



# Assessing the Effectiveness of the Integrated OSPE in Undergraduate Medical Curriculum, Students' Perception

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## Abstract

**Introduction:** Integrated OSPE is a multi-disciplinary practical exam where many disciplines are included. Each station is written as a case scenario after that the students are requested to perform a specific practical task and answer a specific question related to the case. Thereafter there is integration between cognitive and psychomotor skills. In addition to that also integrated OSPE is aligned also with the vertical integration as in the same exam, the student will be assessed on knowledge and skills of basic and clinical sciences. The current study assesses the effectiveness of the integrated OSPE from students' perception in addition to psychometric analysis for the integrated OSPE satisfaction questionnaire was performed to ensure the trustworthiness of the data. **Aim of the Study:** To assess the second-and third-year medical students' perception of integrated OSPE. **Material and Methods:** A descriptive study, cross-sectional study is utilized where a factor analysis of the inter-correlations of responses to 23 items reflecting the assessment of students' perception towards Integrated OSPE for a sample of 293 medical students was carried out. The study was conducted at Fakeeh College for Medical Sciences, Jeddah, KSA. **Instrument:** 23 items self-administrated questionnaire was distributed to second-and third-year medical students. **Results:** Most of the students were satisfied with the integrated OSPE. The results revealed that the 23 items of the I-OSPE satisfaction survey resulted in four factors. **Conclusion:** Integrated OSPE is vital to be implemented and assessed especially in an integrated curriculum as the teaching strategies need to be aligned with the assessment methods. The current study shows high students satisfaction rate for the I-OSPE.

**Keywords:** Cronbach's Alpha, Exploratory Factor Analysis, Integrated OSPE Students' Perception

## 1. Introduction

Assessment is the critical component in the educational process<sup>1</sup>. The teaching and assessment methods need to be aligned well with the assessment methods to enhance the knowledge retention and educational process accordingly<sup>2</sup>. The new paradigm shift in the medical curriculum all over the world emphasizes the utilization of integrated and systems-based curricula. Thereafter, the used assessment methods need to be changed to match the teaching and learning methods<sup>3</sup>.

The Objective Structured Practical Examination (OSPE) was initially formulated in medical education by Harden in 1975<sup>4</sup>.

In the OSPE, the students go through multiple stations to assess their competencies. Different types of stations are used in the procedural/observed station. In this station, the student is requested to perform the procedure or practical activities to be assessed through observation using specific items on a checklist<sup>5</sup>. However, in a static unobserved station, the students are asked to interpret laboratory tests or identify an instrument<sup>6</sup>.

The identification of the station number in any OSPE depends on many factors like the number of the students will be assessed, content, skills and the learning outcomes will be assessed and evaluated, the time assigned for each station,

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the facilities and equipment available and the availability of examiners and assessment checklists<sup>7</sup>.

Studies show that there is a gap between students' performance in the practical/clinical aspect of the curriculum and the theoretical component<sup>8</sup>. To bridge this gap, integrated OSPE is recommended to be utilized, especially in innovative integrated curricula and systems-based curricula<sup>9</sup>. Two types of integration are introduced: The first is the horizontal between all basic science disciplines together, on one hand, and the vertical between the basic and clinical sciences, on the other hand, so the classical OSPE is incompatible with integrated, systems-based curricula<sup>10</sup>.

The Integrated OSPE is a multi-disciplinary practical exam where many disciplines are included. Each station is written as a case scenario and after that, the students are requested to perform a specific practical task and answer a specific question related to the case. For that, there is integration between cognitive and psychomotor skills<sup>11</sup>. In addition to that, integrated OSPE is aligned also with vertical integration as in the same exam the student will be assessed on knowledge and skills of basic and clinical sciences<sup>9</sup>.

The objective of the current study is to assess the second- and third-year medical students' perception of integrated OSPE.

## 2. Methodology

### 2.1 Type of the Study

This is a cross-sectional-descriptive study, where the second and third Students' perception of the integrated OSPEs was assessed.

### 2.2 Site of the Study

Bachelor of Medicine, Bachelor of Surgery (MBBS) program was held in Fakeeh College for Medical Sciences (FCMS). MBBS is an integrated, system-based program. The students started their system-based modules in the second year. Each module comprises anatomy, physiology, histology, biochemistry, pathology, microbiology professionalism and clinical skills where horizontal and vertical integration is maintained. The Multidisciplinary teaching of each module identifies the module learning outcomes and aligned these outcomes with appropriate teaching and assessment methods.

## 3. Target Population

Second- and third-year medical students (309 students).



**Figure 1.** Diagram of a classical multi-disciplinary objective structured practical/clinical examination.

## 4. Description of Integrated - OSPE

Integrated OSPEs were constructed for each module in the second and third years. Different disciplines were included like anatomy, histology, physiology, biochemistry, pathology, pharmacology, microbiology, radiation and general medicine (history taking and physical examinations).

## 5. Validity and Reliability

Validity and reliability are maintained through the following steps:

- Developing a blueprint and extensive examination revision.
- Rating instruments were developed for the clinical skills stations (history taking and physical examination).
- Raters' standardization and training on the developed rating instruments.
- Training of the standardized patients used in clinical skills stations.
- The basic science stations were linked to clinical practices in form of clinical scenario-based stations.
- In each module, the integrated OSPE had 12–20 stations. This exam included different types of stations, both dynamic/observed (for example, taking history or performing physical examination) and static (for example, identification of a slide or data interpretation).

### 5.1 Instrument

The students' satisfaction was assessed using a questionnaire. The used questionnaire consists of four core factors and 23 items.

- Organization of the examination factor consists of five items.
- Preparation for the examination factor consists of four items.
- Quality of the examination factor consists of six items.
- Stations' quality and design consist of eight items.

Content and construct validity were assessed through Exploratory Factor Analysis (EFA) to identify the number of factors that describe the common variance. Furthermore, the reliability of the questionnaire was assessed using Cronbach's coefficient alpha.

The questionnaire has five-point Likert scales ranging from strongly disagree with assigned value 1 to strongly agree with assigned value 5.

## 5.2 Statistical Analysis

The data obtained were analyzed to calculate Cronbach's alpha which is a measure of internal construct reliability. (Using SPSS software version 22) (IBM Corp. Released 2013).

The mean  $\pm$  Standard Deviation (SD) of each item of the questionnaire were calculated and presented. A P-value of  $<0.05$  was statistically significant. Internal consistency reliability was measured using Cronbach's  $\alpha$ .

Testing the psychometric properties of the I-OSPE satisfaction questionnaire was performed through EFA using principal component analysis with varimax rotation.

## 6. Results

### 6.1 Demographic Data

293 students responded to the distributed questionnaire with a response rate of 95%, 60% of the respondents were females (175 students) and 40% were males (118).

## 7. Descriptive Analysis of Students' Satisfaction Questionnaire of Integrated OSPE (I-OSPE)

The table showed that almost all students were satisfied with OSPE

Table 2 shows the frequency distribution of the organization of integrated OSPE individual items. Overall, most students showed a high satisfaction rate for this factor, especially the first and fifth items that were related to the schedule announcement and cooperation of staff

Table 3 shows the frequency distribution of preparation of integrated OSPE individual items. Overall, the majority of students showed a high satisfaction rate for this factor, especially the fourth item that was related to the required equipment and supplies.

Table 4 shows the frequency distribution of preparation of integrated OSPE individual items. Overall, most students showed a high satisfaction rate for this factor, especially the fifth item that was related to the elimination of examination bias.

Table 5 shows the frequency distribution of preparation of integrated OSPE individual items. Overall, the majority of students showed a high satisfaction rate for this factor, especially the first three items that were related to the clarity of instruction, the logical sequence of the examination, and the station reflecting what was taught.

**Table 1.** Means and standard deviation of the four factors of the students' I-OSPE satisfaction questionnaire (n = 293)

Factors	Number of Items	Means	Standard deviation
(F1) Organization of the I-OSPE	5	4.4	±0.76
(F2) Preparation for the I-OSPE	4	4.5	±0.78
(F3) Quality of the I-OSPE	6	4.7	±0.83
(F4) Stations quality and design	8	4.4	±0.75

**Table 2.** Frequency distribution of organization of the I-OSPE factor (n = 293)

	Items	(Strongly agree/ agree) %	Neutral %	(Strongly disagree/ disagree) %
(F1) Organization of the I-OSPE	1. The announcement about the place of the I-OSPE examination is declared	90	10	0
	2. The timetables of the I-OSPE examination were available and known to students early.	80	15	5
	3. General idea about the I-OSPE before the exam process is given.	85	6	4
	4. The examination room/lab was well prepared.	85	4	6
	5. The staff was cooperative in answering your questions related to the organization of the examination.	90	7	3

**Table 3.** Frequency distribution of preparation of the I-OSPE factor (n = 293)

	Items	(Strongly agree/ agree) %	Neutral%	(Strongly disagree/ disagree) %
(F2) Preparation of I-OSPE	1. Proper training and revision are received for students.	90	5	5
	2. Clear instructions prior to start of the exam are given	90	8	2
	3. The revision done before the examination covers the different types of clinical procedures.	80	5	15
	4. All required equipment and supplies were available to complete the procedures.	91	8	1

**Table 4.** Frequency distribution of Quality of I-OSPE factor (n = 293)

	Items	(Strongly agree/agree) %	Neutral%	(Strongly disagree/disagree) %
(F3) Quality of Examination	The integrated OSPE was well structured	90	7	3
	The integrated OSPE covered a wide range of knowledge and skills consistent with the learning outcomes of the course.	85	7	8
	The integrated OSPE promotes critical thinking and problem-solving.	80	5	15
	The Integrated OSPE includes practical experiences that require the integration of knowledge and skills	91	2	8
	This method of integrated OSPE eliminates examiner bias.	93	3	4
	This method of examination decreases stress and provides a chance to score better.	85	6	9

**Table 5.** Frequency distribution of Station quality and design factor (n = 293)

	Items	(Strongly agree/agree) %	Neutral %	(Strongly disagree/disagree) %
(F4) Stations quality and design	Instructions for the station were clear	100	0	0
	The sequence of stations was logical	100	0	0
	Stations reflect what taught	100	0	0
	Stations provided opportunities to learn	91	9	0
	The time allocated in each station was sufficient to complete the procedure/question	92	0	8
	The number of OSPE stations is sufficient.	93	2	5
	The stations were relevant to the required skills.	94	3	3
	The questions asked in the station were relevant	90	4	6

## 8. The psychometric properties

The psychometric properties of the OSPE satisfaction questionnaire were tested through Exploratory Factor Analysis (EFA) and reliability analysis.

### 8.1 First: Exploratory Factor Analysis

#### 8.1.1 Checking the Suitability of Data for Factor Analysis

Sample size: The sample size is 293 students. This sample is adequate for performing Exploratory Factor Analysis.

- The correlation matrix: There is a moderate correlation between the observed items of the questionnaire used in this analysis and this correlation was statistically significant. In addition to that, no large correlation coefficient was observed, so there was no need for the elimination of any of the questionnaire items.
- Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity. The KMO Measure of Sampling Adequacy were 0.86, which is excellent and indicates sufficient items for each factor. In addition to that, Bartlett's test of sphericity was statistically significant ( $P < 0.001$ ) which indicates a significant correlation between questionnaire items. Therefore, this output indicated the appropriateness of the data for factor analysis.

### 8.2 Extraction of Factors

To identify the number of factors describing the common variance and remove the redundant items from the questionnaire, a Principal component analysis with varimax rotation was performed. The analysis revealed 23 items of the I-OSPE satisfaction questionnaire, constituting four factors. These four factors account for 85.46% of the total variance.

### 8.3 Rotation of Factors

No items were deleted from the analysis of the initially formulated 23 items. So, the final validated questionnaire will consist of four factors with 23 items as shown in Table 4.

In addition to that, the communalities of the 23 items were presented in Table 5. These communalities were between 0.51 and 0.75 and this indicated that identified factors explained most of the variance in the items being analyzed.

### 8.2 Second: Reliability Analysis

The Cronbach's alpha coefficients of the I-OSPE satisfaction questionnaire four factors were between 0.70 and 0.86. Furthermore, the total questionnaire Cronbach's alpha was 0.989. This result indicates excellent reliability and good internal consistency of the questionnaire. In addition to that, the reliability scale didn't increase with the deletion of any item from the questionnaire.

**Table 6.** Factor structure of the OSPE satisfaction questionnaire using principal component analysis

Items	Component				Communalities	Factor labeling
	1	2	3	4		
The announcement about the place of the I-OSPE examination is declared	0.72				0.67	F1 The organization of the examination
The timetables of the I-OSPE examination were available and known to students early.	0.70				0.63	
General idea about the I-OSPE before the exam process is given.	0.69				0.60	
The examination room/lab was well prepared.	0.62				0.55	
The staff was cooperative in answering your questions related to the organization of the examination.	0.56				0.59	

Proper training and revision are received for students.		0.77			0.57	F2 Preparation for the examination
Clear instructions prior to start of the exam are given		0.63			0.54	
The revision done before the examination covers the different types of clinical procedures.		0.58			0.52	
All required equipment and supplies were available to complete the procedures.		0.54			0.47	
The integrated OSPE was well structured			0.77		0.65	F3 Quality of the examination
The integrated OSPE covered a wide range of knowledge and skills consistent with the learning outcomes of the course.			0.64		0.47	
The integrated OSPE promotes critical thinking and problem-solving.			0.56		0.55	
The Integrated OSPE includes practical experiences that require the integration of knowledge and skills			0.56		0.54	
This method of integrated OSPE eliminates examiner bias.			0.53		0.75	F4 Stations' quality and design
This method of examination decreases stress and provides a chance to score better.			0.52		0.620	
Instructions for the station were clear				0.64	0.479	
The sequence of stations was logical				0.52	0.61	
Stations reflect what taught				0.50	0.60	
Stations provided opportunities to learn				0.68	0.58	
The time allocated in each station was sufficient to complete the procedure/question				0.60	0.46	
The number of OSPE stations is sufficient.				0.50	0.57	
The stations were relevant to the required skills.				0.50	0.60	
The questions asked in the station were relevant				0.70	0.60	

### 8.2.1 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.989	.979	23

## 9. Discussion

To get the maximum benefit of the integrated curriculum the assessment methods should be fully aligned with teaching strategies. The MBBS program in FCMS is an integrated spiral

curriculum where hybrid teaching multidisciplinary sessions are offered like PBL, TBL, Integrated Cases and Clinical Case Presentation. Thereafter, the assessment methods should be aligned with these integrated methods. This study aims to evaluate the effectiveness of integrated OSPE in the second and

third years of the MBBS program. To assess the effectiveness of integrated OSPE in efficient and appropriate way, it was mandatory to use valid and reliable instrument. The content validity of this instrument was ensured and assessed through the proper revision of medical education experts. Moreover, the construct validity was tested for the same through the Exploratory Factor Analysis (EFA). The reliability of the scale was also evaluated through the utilization of tests for internal consistency, using Cronbach's alpha coefficient. The measured reliability of the questionnaire was 0.989 which is excellent reliability and this result is consistent with a study conducted at Qassim College of Medicine, Kingdom of Saudi Arabia to assess the effectiveness of the Theme-Based Integrated OSPE, in which the exam reliability was 0.924. The high-reliability results from the Integrated OSPE reflect well-structured and high-quality exams<sup>11</sup>. The current study revealed that the students were highly satisfied with the integrated OSPE regarding the four following factors: organization of the I-OSPE, preparation for the I-OSPE, quality of the I-OSPE and stations' quality and design. In addition to that, the highest satisfaction rates were for the quality of I-OSPE and the preparation of I-OSPE. This result was consistent with a study conducted at King Saud University College of Medicine to outline the development and implementation of four Integrated Laboratory Classes (ILCs)<sup>12</sup>. In addition to that, these results are also consistent with the results revealed from a study conducted at Shifa College of Medicine, Pakistan, that aimed to conduct competency-based IPEs and the students were satisfied with the experience<sup>9</sup>. The main reason for students' high satisfaction rate with the I-OSPE regarding the exam quality and preparation in the current study is the clear exam instructions and well-planned orientation given to students before the exam. In addition to that, the linkage of the I-OSPE as a method of assessment with student learning is also evident.

## 10. Conclusion

For an integrated curriculum to succeed, attention should be given, not only to the knowledge and cognitive components but also to the skills acquired. For that, the teaching strategies should be well aligned with the assessment methods. Therefore, theory and practice should have potential clinical application in the future, so the student should utilize the knowledge component in the application of the practical and clinical activities.

Implementing Integrated OSPE was crucial in integrating students' knowledge and skills to improve their learning and this was evident in the high satisfaction of the two domains

related to preparation for the I-OSPE and the quality of the I-OSPE.

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