The Effectiveness of Experience and Teaching Methods on Evaluating Performance of Faculty Members – Statistical Study

Samah Anwar Abbas[1*], Amani Mustafa Ghazzawi[2], Abeer Hassan Ali[3]

[1]Department of Management Information Systems, Faculty of Economics and Administration, King AbdulAziz University, Jeddah, Saudi Arabia; [2]Department of Management Information Systems, Faculty of Business Administration, Taif University, Taif, Saudi Arabia; [3]Department of Information Systems, Faculty of Computer Science, King Khalid University, Abha, Saudi Arabia
[*]Email: Sabbas@kau.edu.sa

Abstract

Evaluating the performance of faculty members working in educational institutions has become one of the significant concerns in the field of teaching. With the aim of improving the promotion process of the faculty members, the current study aims to analyze the two important factors namely teaching experience and the methods of teaching. Previous studies have discussed that certain factors like renewing the contract of the faculties and their service period will be considered while making the decision process of faculty promotion in the educational institutions. Therefore, this study will examine the factors that affect the evaluation process of faculty members. The study also examines to what extent the experience of teaching staff and their teaching methods will impact their performance as teachers in educational institutions. For this, the researcher adopted the statistical method - Pearson correlation and independent-measures t-stat for measuring the effectiveness of the hypothesis proposed in the study. Furthermore, this study concentrates on conducting experiments, based on the average faculty member evaluation of three ratings, which include student, head of the department, and HR. Results of the study indicated that the variable 'teaching method' is found more significant and correlated to the average faculty member evaluation, while the variable 'faculty experience' has not have a significant and strong correlation with the average rating of faculty member performance evaluation.

Keywords: Performance Evaluation; University Faculty Member; Higher Educational Institutions (HEIs); Teaching Methods; Faculty Experience

Introduction

The performance evaluation in any institution can be defined as the formal process used to identify employees' essential duties and responsibilities, traits, and other significant characteristics. It is also used to identify the different employees' improvement areas, which aim for the organization's prosperity (Almeida, 2017). Implementing the process of performance evaluation within the educational institutions can indeed help the senior management of Higher Educational Institutions (HEIs) to identify the strengths and weaknesses of the teaching staff. There is a considerable amount of literature that stresses university faculty members are the main pillars of the higher education system. Performance evaluation is an interdisciplinary study that improves the quality of the education process and manages the university's human resources efficiently, thereby increasing the quality of the university (Farjad et al., 2011).

Evaluation of Faculty members is constantly evolving with updated techniques such as teaching methods, delving into published research, experience years, and department head evalua-

tion. Many other factors such as student satisfaction surveys, which are one of the common methods are used as a tool to recognize the quality of the teaching and learning process (Centra, 1977). Evaluation of faculty members is one way to determine the level of faculties and the achievements to raise the quality of education (Bhatnagar & Saxena, 2018). This process can efficiently be used to provide informative feedback to assist faculty in improving their working level and teaching performance. Faculty member evaluation is one of the critical factors that affect the progress and improvement of the educational system. Moreover, the educational institution that evaluates teacher performance is continuously improving the quality of education by raising their performance to greater levels (Akbari et al., 2014). These days Higher Educational Institutions (HEIs) are facing challenges that affect the performance quality of institution academics such as age, peer review, self-report or review, experience years, gender, and teaching methods (Paulsen, 2002).

Past studies reported that the evaluation of faculty members has always been regarded as the most important development in the field of education. This process will slowly develop the academic levels of the institutions and enhance the learning process. Furthermore, the faculty evaluation process will aid the educational institutions to conduct various faculty development programs, which will enhance the performance of the faculty members (Miller & Seldin, 2014). Several studies have recorded the need for different tools implemented to assess the performance of the faculty members. And the results of these studies are highly convincing, which will bring a change in the behavior of the individual. It is predominantly discussed that teachers make a huge difference in the life of an individual, which can be named teacher effectiveness (Taylor & Tyler, 2012). Prominent research has discussed teacher effectiveness and found that teachers play a major role in the development of students. It was also found that teachers can motivate students, improve their social behavior of the students, and instill confidence among the students (Dargahi & Mohammadzadeh, 2013; Miller & Seldin, 2014).

Few other studies highlighted that teachers tend to be highly productive in schools over a year, especially when he/she is evaluated at constant intervals of time (Dargahi & Mohammadzadeh, 2013). The productivity of the teachers seemed to be even higher after the process of evaluation. Seminal contributions in the research stated that the performance of the teachers is affected by several factors like teaching methods, the attitude of teachers towards teaching, passion level of the teachers towards teaching, their experience in the teaching field, and so forth (Taylor & Tyler, 2012). There is no study so far that discusses on teaching experience and teaching methods as the combined factor which will impact the performance of teachers in educational institutions. Therefore, this study sheds light on the effect of two of these factors, the experience years, and the teaching methods, based on three parameters namely student's rating, department head's rating, and human resource rating. In this study, the researcher assesses the relationship between those factors and the performance evaluation of academics. In this study, the researcher adopts a quantitative method to investigate the effect of the experience and the teaching methods on the level of faculty member evaluation using statistical data analysis. For this, the data is collected from Gazi University, which is one of *the top Public Universities in Ankara, Turkey.*

This study aims to explore faculty evaluation based on student rating, head of department's rating, and human resource rating. It also aims to identify the effectiveness of the teaching methods of the faculty member on the faculty performance evaluation. Also, this study aims to examine the effect of faculty member experience years on the faculty performance evaluation. Furthermore, the researcher finds the significant factors such as faculty teaching method and their experience, which can improve their performance evaluation and thereby it will increase the quality of the educational institutions. This research is important for two reasons: (1) HEIs use faculty performance evaluation

to identify the areas of improvement in terms of teaching methodologies in subsequent semesters. (2) Faculty performance evaluation strongly influences promotion, tenure, and contract renewal decisions. Henceforth, this study aims to examine to which level the experience and teaching methods can affect the evaluation of faculty members.

Conceptual Framework and Research Hypotheses

The conceptual framework of the present study represents the factors that affect the faculty performance evaluation namely member experience and teaching method, as shown in Figure 1.
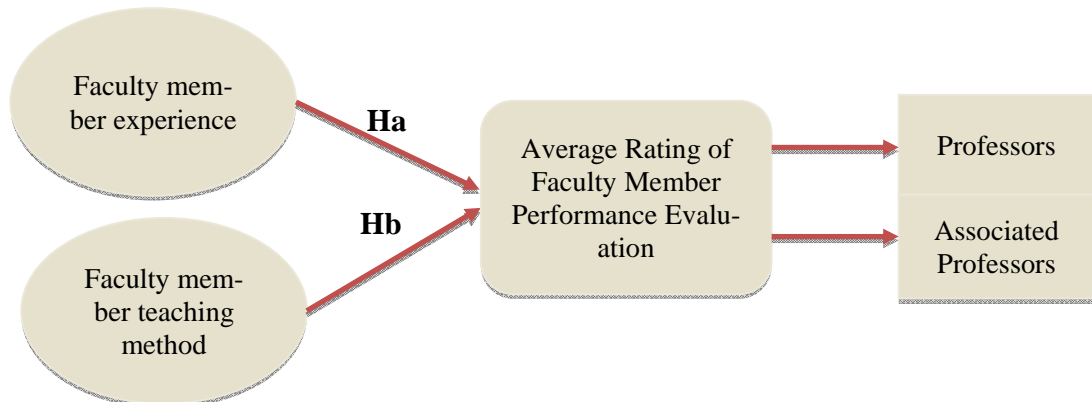

Figure 1. A conceptual Framework of our Hypothesis

Ha: Is there a significant relationship between faculty member experience and the average of faculty member evaluation?

Hb: Is there a significant relationship between teaching method and the average of faculty member evaluation?

Literature Review

In this section, the study will analyze the previous literature associated with the field of the higher education sector. Specifically, how the faculty member's experience and teaching method quality will affect the faculty member's performance based on student's rating, head of department's rating, and human resource rating will be covered in this section.

Some researchers demonstrated that there are more factors that can affect faculty performance, not just limited to one factor as we can see in the study of (M.O. et al., 2016) that applied to a faculty member history dataset from a Nigerian University. This research used feature selection methods in data mining to study sex attributes that can affect faculty performance. They found that working experiences and rank are the most important factors that can influence faculty member performance. The same techniques of data mining were applied in the study of (M. & Salama, 2019) for understanding some attributes that can affect the faculty member's performance and decision-making based on the attribute that affects the performance to be considered in selecting future faculty members. This study implemented its experiment based on three assessments, which include student's rating, head of department's rating, and human resource (HR) rating. Dataset for the study was taken from Gaze University in Turkey. In addition, in the study of (Buyukdagli & Yeralan, 2020), the performance of faculty members stressed on teaching methods, research, and activities performed by the faculty member. These three factors were combined based on the weighting statistical method to enhance the evaluation of faculty members. Also, one of the studies tried to configure a way that can evaluate the faculty performance to enhance teaching and quality of education in

higher education by Nursing Students. Researchers in this study measured the mean score for every four main components that can affect the faculty performance. These four components are identified as teaching methods, academic ability, personal and social characteristics of faculty members, and educational discipline. This study was conducted in Medical Sciences at Urmia University and found that all four components are important in faculty members' evaluation (Beheshti Rad R et al., 2014).

Moreover, some researchers used one assessment for evaluating faculty performance while others used two or three assessments. A study by (Singh et al., 2011) used clustering and association for extracting and analyzing the faculty performance in management discipline using student feedback only. On other hand, the study of (Taheri et al., 2014) aimed to compare three sources namely student rating, faculty self-assessment, and head of a department using questionnaires to evaluate the Birjand University faculty members in Iran. This study found that evaluating faculty performance based on student rating was not enough, which needed to take the consideration of self and head of department assessment. One of the studies found that the assessment based on students' ratings, which is given after the students have finished their exam, will be influenced by their grades. Due to that, this study found that it will not be more effective in faculty performance evaluation, and it needs to consider the students' learning methods as assessment where it found that they should not be affected by the student's grades. The researchers in this study said that there is a positive correlation between students' ratings and learning methods after taking lectures (Nimmer & Stone, 1991). A study by (Hornstein, 2017) found that evaluating faculty performance cannot depend on just students' ratings and there are other factors ignored, such as teaching method. Some researchers found that evaluating based on two assessments such as self and students' assessment can enhance the teaching method. As can be seen, the study (AZIZI et al., 2014) conducted their experiment using a statistical method in comparing the mean score of faculty member self-assessment and students' assessment for each academic level (postgraduate and undergraduate). The researchers in this study found that there is a significant difference in mean scores between self-assessment and students' assessment at the undergraduate level while a few differences at the postgraduate level. Thus, they recommended that the teaching method needs to be adjusted to enhance the faculty performance in teaching, especially at the undergraduate level.

As a result, it can be concluded from the previous related work that evaluating the faculty members based on students' assessments cannot reflect the real evaluation of the performance of the faculty member. Also, based on students' evaluation it can be stated that the study cannot study on the impact factors that can influence the faculty evaluation, such as teaching method, experience, faculty members' demographic information, publishing research, and rank of a faculty member. In this study, the researcher aims to improve the faculty member's performance and study what is the influence of their experiences and teaching methods that can influence their performance. Henceforth, this study focuses on these two factors based on taking the average of three assessments (student's rating, head of department rating, and HR rating).

Methodology
Data Set Terminology and Description
The dataset includes data for faculty members who were evaluated by human resources, the head of the department, and students at Gazi University, one of Turkey's universities in Ankara. The data contained 5820 records, as it included 23 features represented in personal, academic information and assessment of teaching staff members, who are lecturer assistants, lecturers, associated professors, and professors.

Data Preprocessing and Feature Extraction

In the processing and extraction phase, the researcher selected the features that are required in our study and removed the non-significant features. In addition, the nominal data were converted into numerical data to facilitate data processing and later apply statistical methods. As it has been noted, most of the previous studies focused on the effect of student evaluation on the performance of faculty members, which may not give real value to performing effectively. Therefore, the researchers suggested on measuring the effect of the experience factor and the teaching method on the evaluation of the faculty member. Based on this, a random sample of 50 members was taken from the associated professors and professors with a high degree of education and experience. Then, the researcher aimed to focus on studying the impact of experience and teaching method factors on their performance. The study relied on the following characteristics: experience, academic degree, teaching method, evaluation of the head of the department, human resources, and students. The following Table1 shows the features the study used and what they stand for. Table 1 records the results of the feature extraction phase, which stresses keywords such as personal information, experiences, teaching methods, teaching assessment, or evaluation of the lecturer/professor/teacher.

Table 1. Features Classification and Description of Faculty Member Evaluation Dataset

Classification	Features	Variables Description
Personal Information	ID	Each record has a unique ID, for example, 1,2,3...
Experiences	Experience	**(Rating from 1 to 5)** 1 if $Exp \leq 2$ 2 if $2 < Exp \leq 7$ 3 if $7 < Exp \leq 12$ 4 if $12 < Exp \leq 17$ 5 if $Exp > 17$
Teaching Method & Assessment of Lecturer	Teaching method	**(Rating from 1 to 5)** Very poor= 1 Poor= 2 Reasonable= 3 Good= 4 Very good= 5
	Rating of students	
	Rating of head of department	
	Rating of human resources	

This section explains the phase of feature extraction in detail. The experience was classified into five domains described in Table 1. For example, the number 1 refers to faculty members with two or less than two years of experience, while the number 5 refers to faculty members with more than seventeen years of experience. The criteria in the teaching methods indicated the extent of the faculty member's commitment to the course and the methodologies the faculty follows in teaching. In evaluating members, the head of the department relied on the research and conferences presented by the faculty member, while the human resources department relied, in assessment, on the commitment of the faculty member to attend lectures on time and not to be absent. The university also gave scope for students' assessment of a faculty member. These evaluations included five criteria of rating from numbers 1 to 5 as explained in Table 1.

Research methods and design

In this study, the researcher adopted a quantitative method for investigating the effect of the experience and the teaching methods on the level of the average rating of faculty member perfor-

mance evaluation using statistical data analysis. The statistical methods employed in this study include Person correlation and Independent-measures t-state by taking the average of three rating scores (students, head of the department, and HR). Microsoft Excel as a tool was utilized in the analysis phase to determine the impact factors of two variables namely faculty member experience and their teaching methods. Also, this study aimed to determine the degree of the relationship between these two variables and identify a significant factor that influences the faculty member's performance. The independent variables included the faculty members' experience and their teaching methods, while the dependent variable was the average score of all three assessments together, which are students' rating, head of department's rating, and HR rating.

Sample

To conduct our experiments, the researcher adopted random sampling using systematic sampling methods (ZACH, 2021). Our sample is 50 members that including associate professors and professors, whose number reached 2,956 members from the Gazi University dataset. Table 2 records the descriptive statistics of this data.

Table 2. Statistical Descriptive of Faculty Member Evaluation Dataset

Variable	Max	Min	Mean	Standard Deviation
Experience	5	1	4.16	1.02
Teaching method	5	1	3	1.22
Average rating of faculty performance	4.76	2	3.39	0.64

Results and Discussion

Hypothesis testing and result

In this section, the researcher tests each hypothesis individually using *t-stat*, Alpha (α=level of significance) and Correlation Coefficient.

To calculate the Correlation Coefficient (*r*), which use for measuring the relationship strength between two variables, the study adopts the following formula:

$$r = \frac{1}{(n-1)} \sum \left(\frac{x-\underline{x}}{S_x}\right)\left(\frac{y-\underline{y}}{S_y}\right) \qquad (1)$$

Where *n* is sample of population, *x* and *y* are variables sample, $\underline{x}$ and $\underline{y}$ are mean of each variable *x* and *y*, and S_x S_y are standard deviation for each variable. Furthermore, for testing the significance of the correlation coefficient, the researcher utilized Computing *t-stat* to find out the correlation coefficient using the following formula:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \qquad (2)$$

Where *n-2* is a degree of freedom. Thus, testing the two hypotheses are represented as following:

Ha: Is there a significant relationship between faculty member experience and average rating of faculty member evaluation?

H0: p=0 (There is no significant relationship between faculty member experience and faculty member evaluation).

H1: p≠0 (There is a significant relationship between faculty member experience and faculty member evaluation).

The test statistical results of the first hypothesis of the *r, t-stat*, and *p-value* configuration are represented in the Table 3:

Table 3. Test Result of Ha Hypothesis of Faculty Member Experience

Correlation Coefficient	r	0.079258375
Testing the Significance of the Correlation Coefficient	α	0.05
	t stat	0.55
	tc	2.015367574
	p-value	0.584869723

Comparing the value of test statistic (*t-stat*) of 0.55 and the critical value (*tc*) of 2.015 at degree of freedom (*df=48*), the study found that *t-stat* is 0.55 < *tc*. Hence, the study **does not reject the null hypothesis H0**. Concluding that the sample correlation coefficient of 0.079 is too small to have come from a population with no correlation. In another way, although there is a slight positive correlation, it still **does not have a significant correlation** between faculty member experience and the average rating of faculty member performance evaluation. Figure 2 represents the decision rule for the test of hypothesis *Ha* at a 0.05 significance level and 48 *df*.
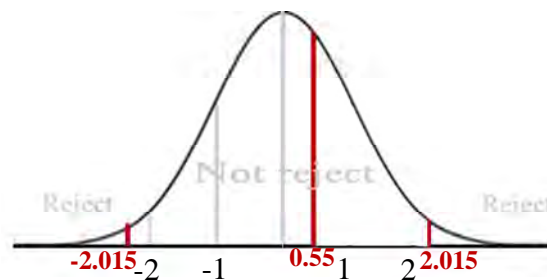

Figure 2. Decision Rule of Testing Ha at α= 0.05 Significant Level and 48= df

Moreover, the study can also explain the test of hypothesis based on *p-value*, where *p* is 0.584 > *α* 0.05. That means there is **no significant relationship** between faculty member experience and the average rating of faculty member performance evaluation. In Figure 3, we can see the relationship based on the scatter plot.
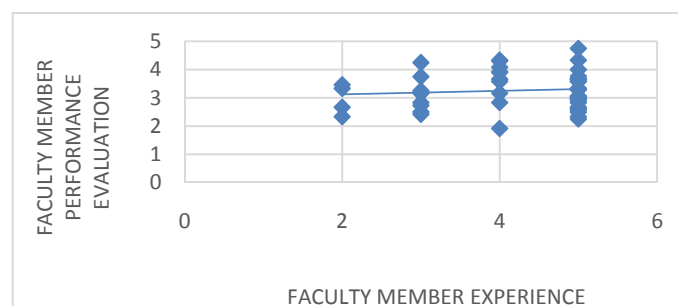

Figure 3. Scatter plot of Experience and Average Rating of Faculty Member Performance Evaluation

Hb: Is there a significant relationship between teaching method and average rating of faculty member evaluation?

H0: p=0 (There is no significant relationship between teaching method and average rating of faculty member evaluation).

H1: p≠0 (There is a significant relationship between teaching methods and average rating of faculty member evaluation).

The test statistical results of the first hypothesis of the *r, t-stat*, and *p-value* configuration are represented in the *Table 4*:

Table 4. Test Result of Hb Hypothesis of Faculty Member Teaching Method

Correlation Coefficient	r	0.7969343
Testing the Significance of the Correlation Coefficient	α	0.05
	t stat	9.24
	tc	2.010634758
	p-values	3.15478E-12

Comparing the value of the test statistic (*t-stat*) of 9.24 and the critical value (*tc*) of 2.011 *at the degree of freedom (df=48)*, we found that the *t-stat* is 9.24 > *tc*. Hence, the study **rejects the null hypothesis H0.** The conclusion is that the sample correlation coefficient round of 0.80 means there is a **strong positive and significant correlation** between teaching method and an average rating of faculty member performance evaluation. Figure 4 represents the decision rule for the test of hypothesis *Hb* at a 0.05 significance level and 48 *df*.
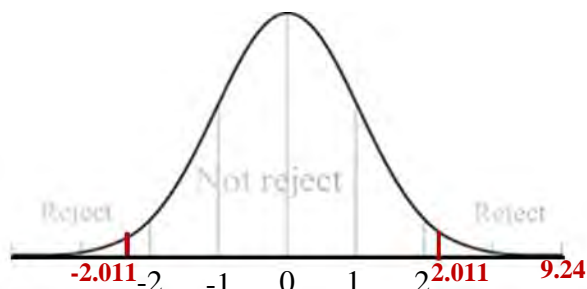

Figure 4. Decision Rule of Testing Hb at α = 0.05 Significant Level and 48 = df

Moreover, the study also explains the test of the hypothesis based on *p-values at df = 48,* where *p* is $0.003 < α$ 0.05. that means there is **a significant relationship** between the teaching method and the average rating of faculty member performance evaluation. In Figure 5, we can see the relationship based on a scatter plot.

Based on the previous analysis section, the researcher presents the result of the tested hypotheses in Table 5. The study found that the teaching method has a significant relationship with the faculty evaluation. Hence, it clearly affects the average rating of faculty member performance evaluation where the result of *t*=9.24 more than the critical value, *r* = + 0.79 explained the strongly and positively correlated, and $p < 0.05$. That means when faculty members concentrate on enhancing their teaching method, like teaching by meeting the course requirement, increasing their relevant knowledge, encouraging students to participate, answering the student's questions, or presenting test solutions, and discussing them with students will increase the average rating of faculty member per-

formance evaluation. As mentioned in the data analysis section, this average is based on students' ratings, head of department ratings, and HR ratings, as a result, all these ratings can be increased if the faculty member enhances their teaching method. On the other hand, the faculty member experience years are not strongly affecting the average rating of the faculty member performance evaluation, as we found the value of $t = 0.55$ is less than the critical value, $r = +0.079$ which indicates a very weak correlation, and $p > 0.05$. Thus, the increase in faculty member experience will not significantly increase the faculty member's performance evaluation. Furthermore, based on the results that have been reached, the study found that the faculty member who has more years of experience, needs to improve his/her method of teaching provided to students to improve the performance evaluation.
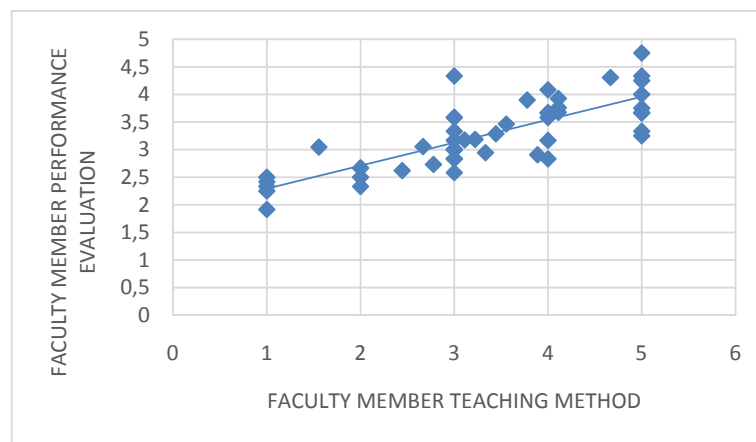

Figure 5. Scatter plot of Teaching Method and Average Rating of Faculty Member Performance Evaluation

Table 5. Faculty Experience and Teaching Method Effects on average rating of Faculty Member Performance Evaluation

Factors	p-value	t-stat	r-correlation	Null Hypothesis
Faculty Experience	0.584	0.55	0.079	Accept
Teaching method	0.003	9.24	0.79	Reject

$p<0.05$, 48= df, tc of faculty experience = 2.015, tc of faculty teaching method = 2.011

Conclusion

This research aims to statically analyze the effect of the years of experience and teaching method on the average rating of faculty member performance evaluation in university faculty members in Turkey with focusing on the professor level based on their importance in higher education. In addition, this research explored the significant associations between the faculty experience and average rating of faculty member performance evaluation and also between teaching methods and faculty member performance. Based on the statistical result, enhancing the faculty members' teaching method will enhance faculty performance evaluation on the average student's rating, head of department's rating, and HR rating of the faculty member. Also, having faculty members with more experience does not necessarily enhance their performance. In future work, the researcher intends to use classification techniques to study the factors that have a more significant impact on enhancing teaching methods.

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