [6]. Furthermore, the instructions of the education undersecretary of Iran’s Ministry of Health and Medical Education underlined the conceptual extension, propagation, and establishment of EBM in both clinical and educational systems. One of the main target groups in this program is clinical residents, because they play a significant role in providing qualified health care services as well as training [5].

Rider et al. considered medical residents as teachers in hospitals [7]. According to the literature, undergraduate medical students receive a great part of their learning through interaction with medical residents [8-12]. Sánchez-Mendiola et al. showed that residents spend more than 32.5% of their time giving instructions to lower-grade medical and para-medical students [13]. Therefore, medical residents are a valuable potential resource in the medical science faculties, given that they have close and direct contact with undergraduate students and consequently could have a substantial influence on their clinical learning [14]. Hence, active, lifelong, and self-ruled learning methods such as EBM need to be considered by medical residents [13].

Because residents play a significant role in clinical decision-making, presenting health care services, and training other students, they were selected as the appropriate sample for this study. Although the EBM course is held for residents in Iran’s medical schools as a continuous program, to the best of the researchers’ best knowledge no research has been conducted into the effectiveness of such courses in improving the EBM knowledge, insight, and skills of residents at Shiraz University of Medical Sciences. This study examined the effectiveness of the EBM course and the factors influencing its application at Shiraz University of Medical Sciences. More specifically, it aimed to examine the level of satisfaction of medical residents after attending the EBM course, the participants’ knowledge and practical capabilities after the EBM course, and to explore the relationship between the knowledge scores and practical capability scores of residents.

Methods

This study was conducted in 2013 using a quantitative approach based on a quasi-experimental single group design. All 110 junior clinical residents at Shiraz University of Medical Sciences in September 2013 participated in the EBM course. A researcher-made questionnaire was sent to all participants one month after the course, and 80 questionnaires were returned, of which 62 were answered completely and
were appropriate for use in the investigation. Because the EBM course had been intended for all junior residents, it was not possible to compare responses with test and control groups.

The EBM course was held for five working days (30 hours) per week for four weeks, and residents were expected to participate five days per week. Participants were excluded from the research sample if they were absent more than one day per week.

The course content included 15 major EBM subjects. Content selection was based on the guidelines of Greenhalgh and Donald [2], and were also confirmed by a team of clinical specialists at Shiraz University of Medical Sciences.

The intervention method included mini-lectures, group discussions, and self-directed learning. For each subject, a short 10 to 15-minute lecture was presented by the instructors, followed by practical activities. Based on the nature of EBM, after the lectures, the residents were divided into small 2-3-member groups and followed these stages in a stepwise manner:

1. Ask a structured clinical question;
2. Write a clinical scenario;
3. Search the resources in university databases;
4. Evaluate the collected articles and select the best one, mentioning the reasons for the selection;
5. Provide the final clinical decision and criticize it (one of the group members reports the result).

The teamwork was supervised by five EBM instructors. Because of the need for practical activities, a wireless Internet connection was available in the workshops, and participants were asked to bring their personal laptops. The list and description of team activities including required practices were organized into workbooks and provided to the participants.

Instrument for self-evaluation of the knowledge: The residents’ views regarding the influence of the EBM course on their knowledge was assessed using the quasi-experimental single group design comprised of 15 EBM subjects based on a 0-10 rating scale. The content of the questionnaire was adopted from Greenhalgh and Donald’s workbook on evidence-based health care [2]. The content validity of the questionnaire was confirmed by five medical education experts [2]. To calculate the reliability of the questionnaire, Cronbach’s alpha was used (r=0.93). One month after the course, participants were asked to score their pre-course and post-course knowledge based on all 15 EBM subjects. Although the evaluation of the residents’ knowledge based on self-assessment might be subjective and inaccurate, the individuals’ views were checked against the different pre-course and post-course scores. Considering that the questionnaires were presented to participants one month after the course, the post-course scores indicated to some extent how much the learning had settled in their minds. The scores may have been lower than if the residents had answered the questionnaires immediately after the course.

Instrument for evaluating the practical capabilities: The practical capabilities of residents were assessed with a test designed by five medical education experts from Shiraz University of Medical Sciences based on the PICO format (P=population, I=intervention, C=comparison, and O=outcome) [16]. This included writing a clinical scenario,
searching articles from valid databases, critically assessing articles, and considering appropriate indices in the article critique. The skills were evaluated by verifying a real patient case in each resident’s specialty field and recording the skill scores on blank forms in a workbook. Teachers rated the practical activities based on a 1-10 rating scale. Each skill was scored between 0 and 2, with the total score of practical capabilities being 10. Residents were expected to gain 5 out of 10 as the minimum score. The practical test questionnaire was sent for participants one month after they had finished the course. The profile of the research design is summarized in Figure 1.

Non-confidential information was asked from participants in the questionnaires. All participants in the study were informed of the research objectives and gave informed consent to participation. The questionnaires were kept completely anonymous. Results of the research were sent to the Shiraz University of Medical Sciences Vice Chancellor for Education.

Results

Of the 62 participants in the study, 19 (31.7%) were male and 41 (68.3%) were female, and all were within the age range of 25 to 40 years; the mean age was 31.1 ± 4.1. The findings of this study were categorized into three main sections: residents’ satisfaction with the EBM course; residents’ knowledge and practical abilities; and the relationships between their knowledge and their practical capabilities scores.

Residents’ satisfaction with the EBM course: All 110 questionnaires were completed. The residents’ level of satisfaction with different aspects of the EBM course showed a mean score higher than 2.5, indicating the minimum satisfaction. Among the five domains of satisfaction, interpersonal skills, teachers, and knowledge, knowledge had the highest scores in comparison with other domains. Among the 30 items of satisfaction in the EBM scale, the items with the highest mean scores were related to “giving feedback to residents by teachers” (3.56), “instructions will be useful in the future” (3.52), “residents encouraged to criticize” (3.45), “the course was based on a necessity” (3.40), and “team-working in learning” (3.43) (Table 1).

Residents’ knowledge and practical abilities: Of the 110 questionnaires sent out, 62 were returned completed. A total of 41 of the 62 respondents were female (68.3%) and 19 were male (31.7%). The findings show that participants’ level of knowledge significantly increased after the course (P<0.001). The total mean score of residents’ self-evaluation increased from 2.82 (out of 10) pre-course to 6.54 post-course (Table 2).

According to the scoring results of the EBM practical ability test, the “critical appraisal of article” skill and the “ability to identify the correct criteria for choosing a good article” received the lowest scores; the highest scores belonged to “ability to search for an article” and “writing a clinical scenario”. The mean score of all residents was 5.9 out of 10, indicating a medium level of practical ability (Table 3).

Correlations between knowledge and practical capabilities: Pearson’s correlation analysis showed a positive significant

<table>
<thead>
<tr>
<th>Last day of the course (5th day)</th>
<th>One month after the course</th>
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<tbody>
<tr>
<td>Evaluating residents’ satisfaction with the EBM course based on a 30-item questionnaire using a 1-4 Likert scale with a cut-off of 2.5.</td>
<td>Comparing the pre-course and post-course scores of knowledge self-evaluation regarding 15 EBM subjects.</td>
</tr>
<tr>
<td>One-sample quasi-experimental design (using the 15-question knowledge self-evaluation questionnaire and comparing the results through paired t-test)</td>
<td>Post-course scores of residents’ practical capabilities in 5 major EBM skills based on five questions using the 0 to 10 rating scale.</td>
</tr>
</tbody>
</table>

**Figure 1:** The quasi-experimental single group design
relationship between the knowledge score and the practical ability score of residents who participated in the EBM course \((r=0.84, P<0.01)\).

**Table 1:** Mean of residents’ scores for satisfaction with different aspects of the EBM course \((\text{Sample size}=62)\) \((\text{Range: 1-4, cut-off point: 2.5})\)

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean Score</th>
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<tbody>
<tr>
<td>1  The EBM course encouraged me to participate more.</td>
<td>2.98±0.42</td>
</tr>
<tr>
<td>2  What I have learnt will be useful in the future.</td>
<td>3.52±0.33</td>
</tr>
<tr>
<td>3  The course enhanced my motivation for educational activities.</td>
<td>2.68±0.13</td>
</tr>
<tr>
<td>4  I think that the course lessons will increase my progress.</td>
<td>2.81±0.60</td>
</tr>
<tr>
<td>5  The course included active instruction and learning based on participants’ needs.</td>
<td>3.40±0.51</td>
</tr>
<tr>
<td>6  I feel that the course objectives were appropriate to my needs.</td>
<td>3.32±0.22</td>
</tr>
<tr>
<td>7  The EBM course helped me develop my self-confidence.</td>
<td>2.98±0.27</td>
</tr>
<tr>
<td>8  I think I have gained what I expected from this course.</td>
<td>2.79±0.23</td>
</tr>
<tr>
<td>9  My problem-solving and critical evaluation skills were increased in this course.</td>
<td>2.80±0.41</td>
</tr>
<tr>
<td>10 The learning objectives of the course are clear to me.</td>
<td>2.89±0.62</td>
</tr>
<tr>
<td>11 This instruction encourages me to be a critical learner.</td>
<td>3.45±0.33</td>
</tr>
<tr>
<td>12 My relationships with other participants have grown in this course.</td>
<td>2.78±0.34</td>
</tr>
<tr>
<td>13 I was not stressed during the course.</td>
<td>3.01±0.45</td>
</tr>
<tr>
<td>14 I found good friends during the course.</td>
<td>3.43±0.32</td>
</tr>
<tr>
<td>15 The EBM course helped increase my self-confidence in the clinical environment.</td>
<td>3.01±0.61</td>
</tr>
<tr>
<td>16 I gained good opportunities to develop my interpersonal skills.</td>
<td>3.21±0.31</td>
</tr>
<tr>
<td>17 Participation in the team work was enjoyable for me.</td>
<td>3.43±0.25</td>
</tr>
<tr>
<td>18 I think the course will be useful in the education of my students.</td>
<td>2.93±0.25</td>
</tr>
<tr>
<td>19 The course sessions were managed correctly and decisively.</td>
<td>3.35±0.47</td>
</tr>
<tr>
<td>20 The course instructors provided conditions for helpful criticism.</td>
<td>3.09±0.23</td>
</tr>
<tr>
<td>21 Clear examples and explanations were presented on teaching lessons to learners.</td>
<td>2.83±0.34</td>
</tr>
<tr>
<td>22 The course teachers had sufficient knowledge and information.</td>
<td>3.33±0.41</td>
</tr>
<tr>
<td>23 The course executives gave feedback to participants.</td>
<td>3.56±0.21</td>
</tr>
<tr>
<td>24 I was rarely tired during the course.</td>
<td>3.11±0.36</td>
</tr>
<tr>
<td>25 The educational space was calm, desirable, and devoid of stress.</td>
<td>2.99±0.39</td>
</tr>
<tr>
<td>26 I had a good feeling participating in this course.</td>
<td>2.80±0.31</td>
</tr>
<tr>
<td>27 I had no problem in asking questions and in having ambiguities clarified.</td>
<td>2.87±0.38</td>
</tr>
<tr>
<td>28 Education scheduling (lectures, teamwork, and time-outs) was appropriate.</td>
<td>2.67±0.45</td>
</tr>
<tr>
<td>29 Education space (ventilation, brightness, and voice loudness) was appropriate.</td>
<td>2.87±0.38</td>
</tr>
<tr>
<td>30 The course was held at an appropriate time.</td>
<td>2.89±0.53</td>
</tr>
</tbody>
</table>

**Discussion and Conclusion**

The 21st century is characterized as the information explosion century. On one hand, individuals break through new frontiers of
knowledge every day; on the other hand, they are faced with a huge bulk of unrefined information. Hence, it is essential to distinguish net from gross value in the era of voluminous knowledge [2]. This issue is of particular importance in the medical sciences where the ability to use up-to-date science is required to understand these complexities.

Table 2: Comparison of pre-course and post-course residents’ knowledge of EBM using paired t-test (Sample size=62, Range: 1-10, cut-off point: 5)

<table>
<thead>
<tr>
<th>Knowledge aspects of the program</th>
<th>Pre Mean</th>
<th>SD</th>
<th>Post Mean</th>
<th>df</th>
<th>T</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical concepts, explanation of importance and necessity</td>
<td>3.67</td>
<td>2.15</td>
<td>7.57</td>
<td>60</td>
<td>14.54</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PICO subject</td>
<td>2.46</td>
<td>1.79</td>
<td>6.81</td>
<td>58</td>
<td>17.35</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Information proficiency, knowledge management and 5S</td>
<td>2.31</td>
<td>1.75</td>
<td>5.87</td>
<td>54</td>
<td>16.32</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Acquaintance with EBM databases</td>
<td>3.15</td>
<td>1.99</td>
<td>7.45</td>
<td>59</td>
<td>16.56</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Rules and methods of scientific querying in resources and databases</td>
<td>3.31</td>
<td>2.07</td>
<td>7.26</td>
<td>61</td>
<td>14.76</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Critical assessment of articles</td>
<td>2.78</td>
<td>1.96</td>
<td>6.42</td>
<td>59</td>
<td>12.27</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Use of articles relevant to screening and diagnosis tests</td>
<td>2.60</td>
<td>1.88</td>
<td>6.26</td>
<td>57</td>
<td>12.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Use of articles relevant to random controlled trials (RCT)</td>
<td>2.78</td>
<td>1.84</td>
<td>6.57</td>
<td>57</td>
<td>13.53</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Use of articles relevant to drug trials</td>
<td>2.75</td>
<td>1.97</td>
<td>6.16</td>
<td>60</td>
<td>11.85</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Calculating the number of people needing treatment</td>
<td>2.59</td>
<td>2.03</td>
<td>5.59</td>
<td>60</td>
<td>13.17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Use of systematic and meta-analytic review articles</td>
<td>2.79</td>
<td>1.97</td>
<td>6.65</td>
<td>60</td>
<td>14.40</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Use of case study articles – chance of survival</td>
<td>2.66</td>
<td>1.90</td>
<td>6.33</td>
<td>60</td>
<td>15.13</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Use of qualitative-descriptive articles</td>
<td>2.98</td>
<td>2.06</td>
<td>6.21</td>
<td>60</td>
<td>13.85</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Analysis of articles relevant to rare phenomena – Case control</td>
<td>2.73</td>
<td>1.94</td>
<td>6.25</td>
<td>59</td>
<td>14.61</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Acquaintance with guidelines and how to prepare them</td>
<td>2.57</td>
<td>1.90</td>
<td>6.38</td>
<td>60</td>
<td>14.33</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total mean score</td>
<td>2.82</td>
<td>1.65</td>
<td>6.54</td>
<td>61</td>
<td>18.79</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

SD: Standardized deviation; df: Degree of freedom

Table 3: Mean scores of practical abilities test of residents after the course (Sample size=62)

<table>
<thead>
<tr>
<th>Scores of practical abilities test in EBM skills</th>
<th>Mean (out of 2)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ability to write a clinical scenario</td>
<td>1.35</td>
<td>0.32</td>
</tr>
<tr>
<td>2 Ability to ask a structured clinical question</td>
<td>1.33</td>
<td>0.33</td>
</tr>
<tr>
<td>3 Ability to search the resources in appropriate databases</td>
<td>1.4</td>
<td>0.28</td>
</tr>
<tr>
<td>4 Ability for critical assessment and selecting the best article</td>
<td>0.97</td>
<td>0.26</td>
</tr>
<tr>
<td>5 Ability to realize the correct criteria of choosing a good article</td>
<td>0.91</td>
<td>0.27</td>
</tr>
<tr>
<td>Total (out of 10)</td>
<td>5.90</td>
<td>1.01</td>
</tr>
</tbody>
</table>

SD: Standardized deviation
Medical residents are working in an era when the volume of evidence can double within a few months. In order to make effective decisions, they need to select valid medical evidence from thousands of articles which are published annually in hundreds of prestigious medical journals. Such an important task is not possible unless medical students and residents have sufficient knowledge and skill in recognizing and ranking the validated evidence. Hence, they increasingly need knowledge, analytical skills, and discernment in selecting the most correct and relevant medical knowledge from the bulk of information generated so as to comprehend and criticize the medical literature and make correct and well-informed clinical decisions [2].

A literature search revealed that the efficiency of conducting an EBM course for medical students has been discussed in several studies [3,7,17-28]. According to the findings of the current study, the EBM course selected for study significantly increased the level of satisfaction, knowledge, and practical ability of the medical residents sampled. This finding is in agreement with those of previous studies. For example, in a study conducted by Srinivasan et al., an EBM course was applied to the curriculum of undergraduate medical students, and the results showed that both students and faculty members were satisfied with it. From their point of view, EBM was relevant and applicable to their academic majors [20]. However, the results of Holloway et al. showed a low level of satisfaction with the EBM course, which is not consistent with the results of the current study [21]. The disparity may be explained by the fact that their statistical sample was composed of undergraduate medical students, suggesting that none of the five domains of the EBM course were applicable or useful in the undergraduates’ medical learning at that stage. Considering that three domains of EBM - “asking a correct clinical question”, “critical assessment of articles”, and “clinical decision-making” - require a relatively high level of medical knowledge and experience, the undergraduate medical students might not have had the pre-requisites for entering the EBM course; and this could explain their low satisfaction with the course.

The findings showed that EBM enhances the knowledge and practical capabilities of medical residents. This finding is in agreement with those of previous studies which indicated that EBM courses significantly enhanced the knowledge, practical skills, and abilities of students in terms of investigation, library skills, self-reported ability, and also the ability to criticize scientific articles [18, 21, 28]. Karimian et al. found in their study that training through an EBM course had a positive impact on the practices of residents in clinical decision-making [29].

According to a Delphi study conducted by Salehi et al. in 2014 regarding the medical educational forum in Iran, the EBM approach was considered by the majority of faculty members to be one of the first priorities for enhancing the quality of the medical education system [30]. Another study by Bigdeli et al. investigated the methods required for applying an EBM course in Iranian traditional medicine using semi-structured interviews with medical experts in Iran. The results of their study suggest that the EBM approach can be developed and extended by reinforcing students’ and residents’ critical thinking using continuous programs such as the inclusion of EBM in student homework, question-answering sessions, the simulation of clinical cases, concept mapping, and the critique of coworkers [31]. Hence, according to the findings of the current study and of other studies conducted in Iran, EBM is an effective education method in Iran. This indicates that EBM courses need to be prioritized in tertiary medical curricula.

Although this study showed that through the application of EBM in their training, medical residents have gained higher scores in questioning, resource searching, and scenario writing, there are still some deficiencies identified in their performance, particularly in the use of best article selection criteria and the ability to critically assess articles. It seems that more emphasis is needed on
developing the practical skills of residents in the EBM course. Furthermore, residents in clinical wards are required to make clinical decisions based on evidence-based medicine. Improving the required facilities and providing additional resources such as increased funding for libraries and up-to-date references could be beneficial for enhancing EBM [32].

Although this study was conducted among medical residents in one of Iran’s major universities, the sample may not have been representative of other universities in Iran and should be extrapolated with caution. In addition, the residents who participated in this study faced heavy workloads and had limited time to take part in this research, especially those in surgery and anesthesia departments. Thus, the results of this study should be generalized with caution. Furthermore, as the effect of the educational intervention was evaluated by use of a questionnaire, the results may be less valid in comparison with more objective methods such as observation.

Acknowledgements
The authors are grateful to the residents at Shiraz University of Medical Sciences who filled out the questionnaires. The contributions of those in clinical departments who helped with collecting the questionnaires are also greatly appreciated. This article is based on a medical education MSc thesis sponsored and granted by Shiraz University of Medical Sciences with the project number 92-6703.

Conflict of Interest
None declared.

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ارائه مدل علی پیش بینی اضطراب رایانه بر اساس باورهای هوشی: نقش واسطه ای اهداف پیشرفت و درگیری شناختی

احمد رستگار

چکیده

در عصر حاضر هر چیزی که به فناوری رایانه مربوط باشد حائز اهمیت فرض می‌گردد؛ با این حال، بسیاری از افراد ممکن است نسبت به کار با رایانه احساسات و تجربیات منفی داشته باشند که یکی از آنها اضطراب رایانه است. هدف از این مطالعه ارائه مدلی برای پیش‌بینی اضطراب رایانه بر اساس باورهای هوشی و تمرکز روی اهداف پیشرفت و درگیری شناختی بوده است.

روش: این پژوهش توصیفی از نوع همبستگی بود. جامعه آماری شامل دانشجویان رشته‌های علوم انسانی دانشگاه پیام‌نور شیراز بود که 190 دانشجوی کارشناسی (14 دختر و 64 پسر) از دانشکده علوم انسانی دانشگاه پیام‌نور شیراز با استفاده از روش نمونه‌گیری طبقه‌ای نسبتی انتخاب شدند. ابزار پژوهش پرسشنامه‌های مقیاس اضطراب رایانه، اهداف پیشرفت، باورهای هوشی و درگیری شناختی بود. برای تحلیل داده‌ها از روش تحلیل مسیر بر کمک نرم‌افزار لیزرل نسخه 8/51 استفاده شد.

نتایج: نتایج نشان داد که اثر مستقیم باورهای هوشی افزایشی بر اضطراب رایانه دانشجویان متفاوت و اقدام با 0-50 است و از نظر آماری در سطح 0/01 معنادار است که از طریق هایگی و راهبردهای نداشته‌ای الصور متغیر به کمیت در ضمن، اثر غیرمستقیم باورهای هوشی داتی بر اضطراب رایانه برای با 0/01 و از نظر آماری معنادار نیست، علاوه بر این از میان میانگین‌های وارد شده در پژوهش، بیشترین اثر غیرمستقیم بر اضطراب رایانه به اهداف تحقیق متعلق داشته که مقدار با 13/00 و در سطح 0/01 معنادار است. همچنین بیشترین اثر مستقیم بر اضطراب رایانه در مدل بررسی شده متعلق به راهبردهای شناختی معمول است که برای با 35/00 به و در سطح 0/01 معنادار است.

نتایج پیش‌بینی: با اقدام دادن که رابطه بین باورهای هوشی و اضطراب رایانه تحت تأثیر اهداف پیشرفت و درگیری شناختی است.

کلیدواژه‌های اصلی: اضطراب رایانه، هوش، اهداف، شناخت
Presenting a Causal Model of Predicting Computer Anxiety Based on Intelligence Beliefs: The Mediatory Role of Achievement Goals and Cognitive Engagement

Ahmad Rastegar*

PhD of Distance Educational Planning, Assistant Professor, Department of Educational Science, Payame Noor University, Tehran, Iran

ABSTRACT

Introduction: Everything related to computer technology is supposed to be important in the present era; however, many people have negative feelings and attitudes toward working with computers. One such feeling is computer anxiety. This study purposed to present a model for predicting computer anxiety based on intelligence beliefs and focusing on achievement goals and cognitive engagement.

Methods: This study was descriptive and correlational type. The study population consisted of humanities students of Shiraz Payam Noor University. Using stratified sampling, 290 (194 female and 96 male) undergraduate students of the Faculty of Humanistic Studies, Shiraz Payame Noor University were selected and assigned as the research samples. Participants were asked to complete such questionnaires as the Computer Anxiety Scale, Achievement Goals, and Intelligence Beliefs and Cognitive Engagement. Path analysis using LISREL software version 8.51 was used for data analysis.

Results: The results showed that incremental intelligence beliefs had a negative indirect effect on students’ computer anxiety (-0.05), which was statistically significant at a level of 0.01 (P<0.01). This indirect effect operates through mastery goals and deep cognitive strategies. Meanwhile, the indirect effect of entity intelligence beliefs on computer anxiety equaled 0.01 and was not statistically significant. Moreover, among the variables included in the study, mastery goals had the most indirect effect on computer anxiety; the effect was negative, equal to 0.13, and statistically significant at a level of 0.01 (P<0.01). Direct cognitive strategies had the most direct effect on computer anxiety in the fitted model at a rate of 0.39, which was statistically significant at a level of 0.01 (P<0.01).

Conclusion: The findings of this research showed that the relationship between intelligence beliefs and computer anxiety is affected by achievement goals and cognitive engagement.

Keywords: Computer Anxiety, Intelligence, Goals, Cognition
Introduction

Today, information can be rapidly transferred to a wide population because of science and technology. “In this information age, in which a growing amount of information rapidly spreads out, it is necessary that students become active individuals who can reach, organize, process and internalize the constantly-increasing information instead of becoming passive learners in the learning process” [1]. Moreover, industrial advancements and changes in the quality of life resulting from such advancements have affected the mental health of people. One such mental effect is computer anxiety, which has been markedly noticed by researchers [1,2].

“The importance of anxiety is underlined by the introduction of the umbrella-concept of academic anxiety, defined as a collection of anxieties lived by the students in the pre-university and university environment, or related to it, such as: math anxiety, science anxiety, and foreign language anxiety” [2]. Computer anxiety can be added to this category because of the need, specific to the contemporary age, to effectively use the computer as a learning means [3].

Theorists have tried to analyze one of the newest pathologies of the second millennium: computer anxiety. Golamali Lavasani [4] suggests that computer anxiety is a kind of emotional and cognitive reaction that occurs while the individual is working and interacting with a computer; it happens as a consequence of a lack of awareness and the individual’s attitude towards the computer as a threatening object.

The computer is a part of today’s everyday life. This reality is more vivid in universities and among university students. Interacting with a computer is an essential and fundamental part of many scientific fields. Therefore, in these circumstances, educational systems should undergo many changes to be effective in the process of developing a society. During the past decade, emphasis on computer technology in everyday life and also on the university campus has been increased. Now, multimedia classes with their associated technologies are commonplace in universities. Increasingly, university students are obliged to deliver their assignments via computer and use hardware and software in their projects [5]. According to Osatuyi [6], computer anxiety relates to the uncertainties and risks associated with the increasing proliferation of digital goods and services in the current information age.

Meanwhile, open and distance educational systems which claim to be ahead of other areas of science (in this sense) are faced with two fundamental challenges: first, they should convey the necessary information about new information technologies to their learners, and secondly, they should provide such technologies for their learners. Therefore, it can logically be assumed that the use of a computer can cause anxiety and distress among students. This may result in a huge number of students avoiding the utilization of new technologies (especially the computer) in their projects, which can in turn result in their deprivation of the information, speed, and accuracy of modern technologies [4]. Utilizing a computer is not always a pleasant and joyful experience for its users. Even worse, some students hate working with computers or are sometimes frightened by this experience. These people are suffering from different degrees of computer anxiety [7].

Different conditions make people, especially university students, become familiar with the computer and how to use it properly. Users should not avoid the computer and should not have any fear regarding it. Obviously, reaching these goals needs more cognition, perception, and information about computer anxiety and its mediatory factors.

Since 1980 researchers and educational psychologists have relied on cognitive-motivational perspectives which study the cognitive and motivational determinants of a learner’s functions to explain a learner’s behavioral outcome in an educational environment. Dweck’s Theory regarding intelligence beliefs and achievement goals lies within this framework [8]. Intelligence beliefs comprise both incremental and entity
intelligence belief. Incremental intelligence belief means that intelligence has a flexible, expandable and controllable quality [9, 10, 8]. Learners who have an incremental intelligence theory most notably concentrate on improving their capabilities and learning new information. These learners strive to overcome their previous frustration and failures [8,9].

Learners with an entity theory about intelligence believe that intelligence has a fixed, inflexible, uncontrollable, and non-expandable quality [8-10]. These learners concentrate on performing well and make little endeavor to achieve their goals and overcome their obstacles [8]. Dweck and Leggett [9] claimed that intelligence beliefs are subordinate factors of success, which means they cannot directly affect success.

According to Dweck and Leggett [9], the concept of goal achievement refers to a learner’s reasons for doing his tasks [11]. In other words, learners will ask themselves why they should do a particular job. Dweck and Leggett [9] noticed two types of goals: mastery goals and performance goals. Learners who choose mastery goals concentrate on mastery and obtaining different skills through their tasks. Conversely, learners who choose performance goals try to show their capabilities to others and impel observers to give good evaluations of their work.

Some researchers have expanded Dweck’s theory of goals by categorizing them into two dimensions: performance-approach and performance-avoidance goals. They have considered mastery goals, performance-approach goals, and performance-avoidance goals [8]. Learners who have performance-approach goals compare their performance with that of others. They consider learning as a means to reaching their goals. Those who use performance-avoidance goals try to make people evaluate their performance positively. Meanwhile, they try to show themselves as more intelligent than others so as to avoid punishment [12]. Some research projects have studied the correlation between intelligence beliefs and achievement goals, and some studies have shown a positive and significant relationship between intelligence and mastery goals [8,9,13-15].

Other studies have indicated that students with entity intelligence beliefs choose performance-approach goals [9,12,13,15,16]. A student’s entity beliefs about intelligence are related to his/her choice of performance-avoidance goals [12-15].

Although some research findings do not proven a positive and significant relationship between mastery goals and entity intelligence beliefs and performance-approach goals, they do, simultaneously, prove a negative relationship between incremental intelligence beliefs and performance-avoidance goals and between entity intelligence beliefs and mastery goals [8].

Some researchers have studied the relationship between achievement goals and computer anxiety. For example, Tanaka, Takehara, and Yamauchi [17] have shown that performance-approach goals have a negative correlation with state anxiety, while performance-avoidance goals have a positive relation with it. Among their findings, only the relationship between performance-avoidance goals and state anxiety was significant. Other studies have indicated that mastery goals and performance-avoidance goals have a negative correlation with test anxiety [18-20], while performance-avoidance goals have a positive correlation with it [20]. Salili, Chiu, and Lai [21] noted that among Chinese students, learning goals have a positive correlation with test anxiety. Dickson and MacLeod [22] determined that anxiety is correlated to avoidance goals. Lavasani, Weisani, and Ejei [23] demonstrated that performance-approach and performance-avoidance goals affect statistics anxiety through extrinsic motivation and cognitive strategies. In a study on Tehran university students, Ghorban Jahromi [24] found that the relationship between performance-avoidance goals and computer anxiety is positive and the relationship between mastery goals and computer anxiety is negative. In that study, a significant correlation between performance-
approach goals and computer anxiety was noted. Clearly, few studies have examined the relationship between achievement goals and computer anxiety. Therefore, to determine those variables which can mediate between achievement goals and computer anxiety, the following discussions will consider cognitive engagement as a result of the adoption of achievement goals by learners. Cognitive engagement refers to all kinds of processing used by students for learning [25] and includes deep and shallow strategies which will be discussed in this article.

The research literature indicates an experimental correlation between the adoption of mastery and performance goals and cognitive engagement [26]. Cognitive engagement has commonly been conceptualized as deep and shallow learning strategies [27]. Deep learning is characterized by strategies such as elaborating ideas, thinking critically, and linking as well as integrating one concept with another [28]. In comparison, shallow learning is characterized by such strategies as memorization and reproduction of learning materials [28]. Accumulating evidence from the achievement goal literature has established a consistent pattern that indicates a mastery goal would facilitate the use of deep learning strategies (e.g., Elliot and McGregor, 2001; Greene et al., 2004 [26]).

The relationship between performance-approach goals and learning strategies is ineffective and therefore indecisive. Some studies (e.g., Elliot and McGregor, 2001, cited in [26]) have confirmed that this goal can only predict the use of shallow learning strategies. In other studies [29], this goal has a relationship with the use of both deep and shallow learning strategies. Others still [30] have not indicated any correlation between performance goals and learning strategies [26].

Liem et al. [26] indicated that both mastery and performance-approach goals positively predict deep learning. Mastery goals have a positive relation with shallow learning, and performance-avoidance goals positively predict shallow learning. Rastegar et al. [12] also showed that mastery goals positively predict metacognitive strategies and performance-avoidance and performance-approach goals positively predict cognitive strategies.

The results of some studies concerning the relationship between achievement goals and cognitive engagement indicate a positive relation between mastery goals and using deep processing strategies such as metacognitive strategies [8-10,15,16,25,31].

Moreover, research findings indicate that performance-approach goals [8,15,16,25,32] are positively and significantly related to performance-avoidance goals [15] through cognitive strategies. However, the results of Sins, et al. [33] indicate that performance-approach goal orientation has no significant correlation with the use of shallow strategies.

Some researchers have studied the relationship between cognitive engagement and computer anxiety. For example, Naveh-Benjamin [34] indicated that familiarizing learners with the procedure of learning (metacognitive strategies) can be effective in reducing their anxiety. In another study, Tsai and Tsai [35] concluded that learners with a better understanding of the four strategies of information processing, choosing the best ideas, monitoring their understanding, and using original references for their studying had more knowledge and better orientation about computers and less computer anxiety. In other words, there was a strong correlation between using these strategies and computer anxiety, but there was no correlation between shallow strategies (such as memorizing and rehearsal) and computer anxiety. Ward also found that those learners who use advanced strategies in their learning procedure have less computer anxiety than those who use shallow and simple strategies. Moreover, other studies have shown that learner’s strategies play a strong role in reducing computer anxiety [36]. Given the abovementioned findings about relationships among variables, the main research goal of the present study was to investigate the mediatery role of achievement goals and cognitive engagement in the relationship between intelligence beliefs and
computer anxiety in Payame Noor University undergraduate students within a causal model. A model derived from Dweck’s Social-cognitive perspective and other studies was used as the conceptual model and analyzed by means of path analysis (Figure 1).

**Methods**

This descriptive, correlation study was designed to examine the relationships between the studied variables through a causal model. The research population comprised undergraduate students of the Humanistic Studies Department of Shiraz Payame Noor University in the academic year 2013-2014. The research sample included 290 (194 female and 96 male) students selected by means of ratio stratified sampling. This method of sampling was chosen because of the heterogeneity of the population based on the gender variable. Data was collected through the 32-item computer anxiety scale by Beckers and Schmidt [7], the 12-item achievement goals questionnaire by Middleton and Midgley [37], the 9-item intelligence beliefs by [8] Dupeyrat and Marine, and the cognitive engagement subscale from the MSLQ questionnaire by Pintrich et al. [38] including 22 items. To determine the reliability coefficient of the subscales, Cronbach’s alpha (α) was used. The reliability coefficients for entity intelligence beliefs, incremental intelligence beliefs, computer anxiety, mastery goals, performance-approach goals, performance-avoidance goals, shallow and deep cognitive engagement were 0.80, 0.78, 0.70, 0.78, 0.78, 0.70, 0.69, and 0.70, respectively, all of which indicate the good reliability of the tools. Confirmatory factor analysis was used to determine the structure validity of variables, and the fit indices of this analysis are displayed in Table 1.

Several indices were used to assess the overall fit of the model: the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), and root mean square error of approximation (RMSEA). Generally speaking, GFI and AGFI values above 0.90 and RMSEA values less than 0.06 are indicative of an optimal model fit. RMSEA values at or above 1.0 reflect a poor fitting model. Values of $\chi^2/df$ that fall below 5.00 and CFI above 0.90 are indicative of a good fit.

Table 1 shows that the data has a good fit with factorial and fundamental constructs of intelligence beliefs, achievement goals, cognitive engagement, and computer anxiety, indicating that the questions are consistent with theoretical constructs. Data was analyzed using some descriptive indices (mean, standard deviation, skewness, and kurtosis), Pearson correlation coefficient, and path analysis with LISREL.

![Figure 1: Conceptual path model of the variables affecting computer anxiety](image-url)
Results

The causal correlations among the research variables were investigated using path analysis. Intelligence beliefs were considered as exogenous variables, while achievement goals, cognitive engagement, and computer anxiety were considered as endogenous variables. Table 2 shows the statistical indices of the research sample. Skewness and kurtosis statistics indicate that data distribution for each variable was normal. Also according to the data in Table 2, the significance level for Kolmogorov-Smirnov test for all variables is higher than 0.05, which represents a normal distribution of variables.

Since a correlation matrix is the basis of causal model analysis, Table 3 presents the correlation matrix of the variables under study along with the correlation coefficients and their significance levels.

According to Table 3, deep strategies (0.41), shallow strategies (0.28), performance-avoidance goals (0.13), mastery goals (0.10), incremental intelligence beliefs (0.08), entity intelligence beliefs (0.02), and performance-approach goals (-0.005) had the highest to lowest correlation coefficients with computer anxiety, respectively, the first three being statistically significant (p<0.01). Since the research goal was to study the mediatory role of achievement goals and cognitive engagement in the relationship between intelligence beliefs and computer anxiety, Table 4 presents the direct, indirect, and total effect coefficients of variables with their significance levels.

As can be seen in Table 4, none of the exogenous variables (entity intelligence...
beliefs and incremental intelligence beliefs) has a direct effect on computer anxiety; however, they do have indirect effects. In fact, achievement goals and cognitive engagement have mediating roles between intelligence beliefs and computer anxiety. The indirect effect of incremental intelligence beliefs (-0.05) is significant at 0.01 and is presented via performance-approach goals, performance-avoidance goals, and shallow strategies. The indirect effect of entity intelligence beliefs on computer anxiety (-0.01) has not reached a significant level. Moreover, the indirect effect of mastery goals on computer anxiety (-0.13) is significant at 0.01 and is presented through deep strategies. The indirect effect of performance-approach goals on computer anxiety (0.03) is not significant, but the indirect effect of performance-avoidance goals on computer anxiety (0.04) is significant at 0.05 and is presented through shallow strategies. Among the endogenous variables, only shallow and deep strategies directly affect computer anxiety, with deep strategies having the greatest effect (-0.39). It is noteworthy that mastery goals have the highest indirect effects on computer anxiety. Moreover, the amount of explained variance of computer anxiety in the fitted model is 22%. (Figure 2)

Given the fit indices presented in Table 5, the fitness of the computer anxiety predicting model is relatively good.

### Discussion and Conclusion

This research studied the mediating role of achievement goals and cognitive engagement in the relationship between intelligence beliefs and computer anxiety. Therefore, based on Dweck’s social-cognitive theory and research literature, a conceptual model was proposed and then analyzed by means of path analysis. The results showed that the proposed model has a good fitness with research data and predicts 22% of computer anxiety variance. Among exogenous variables, deep strategies had the greatest direct effect on computer

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Direct effect</th>
<th>Indirect effect</th>
<th>Total effect</th>
<th>R²</th>
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<tr>
<td>On Performance-avoidance goals from:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entity intelligence belief</td>
<td>0.33**</td>
<td>-</td>
<td>0.33**</td>
<td>0.11</td>
<td></td>
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<tr>
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<td></td>
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<tr>
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<td></td>
</tr>
<tr>
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<tr>
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<td></td>
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<td>-</td>
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<tr>
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<td>0.15**</td>
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</tr>
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<td></td>
<td></td>
<td></td>
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<td>0.14**</td>
<td>0.14**</td>
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</tr>
<tr>
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<td>-0.34**</td>
<td>-</td>
<td>-0.34**</td>
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<tr>
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<td>0.05**</td>
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<tr>
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<td>-0.04**</td>
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<td>-</td>
<td>-0.24**</td>
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<td></td>
</tr>
<tr>
<td>Deep strategy</td>
<td>-0.39**</td>
<td>-</td>
<td>-0.39**</td>
<td></td>
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</tbody>
</table>

*P<0.01; **P<0.05
This finding proves the hidden value and effectiveness of these strategies for students. It is noteworthy that the importance and positive effect of these strategies have been proven in many psychological studies. Also among the endogenous variables, mastery goals had the greatest indirect effect on computer anxiety through deep strategies. The fact that entity intelligence beliefs has a significant and positive effect on performance-approach goals indicates that students who think intelligence has a fixed quality focus on attaining high scores, being better than others, and gaining rewards; moreover, they choose performance-approach goals. These findings are in line with those of Dweck and Legget [9], Vermetten et al. [16], and Braten and Sromso [11].

The results also indicate the correlation between entity intelligence beliefs and performance-avoidance goals is not significant. In other words, entity intelligence beliefs cannot predict performance-avoidance goals. This finding is in line with those of Dupeyrat and Marine [8]; however, it is not congruent with the findings of Zare et al. [13]. Those who choose performance-avoidance goals try to gain positive judgments from others and show themselves as good people in order to avoid punishments [39]. In fact, they tend to have no lack of skill compared with their peers and classmates, because they concentrate on avoiding failure. The fact that incremental intelligence belief has a significant direct and positive effect on mastery goals indicates that students who think intelligence has a flexible and ascending quality focus on hard work, accept mistakes as a factor of learning, and perfect understanding and gaining new skills while they choose mastery goals. This finding is in line with those of Dweck and Legget [9], Vermetten et al. [16], Braten and Stromso [11], and Zare et al. [13]. The findings also indicate that performance-avoidance goals have a positive, direct, and significant effect on shallow strategies. This

**Figure 2:** Path diagram and estimation of the fitted model parameters for predicting computer anxiety

<table>
<thead>
<tr>
<th>Table 5: Fit indices of the computer anxiety model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>x2/df</strong></td>
</tr>
<tr>
<td>1.78</td>
</tr>
</tbody>
</table>

*P<0.01; **P<0.05*
finding is congruent with those of Rastegar et al. [12], Elliot et al. [30], and Elliot and McGregor [35], yet is not in line with those of Sins et al. [36].

Overall, the abovementioned findings indicate that students who tend toward avoiding a lack of skill and failure in regard to their peers and classmates use shallow strategies to reach their goals, and the findings show the correlation between performance-approach goals and shallow strategies is not significant. Students who have approach-performance goals concentrate on comparing their performance with that of others and consider learning as a means to reach their goals. Such a person seeks achievement so as to show his/her abilities to others and thereby gain their approval. This perception of performance arouses emotions which can motivate an individual to work harder and increase his concentration on his/her homework. This finding is in line with those of Middleton and Midgley [40] and Elliot and McGregor [35], but it is not congruent with those of Rastegar et al. [12], Elliot, McGregor, and Gable [30], Elliot and McGregor [35], or Dupeyrat and Marine [8]. In fact, it has been proven that the correlation between performance-approach goals and cognitive processing of learned data by students is paradoxical. Given this paradox, Midgley, Kaplan, and Middleton [40] believe that performance-approach goals are affected by the nature of learned materials, individual characteristics, and environmental conditions. Therefore, this paradox can be the result of using different instruments, age groups, and educational environments. For example, succeeding at university may require more endeavor and hard work than succeeding at a secondary school. Students who adopt performance-approach goals make more use of shallow cognitive strategies to reach their goals. Moreover, the results show that mastery goals have direct, positive and significant effect on deep strategies. This finding is congruent with those of Dweck and Legget [9], Elliot, McGregor, and Gable [30], Elliot and McGregor [35], Vermetten et al. [16], Dupeyrat and Marine [8], and Rastegar et al. [12].

Generally, the abovementioned findings indicate that students who seek mastery goals are interested in their homework and consider it to be important and functional. These students work endlessly and use deep strategies. Additionally, the results indicate that deep strategies have a direct, negative, and significant effect on computer anxiety. This finding is congruent with those of Tsai and Tsai [38] and Naveh-Benjamin [37]. Therefore, it can be concluded that students who use deep strategies, like lesson planning, control, monitoring and organizing, in their leaning process are likely to have less computer anxiety. Ultimately, the fact that shallow strategies have a direct and positive effect on computer anxiety indicates that students who use strategies like memorizing, rehearsal, summarizing, explaining and such have higher levels of computer anxiety. This finding is in agreement with those of Tsai and Tsai [38]. The findings show that the construct of shallow strategies has a positive and significant effect on computer anxiety, which proves that these strategies have more dysfunctional outcomes than deep strategies.

Given these findings about deep strategies and their roles in decreasing student’s computer anxiety, lesson planners should identify those variables which can motivate students to use deep strategies. Sins et al. [36] believe that achievement goal theorists suppose that students who have higher levels of mastery goals try to gain a deep insight into learning. means that these students are more engaged in deep cognitive processes so as to increase their understanding [18]. Thus, it is suggested that more interesting, usable, and beneficial tasks be provided to students., while educational authorities adapt their teaching methods to student strategies, they are recommended to increase student’s insight into deep strategies and motivate them to engage more cognitively and actively in their learning processes. Given the findings, it can also be concluded that, in classes which have fewer students and continuous evaluation, students organize their learning
process so that they tend to choose mastery goals. According to Meece, Blumenfeld, and Hoyl [44], other class-related characteristics also direct students toward mastery goals, such as diversity of homework, challenging homework, and the quality of assignments given them which should inspire the feeling that doing homework can help improve learning. According to Elliot and Dweck [41], students will seek performance goals if the criteria of schools and other educational institutions are normative. Conversely, if the criteria of these institutes are criterion-oriented accompanied by concentration on skills, students will pursue mastery goals and try to expand their learning and skills. If such an orientation as “university increases students’ social responsibility and understanding of the world” could be internalized, thereafter, students’ motivation for learning would be increased and they would be more responsible for their learning.

Moreover, given the indirect and negative effect of incremental intelligence beliefs on computer anxiety, it can be concluded that students who think that intelligence has a flexible and expandable quality adopt mastery goals and use deep strategies to reach their goals. Thus, these students are likely to experience less computer anxiety. Since the variables in this study could only predict 22% of computer anxiety variance, further research into other motivational variables and in this domain is highly recommended.

Acknowledgments
The author thanks all those students in the Faculty of Humanistic Studies from Shiraz Payame Noor University who contributed to this research.

Conflict of Interest
None declared.

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بررسی سطح رضایت دانشجویان از عملکرد دانشگاه (مطالعه موردی: دانشگاه علوم پزشکی اردبیل)

چکیده

در این پژوهش توصیفی، تعداد 705 نفر از دانشجویان مورد پرسش قرار گرفتند. ابزارگردآوری داده‌ها پرسشنامه بود. روایی این پرسشنامه بر اساس نظر شش نفر از خبرگان و پایایی آن نیز با استفاده از ضریب آلفای کرونباخ 0/816(تاریخ دریافت: 1394/11/13: تاریخ اصلاح: 1395/6/26: تاریخ پذیرش: 1395/7/10) بررسی و مورد تأیید قرار گرفت.

از لحاظ رضایت دانشجویان، ابعاد زیر حائز نمره ای بالاتر از میانگین شدند:

- مدیریت دانشجویی و دانشگاهی (زنان: 4/01: مردان: 4/03).

نتایج گیری: دانشجویان دانشگاه علوم پزشکی اردبیل از عملکرد همه واحدهای جز مدیریت فرهنگی دانشجویی رضایت نشان داده‌اند.

کلیدواژه‌ها: دانشجو، رضایت مندی، دانشگاه، عملکرد
Assessment of the Student Satisfaction Level of University Performance (Case study: Ardabil University of Medical Sciences)

Adel Zahed-Babelan1, Mahdi Moenikia2, Abbas Nagizadeh-Bagi3, Moggan KhanBabaZadeh-Ghadim4

1PhD in Educational Administration, Associate Professor of Educational Sciences group, Faculty of Psychology and Educational Sciences, Mohaghegh Ardabili University, Ardabil, Iran
2PhD in Distance Learning, Assistant Professor of Educational Sciences group, Faculty of Psychology and Educational Sciences, Mohaghegh Ardabili University, Ardabil, Iran
3PhD in Sport Management, Associate Professor of Basic Sciences group, Medical Faculty Medical Sciences University of Ardabil, Ardabili, Iran
4PhD Student in Educational Administration, Mohaghegh Ardabili University, Employed in the management of academic affairs and graduate studies in Medical Sciences University of Ardabil, Iran

ABSTRACT

Introduction: Every organization, which is a provider of services or products, is always responsible for seeking the client’s comments as feedback in order to identify the shortcomings. On the basis of such comments, organizational plans can go through growth and improvement phases. The present study, from the point of view of client tendency, is aimed at measuring the rate of satisfaction of students of Ardabil University of Medical sciences with faculties, educational management, student-cultural management, and counselling units.

Methods: As many as 705 students from all faculties of Ardabil University of Medical Sciences participated in this descriptive study. The main instrument for data collection was a questionnaire whose validity and reliability were examined and approved by the face validity method and Cronbach’s alpha coefficient (0.816). In the first step, data was investigated through descriptive statistical methods, while independent t-test and ANOVA analysis were used in the next stage to determine the difference between group comments.

Results: The results indicate that in terms of student satisfaction, the following dimensions have gained a higher score than average: colleges (female: 4.13 and male: 4.09), educational administration (female: 4.01 and male: 4.5), and counselling centre (female: 3.39 and male: 3.35). Also, student cultural management indicated a below-average satisfaction score (female: 1.85 and male: 1.99).

Conclusion: Student dissatisfaction with the practices of student-cultural management and the counselling unit is a shortcoming, which requires the people in charge to take necessary measures to improve the quality of affairs.

Keywords: Student, Satisfaction, University, Performance
Introduction

Any successful university is an institution that constantly grows and hones its abilities to meet a student’s needs and expectations and to increase their satisfaction. Researchers believe that the student satisfaction is a factor that affects the growth and development of educational centres. To achieve a good university and student satisfaction, it is necessary for a university and its officials to provide better services. Its employees, too, must pay more attention to how such services are provided. According to this point, students look at issues in different ways because of their age and moral. Investigating educational satisfaction can be a basis for helping students; it is an indicator to improve the performance and shows the success rate. On the other hand, investigating student satisfaction is useful in raising awareness of the educational process and its quality; it also shows extent of students’ interest in learning and education [1].

A study in South Africa showed the relative satisfaction of students in educational services, while the main problems reported were their tuition and university welfare services [2]. In another study, results showed that university staff and faculty members were satisfied with the service provided, but the bachelor’s students’ satisfaction was at a lower level. Library users were not satisfied about accessing the computer, the Internet, and software packages [3]. Moreover, a study by Hanssen and Solvoll at a Norwegian university indicated that the factor that most strongly influences student satisfaction with university facilities is the quality of its social areas, auditoriums, and libraries. Conversely, it is determined that computer access on the campus does not influence student satisfaction [4]. Also, another study by Poon and Brownlow indicated that real estate students in Australia have a relatively higher level of student satisfaction compared to environment students overall, but environment students have a higher level of satisfaction in this regard [5].

In this respect, a study by Hopland and Nyhus indicated a modest, yet significant, relationship between satisfaction with school facilities and exam results [6].

With this interpretation, the objective is to determine the level of student satisfaction in the Medical University of Ardabil.

Methods

In this research, the study methodology is a descriptive method and a questionnaire is used to collect data. The population consisted of all Ardebil University of Medical Sciences students in the academic year 2005–2006. In this study, all subjects were given the questionnaire. After collecting questionnaires, about 705 of them were found to be suitable for analysis (because others answered the questionnaires in a very incomplete manner). For data collection, a researcher made the questionnaire comprising 30 questions that measured the students’ satisfaction with university performance (15 questions), instructional educational and cultural management (nine questions), and the counselling centre (six questions).

The face validity of the questionnaire was set by six university professors (specialized in the field of educational management).

Reliability of the questionnaire was reviewed and approved by Cronbach’s alpha (0.816). The data collected were analysed using descriptive statistics in the first stage; next, independent t-test and ANOVA test were used to assess differences between groups.

In compliance with ‘Ethics in Research’, all participants were informed about the research objectives, and they participated in the study with the full consent. More precisely, the entrance criterion to study was full consent to participate in research, while the exclusion criterion was dissatisfaction (even low) of students to take part in this study.

Results

In this study, the mean age of students 20.6±1.5 (The minimum age was 18 and the maximum age was 29). Overall, 541 students were female (77%) and 164 students were male (23%). Also, in terms of course shift,
470 students were in day courses (67%) and 235 (33%) were enrolled in night courses. In terms of educational level, 207 students (29.3%) were studying for their associate degrees, while 222 students (31.5%) were studying for the bachelor degree and 157 students (22.2%) for the Master of Science degree. As many as 119 students (16.9%) were studying at the PHD level. In terms of being native and living in a dormitory, out of 705 students participating in the study, 259 (37%) were native and 446 (63%) were non-native. Among the non-native students, 350 (78%) were living in university dormitories.

Most of these students (27.5%) were nursing students, and the lowest amount of students (2.3%) was disease-fighting major students. However, 17 subjects did not write their field in the questionnaire.

Both male and female students had a medium level of satisfaction from schools and educational management, and had moderate-to-low satisfaction from student and cultural management and the counselling centre. Also, there was no significant difference between males and females regarding satisfaction with department services—except the educational administration department. Satisfaction of male students in educational administration was higher than the female ones. This difference was statistically significant (Table 1).

Students’ satisfaction relating to colleges services in associate degree and bachelor degree was moderate; it was at the PHD level moderate to low. This difference is statically significant. Also, there was significant difference in student satisfaction in different educational levels from educational administration, student cultural management, and the consultation centre (Table 2).

For comparing student satisfaction based on academic shifts, the independent t-test was used, and the differences between day course and night courses students were not found to be statistically significant. Also, for comparison of student satisfaction based on being native and non-native, the independent t-test was used, and it was observed that in colleges and in educational administering field, native student satisfaction is higher than that of non-native students. But in terms of student cultural management and the counselling centre, non-native students’ satisfaction was higher—this difference is not statistically significant. Comparing the mean of student satisfaction from fields based

<table>
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<tr>
<th>Area</th>
<th>Gender</th>
<th>Num</th>
<th>Percent (%)</th>
<th>Mean</th>
<th>SD</th>
<th>Sig. (2-tailed)</th>
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<td>23</td>
<td>3.65</td>
<td>2.3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Consultation Center</th>
<th>student cultural management</th>
<th>Educational Administration</th>
<th>Colleges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Associate degree</td>
<td>3.90</td>
<td>2.13</td>
<td>4.03</td>
</tr>
<tr>
<td></td>
<td>Bachelor degree</td>
<td>3.07</td>
<td>1.67</td>
<td>4.50</td>
</tr>
<tr>
<td></td>
<td>MA.</td>
<td>3.21</td>
<td>2.08</td>
<td>2.96</td>
</tr>
<tr>
<td></td>
<td>PHD</td>
<td>2.79</td>
<td>1.52</td>
<td>3.76</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>0.001</td>
<td>0.008</td>
<td>0.001</td>
</tr>
</tbody>
</table>
on their residency status, it was observed that both in colleges and in the educational administration field, the mean relating to non-dormitory student satisfaction was higher than those who live in the dormitory. However, in terms of student cultural management and the counselling centre, the mean for those who live in the dormitory was higher—this difference was not statically significant.

In examining students’ satisfaction from services, it was observed that “colleges” with 4.14 score was highest and “thereafter educational administering”, “counselling centre” and “student cultural management” with 4.13, 3.46, and 1.88 scores were were in the next ranks of students satisfaction (Table 3).

<table>
<thead>
<tr>
<th>Service provider units</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colleges</td>
<td>4.14</td>
<td>1.79</td>
</tr>
<tr>
<td>Educational Administration</td>
<td>4.13</td>
<td>2.29</td>
</tr>
<tr>
<td>Counseling center</td>
<td>3.47</td>
<td>2.4</td>
</tr>
<tr>
<td>Student cultural management</td>
<td>1.89</td>
<td>1.32</td>
</tr>
</tbody>
</table>

Based on ANOVA test and P-Value=0.001<0.05, It was concluded that there is a significant difference between the average of items.

Discussion and Conclusion

It seems that the importance of cultural and welfare affairs among students is more. Services such as timely delivery of student loans, student transportation services, nutrition, services provided in dormitories due to students’ organizations and clubs, and physical education and their extracurricular programmes can reduce the dissatisfaction. Since welfare facilities in large universities are more and can provide better services to students in this regard, the lack of consistency of the findings of this research against similar studies in large universities should be found in terms of different services provided. Since no university areas has not achieved higher scores on the level of satisfaction, managers and employees of the university should strive to identify the factors affecting student satisfaction in various areas and take appropriate actions to improve them. Also, further research is recommended following the modelling of the factors affecting student satisfaction so as to offer a native model of student satisfaction for universities of Iran.

Conflict of Interest

None declared.

References