

# Public Perception Of Online Assessment Of Chemistry Practical Examination

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## **Abstract**

The study examined public perception of on online assessment of chemistry practical examination. Descriptive survey design was employed for the study. Three research questions and two hypotheses guided the study. Online survey and focused group discussion (FGD) of 220 and 10 participants respectively. Public Perception of Online Assessment of Chemistry Practical Examination (PPOACPE) was used as instrument for data collection. An expert in measurement & evaluation and another expert in chemistry education both in science education department, University of Nigeria Nsukka, validated the instrument. The reliability index of 0.67 was obtained using Cronbach Alpha reliability estimate. Research questions was answered using quantitative analysis, i.e. mean and standard deviation, while the focus group discussion was analyzed qualitatively. The hypotheses were analyzed using t-test and analysis of variance (ANOVA). The summary of the focus group discussion was transcribed. The result showed that the general public has positive perception of online assessment of student in chemistry practical. There was no significant difference in the mean response of the perception of the general public of online assessment of chemistry practical with respect to both socio-economic and location. It was recommended that, online assessment should be employed in assessing students during chemistry practical, also students should be adequately instructed on the areas in which they will be assessed during the practical sessions, and proper feedback should be given.

**Keywords:** Chemistry, Laboratory, Chemistry practical, Assessment, Online assessment

## Introduction

The physiological and biological activity of living organisms is attributed to some degree of chemical reaction. This chemical reaction takes place when living organisms breathe, eat, walk, talk, sit or even run. The knowledge which is concerned with these physical activities, phenomena and unbiased observation and systematic experimentation is referred to as science (Britannica, 2020). The branch of science that deals with the properties, composition and structures of substances (elements and compounds), the transformation they undergo and the energy that is released or absorbed during the process is what Usselman & Rocke, (2020) described as Chemistry. Chemistry is one of the core sciences subjects. It has been described as the study of matter and its interactions with other matter and energy (Anne, 2020). By nature, chemistry is broad and it is divided into various components namely; physical chemistry, organic chemistry, inorganic chemistry, Analytical chemistry, and practical chemistry, among others.

Chemistry is a body of knowledge gained from observation, study and experimentation as opposed to guesswork or opinion (Okorie, 2018). According to Abungu, Okere and Wachanga (2014) chemistry is a practical science subject that provides students with the opportunity to use science process skills that can be applied to solve problems in everyday life and contribute to national development. The importance of chemistry cannot be overemphasized as identified by Anne (2020) that in medicine, the knowledge of chemistry helps a person to understand how vitamin, supplement and drugs generally can benefit or cause harm to a person. It's also applied in testing new medical treatment and medicine. The use of bleach, disinfectant, dettol and soaps and how they work are all chemistry. Chemistry also explains how food transforms from raw to cooked food, the preservation, utilization of food by the body and how ingredients interact to become food. All these processes are harnessed in the chemistry laboratory.

According to Bertholf, (2017) a laboratory is a facility that provides controlled environments to build an organized body of knowledge in the form of tested explanations and make predictions about the universe. Chemistry laboratory is a laboratory for research in chemistry. It usually involves student interaction with laboratory equipment and facilities in

order to facilitate learning. This interaction in a controlled environment is referred to as practical work. Chemistry practical according to Avi, Mira and Ian (2013) is experiences in school settings in which students interact with equipment and materials or secondary sources of data to observe and understand the natural world. Chemistry practical is an aspect of chemistry where theories learnt in class are put into practice. Chemistry practical according to (Abrahams & Reiss, 2012) is teaching and learning activity in which students, working either individually or in small groups, are involved in manipulating and observing real objects and materials as opposed to materials as those obtained from a text-based account.

Laboratory practical activities have long had a distinctive and central role in science curricula as a means of understanding the natural world. For students to effectively participate and gain better understanding of laboratory activities there are number of skills and abilities which the students need to develop. These skills include: observational skills, measuring abilities, communication/ writing skills for effective reporting of inferences, ability to classify variables and phenomena, ability to manipulate numbers (numeric intelligence), time management competence, questioning skills, planning and hypothesizing abilities, ability for students to formulate models, effectively explain experimental procedures, creativity and intuitive abilities, dexterity in handling equipment, ability to differentiate colours etc. the only means to know if these skills has been acquired and being deployed by students in the laboratory is through assessment of the practical works been done in the laboratory during and after the activities.

This is in agreement with Nworgu, (2015) that teaching and learning cannot be said to have taken place without adequate and appropriate testing. Test in this case is an assessment instrument (tool). It is a structured situation comprising a set of items (questions or statements) given to individuals to determine the amount of relevant traits or abilities they possess (Nworgu, 2015). Assessment is the gathering or collection of information about an object in order to rate it. There are several assessment techniques through which information about student achievement can be gathered and evaluated. It can be through tests, examinations, extended practical work, projects, portfolios and oral work (International Baccalaureate Organization (IB), 2017). Assessment can also be the collection of quantitative and qualitative data about student learning using variety of techniques (Doran, Lawrenz & Hegelson as cited in Sedumedi, 2018).

According to Hensiek et al. (2016) who stated that instead of relying on an indirect assessment of students' technique via their reported data, instructors have the ability to monitor students' skills and provide appropriate individual feedback to improve their performance through online digital assessment.

Online assessment is a form of assessment where by students are assessed at the end or during an online instructional processes. Students are taught and also assessed either by administering an online test or through submission of online video presentation by each student. According to Barbara, Yukie, Robert, Marianne, and Karla (2010), online assessment is defined as the assessment that takes place partially or entirely over the Internet. Online learning and assessment saves time, reduces cost and enhance individualized learning. Technology supports learning experiences through active learning by building knowledge through inquiry-based manipulation of digital artifacts and interactive learning where learner builds knowledge through inquiry-based collaborative interaction with other learners and teachers (Barbara, Yukie, Robert, Marianne, & Karla, 2010). This indicates that online assessment can be done through inquiry-based collaborative interaction where the teacher can assess the learner's skills and knowledge via a created video by students.

The video can be assessed by the teacher and sent back to the students as feedback through the internet, thereby improving individualized learning. Similarly, Mozilla, (2016) opined that 'digital badges are an effective way to showcase skills a student has learnt while the badging structure itself provides the opportunity for evidence-based assessment of these skills. Digital badges are visual representations of skills that learners have acquired by mastering a certain skill or activity (Jacob, 2017). This is an indication that digital badges can be of great importance to acquiring skills. Digital badges enable learners to continue practicing skills until the skill is mastered, thereby making online learning authentic and reliable. Similarly, Jacob (2017) asserted that digital badges enable students to showcase and articulate skills that may not be easily described. Furthermore, digital badges provide opportunity for facilitator to assess and give feedback to students concerning their performance, that is to say if any student succeed at mastering a set of skills a badge is given to him/her, if they did not succeed, then the facilitator would have a discussion with the students on what they need to do to earn the badge (Brown, 2015).

Cakiroglu, Erdogdu, Kokoc and Atabay, (2017) discovered that students feel much better with online assessment. In line with this, Uddin, Ahmar and Aljara (2016) reported from their study that students show more concern in knowing their scores immediately they finish a test through automatic online grading system. Marius, Dan, Emilian, Marius and Dara (2016) have also found out that student's express preferences for online assessment. Ozden, Erturk and Sanli (2004) reported that students are positive about the effectiveness of online assessment system because the features of obtaining immediate scores and feedback motivated them and contributed positively to their progress in the exam. Similarly, Barbara, Yukie, Robert, Marianne, and Karla (2010) asserted that students in online learning conditions performed modestly better than those receiving face-to-face instruction. In contrast, Betlej (2013); Kuriakose and Luwes (2016) revealed that students show phobia for online assessment due to their local communities and they are not familiar with computers. Furthermore, Okioga (2013) found out that students' social economic background is influenced student academic performance. Simone, Johanna, Astrid and Presella (2018) also found out that there is a relationship between the socio-economic factors and student academic performance. This finding negates the result of Machebe and Ifelunni (2014) who stated that parental socio-economic status has no significant effect on students' academic performance.

Since digital badges are visual representations of skills that learners have acquired by mastering a certain skill or activity which can be of great importance to acquiring skills. It enables learners to continue practicing skills until the skill is mastered, thereby making online learning authentic and reliable. Digital badge, which is an online assessment technique enable students to showcase and articulate skills that may not be easily described. As well as provide opportunity for facilitators to assess and give feedback to students concerning their performance. This study tends to assess the public perceptions of online assessment of chemistry practical.

### **Purpose of the study**

The purpose of the study is to determine;

- 1) Public perception of online assessment of chemistry practical exams
- 2) Public perception of online assessment of chemistry practical exams with respect to socio-economic status

- 3) Public perception of online assessment of chemistry practical exams with respect to location

### **Research Questions**

These research questions guided the study:

- 1) What are the public perceptions of online assessment of chemistry practical exams?
- 2) What are the public perceptions of online assessment of chemistry practical exams with respect to socio-economic status?
- 3) What are the public perceptions of online assessment of chemistry practical exams with respect to location?

### **Hypotheses**

The following null hypotheses are formulated and would be tested at [ $p < 0.05$ ] level of significance:

Ho<sub>1</sub>: There is no significant difference in the mean responses of public perceptions of online assessment of chemistry practical with respect to their socio-economic status

Ho<sub>2</sub>: There is no significant difference in the mean responses of public perception of online assessment of chemistry practical with respect to location.

### **Method**

The study adopted a descriptive survey design. The design was adopted because according to Formplus (2020) descriptive survey research design uses survey to gather data about varying opinions of subjects. The design was ideal for the study because the study tends to assess public perception of online assessment of chemistry practical exams. The method of data collection was online survey. Public Perception of Online Assessment of Chemistry Practical Examination (PPOACPE) was used as instrument for data collection. The PPOACPE was divided into two sections. Section A comprises of demographic information of the respondents, such as location and socioeconomic status, while Section B contains twenty items on online assessment of chemistry practical. A 4-point positive scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD), were used in the instrument. The benchmark for decision making is 2.50. The mean of 2.50 and above indicates positive perception while below

2.50 indicates negative perception. The instrument was uploaded on various group chats on WhatsApp in which 220 persons responded to the instrument.

The instrument was validated by two experts, one from Measurement and Evaluation, and the other from Chemistry Education department from the faculty of education, University of Nigeria, Nsukka. The experts were asked to check out for clarity of items and if the items are capable of eliciting the relevant information it was prepared for. Twenty copies of the instrument were administered on the public, i.e. teachers, students, parents etc. The responses were subjected to reliability estimate using Cronbach Alpha. Reliability index of 0.67 was obtained. Research questions was answered using quantitative analysis, i.e. mean and standard deviation, while the focus group discussion was analyzed qualitatively. The hypotheses were analyzed using t-test and analysis of variance (ANOVA).

## Results

**Research Question1:** What are the public perceptions of online assessment of chemistry practical exams?

**Table 1:** The Mean responses of two hundred and twenty respondents

S/N	Items	N	Mean	SD	Decision
1	Online assessment can effectively determine observation skill of students in chemistry practical	220	3.47	0.79	Agreed
2	Online assessment effectively determine measuring abilities of students in chemistry practical	220	2.60	0.78	Agreed
3	Online assessment can be used to evaluate student's communication skill during chemistry practical	220	2.75	0.71	Agreed
4	Online assessment tests students classification skill during chemistry practical	220	2.79	0.72	Agreed
5	Online assessment assess students predictive abilities during chemistry practical	220	2.77	0.77	Agreed
6	Online assessment effectively determine how students make inferences during chemistry practical	220	2.69	0.69	Agreed
7	Online assessment effectively identify students with numeric	220	2.61	0.79	Agreed

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	intelligence in the course of chemistry practical					
8	Online assessment can effectively assess students time management competence by the end of the practical session	220	2.85	0.81	Agreed	
9	Online assessment effectively tests students questioning skill during chemistry practical	220	2.85	0.81	Agreed	
10	Online assessment effectively tests students skill in interpretation of result during the chemistry practical	220	2.76	0.77	Agreed	
11	Online assessment effectively assesses students planning skill during chemistry practical	220	3.11	0.89	Agreed	
12	Online assessment can effectively assess student's competence in manipulating variables	220	2.70	0.81	Agreed	
13	Online assessment effectively evaluate students hypothesizing abilities during chemistry practical	220	2.69	0.76	Agreed	
14	Online assessment effectively evaluates the ability of students in formulating models	220	2.73	0.76	Agreed	
15	Online assessment effectively tests students ability to describe various experimental procedures in chemistry	220	2.81	0.74	Agreed	
16	Online assessment effectively assesses students critical thinking skill during chemistry practical	220	2.81	0.71	Agreed	
17	Online assessment effectively tests students dexteric skill in drawing during chemistry practical	220	2.63	0.80	Agreed	
18	Online assessment assesses students computational skill during chemistry practical session	220	2.65	0.77	Agreed	
19	Online assessment effectively assesses students creative ability during the course of the chemistry practical	220	2.72	0.75	Agreed	
20	Online assessment effectively assesses students color differentiation abilities during the course of chemistry practical	220	2.72	0.78	Agreed	
	<b>Grand Total</b>	<b>220</b>	<b>2.79</b>	<b>0.41</b>	<b>Agreed</b>	

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**Benchmark: 2.50**



The result in Table 1 shows the public perception of online assessment of chemistry practical examination. All the items are positive, indicating that the public have positive perception of online assessment of chemistry practical examination. The grand mean of 2.79 with the standard deviation of 0.41 is an indication that the general public has positive perception of online assessment of chemistry practical examinations.

**Research Question 2:** What are the public perceptions of online assessment of chemistry practical exams with respect to socio-economic status?

**Table 2:** Public perceptions of online assessment of chemistry practical examination with respect to socio-economic status?

<b>Socio-economic status</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>
<b>High</b>	62	2.77	0.48
<b>Middle</b>	141	2.81	0.37
<b>Low</b>	17	2.70	0.44
<b>Total</b>	<b>220</b>	<b>2.79</b>	<b>0.41</b>

The result in Table 2 shows the public perception of online assessment of chemistry practical examination with respect to socio economic status. All the socio economic status was positive indicating that the high meddle and low socio economic status has positive perception of online assessment of chemistry practical examination. The grand mean of 2.79 with a standard deviation of 0.41 is an indication that the high, middle and low socio economic status accepted the online assessment of chemistry practical examination.

**Research Question 3:** What are the public perceptions of online assessment of chemistry practical exams with respect to location?

**Table 3:** Public perception of online assessment of chemistry practical examination with respect to socio-economic status

<b>Location</b>	<b>N</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Urban</b>	111	2.79	0.44
<b>Rural</b>	109	2.79	0.38

<b>Total</b>	220	2.79	0.41
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The result in Table 3 shows the public perception of online assessment of chemistry practical examination with respect to location. All the location was positive indicating that people who lives in the rural and urban areas has positive perception of online assessment of chemistry practical examination. The grand mean of 2.79 with a standard deviation of 0.41 is an indication that the people who live in the rural and urban areas accepted the online assessment of chemistry practical examination.

**Hypothesis 1:** There is no significant difference in the mean responses of public perceptions of online assessment of chemistry practical with respect to their socio-economic status

**Table 4:** ANOVA summary table for the difference in the public perception of online assessment of chemistry practical examination with respect to socio-economic status

	Sum of Squares	df	Mean square	F	Sig.	Decision
Between Groups	0.19	2	0.099	0.59	0.56	Do not reject Ho
Within Groups	36.66	217	0.169			
Total	36.86	219				

Result in Table 4 shows that the F-value of 0.59 with an associated probability value of 0.56 was obtained for the public perception of online assessment of chemistry practical examination with respect to socio economic status. Since the probability of 0.56 is greater than 0.05 set as the benchmark for taking decision. The null hypothesis was found not to be significant. Therefore, the null hypothesis which states that there is no significant difference in the public perception of online assessment of chemistry practical examination with respect to socio economic status was not rejected.

**Hypothesis 2:** There is no significant difference in the mean responses of public perceptions of online assessment of chemistry practical with respect to location

**Table 5:** t-test summary table of the public perception of online assessment of chemistry practical examination with respect to location

Location	N	Mean	S.D	Df	t-cal	Sig(2-tailed)	Decision
Urban	111	2.79	0.44	218	0.06	0.95	Do not reject Ho
Rural	109	2.79	0.38				

Result in Table 5 shows that the t-cal of 0.06 with an associated probability value of 0.95 was obtained for the public perception of online assessment of chemistry practical examination with respect to location. Since the probability of 0.06 is greater than 0.05 set as the benchmark for taking decision. The null hypothesis was found not to be significant. Therefore, the null hypothesis which states that there is no significant difference in the public perception of online assessment of chemistry practical examination with respect to location was not rejected.

## Discussion

The public agreed that online assessment can be effectively used to assess chemistry practical. This can be attributed to the fact that each student would have the opportunity to improve on their skills, learn and be assessed independently. This result is in conformity with the study of Barbara, Yukie, Robert, Marianne, and Karla (2010) whose findings revealed that students in online learning conditions performed modestly better than those receiving face-to-face instruction. Similarly, Cakiroglu, Erdogdu, Kokoc and Atabay, (2017) discovered that students feel much better with online assessment.

The study revealed that there is no difference in the mean responses of the three socio-economic groups in their perceptions of online assessment of chemistry practical. This result is in agreement with Machebe and Ifelunni (2014) who stated that parental socio-economic status have no significant effect on students' academic performance. In contrast, this result negates the findings of Okioga (2013) who stated that students' academic achievement is influenced by their socio-economic background and also Simone, Johanna, Astrid and Presella (2018) whose findings indicates that there is a relationship between academic performance of students and socio-economic factors. This difference in result may be due to the reason that, there is now an easy access to the internet at a cheap rate.

From the result of the study, it showed that there is no significant difference in the mean responses of both urban and rural public perceptions of online assessment of chemistry practical.

This result is in conformity with Marius, Dan, Emilian, Marius and Dara (2016) who found out that student's express preferences for online assessment. This finding is in disagreement with the finding of Betlej (2013); Kuriakose and Luwes (2016) who reported that students show phobia for online assessment due to their local communities and they are not familiar with computers. This inconsistency in finding may be due to the reason that the studies were carried out in different location and the current experience students have been exposed to.

From the focused group discussion, it was revealed that online assessment is good and would be very effective, if adequate measures are put in place to ensure that all aspects of learning are been considered. It was discussed that, since online assessment is an individualized assessment system, a system should be created to enable uniformity in assessment of different categories and levels of students. Also, students must be instructed on how to send feedback in case of physical distances. It was further observed that most students may be prone to anxiety which may lead to non-submission of the practical works as well as not meeting up with the allotted time for the completion of the work, in all the idea of online assessment of chemistry practical was positively perceived by chemistry teachers, students, parents and others who were involved in the focused group discussion.

## **Conclusion**

The study which investigated the public perception of online assessment of chemistry practical revealed that the public all agreed that online assessment can be used to assess chemistry practical. There was no significant difference in the mean response of the public perception of online assessment of chemistry practical with respect to both socio-economic statuses, i.e. individuals in the high, middle and low socio-economic groups have similar response on the use of online platform to assess chemistry practical. Location has no influence in the public perception of online assessment of chemistry practical.

## **Recommendation**

Based on the findings, it was recommended that;

1. Online assessment should be employed in assessing students during chemistry practical because it improves individualized learning among students.

2. Students should be adequately instructed on the areas in which they will be assessed during the practical sessions
3. Proper measures should be taken and assessments designed in such a way that students can see get feedback immediately after the assessment so as to motivate them for further learning.

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