

Chapter 26

HIGHER-ORDERED TEST ITEMS AS ASSESSMENT PRACTICE IN HIGHER EDUCATION DURING PANDEMICS: IMPLICATIONS FOR EFFECTIVE E-LEARNING AND SAFETY

By

Bassey A. Bassey, PhD

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Valentine J. Owan

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Introduction

Testing is one of the core educational assessment practices in higher education for performance appraisal, placement and decision-making. Testing in education is also used to assess students' level of understanding, knowledge and skills possessed after completing a course or a programme (Bassey, Ubi, Anagbogu & Owan, 2020). Based on significant importance, it is very glaring that different higher institutions of learning and beyond are using this valuable tool for grading students' performance. It is well known, in Nigeria, that traditional methods of testing and evaluation have failed in eliciting the actual performance of students (Bassey, Owan & Agunwa, 2019) due to corrupt practices in higher education (Arop, Ekpang, Nwannunu & Owan, 2018; Bassey et al., 2019). Such corrupt practices include the high rate of examination malpractice, sex for grades, bribery and many others (Arop et al., 2018). Due to such unacceptable practices, students' performance results are usually distorted and misleading because it has become "difficult to judge students based on their grades from say an examination or test" (Bassey et al., 2019, p.2).

It can be generally agreed that health pandemics constitute a part of man's living. Different pandemics have hit the globe, Africa and/or

Nigeria at different times putting a halt to educational, religious, economic, social and political activities. One example of such a pandemic that has halted almost all of the world's activities is the coronavirus (COVID-19). Other pandemics that have hit the world include chikungunya, cholera, ebola virus disease, Hendra virus infection, Lassa fever, Marburg virus disease, meningitis, MERS-CoV, Monkeypox, Nipah virus infection, Plague, Rift valley fever, Severe Acute Respiratory Syndrome (SARS), Smallpox, Yellow fever and so on (World Health Organisation, WHO, 2020). Although all of these pandemics claimed the lives of so many victims, others further stopped academic activities. For instance, the outburst of the novel coronavirus from Wuhan city in China spread like a wildfire to different countries of the world including Nigeria. Schools, churches and other public places/gatherings were closed down as one of the means of controlling its spread while promoting social or physical distancing (a policy developed by WHO to reduce the spread of the virus).

The closure of schools for over seven months has affected the academic calendar of education at all levels in Nigeria and elsewhere leading to many experts advocating for a switch to electronic learning (e-learning). The idea was to encourage teaching and learning from remote locations through internet platforms. This implies that both teachers and learners engage in online class discussions from the comfort of their homes without having to be physically present in a normal classroom setting. While this approach is very clever (especially in a time that learners and teachers need to abide by the social or physical distancing policy), one question that has continued to trouble the minds of some scholars is how to effectively evaluate learners' performance on e-learning platform during a pandemic. If many Nigerian learners in higher education could use smartphones, micro-computers and other diverse techniques to cheat during examination in a regular classroom, with several invigilators; what would such learners not do from the comfort of their homes where there is no invigilator/supervisor? In answering this question, this chapter has proposed the use of higher-ordered test items (HOTIs) as an assessment practice or approach that can be used to assess higher education learners on e-learning platforms during a health pandemic and beyond. The approach (HOTIs) is also intended for use by teachers

seeking to reduce students' rate of cheating in higher education during regular classroom examinations.

Conceptual clarification

Pandemics

A pandemic is a serious disease outbreak that occurs annually, with its spread across multiple countries, regions, continents or the entire world. A pandemic is an epidemic occurring on a scale that crosses international boundaries, usually affecting people on a worldwide scale (Miquel, 2008). A high degree of mortality (death) is one of the top effects of health pandemics. However, a disease or condition should not be considered a pandemic because it is neither infectious nor contagious (Dumar, 2009). For a disease to become a pandemic, it follows a chain pattern beginning from where most animals are infected with a virus and certain animals infect humans, the virus travels immediately to the stage where it starts to propagate and finishes with the stage where human infections by the virus spread globally (Nebehay, 2020).

To effectively manage health pandemics some of the core strategies are containment and mitigation. Containment is applied at the early stages of the epidemic to prevent the spread of an outbreak from infected persons to others. It involves activities such as contact tracing and isolation of infected individuals. Other prevention control measures such as the use of vaccines (if available) can be applied to contain the spread (Institute of Medicine (US) Forum on Microbial Threats, 2007). Mitigation measures are used to slow down the rate of spread of the disease and its effect on the healthcare system and society. Mitigation measures can be applied when it is glaring that containing the spread of the outbreak is no longer possible. However, it is still possible to apply both containment and mitigation measures simultaneously (Baird, 2020). In managing the outbreak of infectious disease, one key principle that must be adhered is making efforts to reduce the peak of the epidemic which is known as “flattening the epidemic curve” (Anderson, Heesterbeek, Klinkenberg & Hollingsworth, 2020; Stawicki et al., 2020). The reason for this is to help minimize health risk and avoid overwhelming health services while waiting for a

treatment or vaccine to be developed. Some several techniques or procedures can be used to provide intervention in managing outbreaks without relying on pharmaceutical products, especially when they are yet to be developed (Stawicki et al., 2020).

E-learning

E-learning is a term used to describe the use of technological tools in teaching and learning in a virtual environment outside the regular or traditional classroom settings. It involves assessing educational curriculum contents and gaining learning experiences in an online platform through the support of internet and related technological products. In modern times, e-learning can be used to offer a fulltime course or programme to subscribed learners. Different terms are used to describe learning delivered through the internet. These terms range from computer-aided learning, computer-aided instruction, online learning, distance education, computerized electronic learning, internet learning and many others. A course delivered on a CD or DVD-ROM, television channel, videotape or through satellite networks is not e-learning if there is no provision for learners'/recipients' participation or involvement.

For a practice to be considered as e-learning; first, it must make use of technological resources; secondly, it must be offered outside the traditional classroom setting (usually across distance and remote locations); lastly, it must be interactive, providing instructors and learners opportunities to communicate as in a normal classroom. E-learning can take the form of live sessions where individuals participate in learning activities in real-time. It can also take the form of a pre-recorded video presentation where participants are to view such a video, make comments, contributions and ask questions using the comment section. The teacher can provide real-time feedback to participants, answer their questions and engage in further discussions. Electronic platforms can also be used to give students assignments, quizzes, tests and/or examinations.

E-learning has shown, in recent times, to be a valuable platform of immense usefulness to promote teaching and learning during pandemics. This is not surprising considering the power of e-learning to take classrooms or instructional environments to the comfort of

students' and teachers' homes. Furthermore, most serious health pandemics are infectious diseases that spread from one individual to another. To contain the spread, social or physical distancing is usually one of the interventions that can be applied. For instance, the case of the novel coronavirus (at the time of writing) has led to the closure of schools across different countries, as nations including Nigeria, are making efforts to mitigate the spread of the virus. This incident has rendered the traditional classroom useless as learners' safety need to be given a top priority. Currently, many experts are advocating for a switch to e-learning (Huang, Liu, Thili, Yang & Wang, 2020; Iwai, 2020; Lederman, 2020; Mara, Williams, Ritter, Kansas & Star, 2020). E-learning becomes particularly useful during pandemics as learners can acquire knowledge, values and skills while maintaining Physical Social Distancing (PSD). With this in place, learning becomes undisrupted in the face of a serious health pandemic, while appropriate containment and mitigation guidelines are adhered pending when a solution would be discovered.

Test items

Test item refers to the basic of a unit of a test interaction in which learners are expected to respond to by providing answers perceived to be the key to unlock such items. What we often call a test question is more properly known as an item, since it may not be worded as an actual question (Catforms Testing Service, CTS, 2020). A good test is made of a group of selected test items which can take different forms including multiple-choice, matching, true/false, short answer, and essay (CTS, 2020; Owan et al., 2019). The purpose of administering test items is to test for students' knowledge, comprehension, speed, power, intelligence, aptitude and/or a combination of two or more of these. Test items could also be presented to an individual per time or a group of students. In the group test, it is the choice of the administrator to decide on the sitting arrangement based on the available resources in the environment (Bassey, Owan, Amanso & Otu, 2020). Studies such as Steedle, Zahner and Kugelmass, (2014) and Seidelman (2014) have shown that the administration of test items has a role to play in determining the academic performance of students. The individual item quality of a test is considered as one of the most important indicators of test quality, generally. Therefore, a test with high-quality

items should be regarded as a quality test. It takes time and a great deal of effort to construct a test with high-quality test items, however, such items of high quality are needed to make a test valid. Quality test items must measure the skills and knowledge of the learners about the subject in question and not the student's test-taking skills. Six important characteristics of test items are explained briefly below:

- a. *Relevance*: A good test item is relevant if it is developed to achieve the learning objectives being measured.
- b. *Importance*: A good test item is important if it contributes to addresses learning objectives.
- c. *Comprehensible*: A good test item should be easy for respondents to understand. It should be very simple and free of heavy vocabulary beyond the level of students under assessment. It should be clear, and not a distraction from the concept at hand. Besides, because of this principle, there should be no objection to an item being read verbally to reading impaired students.
- d. *Unambiguity*: A good test item should be clear and precise enough so that it does not lend itself to multiple meanings. If a word has more than one possible definition, the context in which it is used should leave no reasonable doubt as to which definition is intended. Directions also should contain no ambiguity. If the student is to circle the correct answer, he should not be instructed to mark the correct answer.
- e. *Non-controversiality*: A good test item should not put the minds of respondents into any form of controversy in choosing the right option. In situations where more than one option can answer a question, proper directions should be provided to respondents on the most appropriate answer.
- f. *Independence*: A good test item should be so independent that it does not provide an answer or a clue to the answers of other items in the same test. The rule of independence applies in situations where a correct answer to an item (say-2) depends on getting a previous item (say-1) correct. On the other hand, if getting item 2 correct depends on getting item 1 correct, then Item 2 tells you nothing about the skills of the student who failed Item 1. However, a student who failed item 1 would likely be penalized twice in effect, as the student would most likely fail item 2 unless through guessing. This technique is commonly practised in mathematics (in

problems involving substitution) and English language (in comprehension problems).

An item in which bright learners surpass the dull ones is judged as being good, while the one which shows no difference in respect of bright and dull learners or in which the dull group is more successful than the bright group is a bad test item (Bassey, 2019). The test item fails to discriminate between bright and dull learners on account of any one of these reasons:

- i. It is so easy that everyone passes it or it is so hard that everyone fails it.
- ii. It is ambiguous or confusing.
- iii. It measures something different from what the test measures (Sidhu, 2007).

Good test items automatically satisfy various criteria of a good test namely: purpose, acceptability, adequacy, usability, validity, standardization, objectivity, reliability, discrimination, and so on, which are both technical and practical characteristics of a good test (Bassey, 2019).

Nature and structure of higher-ordered test items

High-ordered test items (HOTIs) are items that respondents or test takers cannot simply answer by mere reading, recalling or recollecting information. Low-ordered test items focus on students' understanding, knowledge or comprehension of a topic or lesson content, while HOTIs put advanced cognitive demand on students by encouraging them to think beyond literal questions. HOTIs promote critical thinking skills as it requires that students apply, analyze, synthesize, and evaluate the information presented to them beyond simply recalling facts. Following Bloom's taxonomy of cognitive ordered, higher-ordered test items include testing for *application*, *analysis*, *synthesis* and *evaluation*.

Application items would require that students transfer knowledge acquired in an earlier context to a newer context. Words often used in application test items include apply, manipulate, employ, carry out, illustrate, interpret, demonstrate, dramatize, and so on. Some examples of application test items include:

- How would you use your knowledge of latitude and longitude to locate Calabar on the world map?
- What happens when you multiply each of these numbers by nine?
- If you had eight inches of water in your basement and a hose, how would you use the hose to get the water out?

Analysis items would require that students break down a whole into smaller components so that each component can be understood partially. To analyse require students to identify reasons, causes, or motives and reach conclusions or generalizations. Words often used in analysis test items include analyze, why, criticize, draw conclusions, simplify, distinguish, examine, explain, and so on. Some examples of *analysis test items* include:

- What are some of the factors that cause rust?
- Why do we call all these animals mammals?
- Why did the United States war with England?

Synthesis test items may present learners with shattered/scrambled ideas or ideas from multiple sources for them to use their initiative to assemble/integrate such idea logically into meaningful information. These items also challenge students to engage in creative and original thinking. These questions invite learners to produce original ideas and solve problems. Words often used in synthesis test items include: compose, construct, design, rearrange, create, formulate, set up, produce, and so on. Some examples of synthesis test items include:

- How would you assemble these items to create a windmill?
- Construct a tower one foot tall using only four blocks
- Put these words together to form a complete sentence.

Evaluation test items would require students to pass value judgements based on their perception of phenomena, explain reasons for their position of judgements, compare and contrast information and develop reasoning based on available evidence presented to them. *Evaluation test items* do not have single right answers. Words often used in evaluation test items include judge, assess, evaluate, rate, value, criticize, compare, and so on. Some examples of evaluation test items include:

- What do you think about your schooling?
- What story did you like the best?
- Do you think that the missionaries did the right thing?

To assess lower and higher-ordered thinking, Brookhart (2010) presented some basic principles which include:

- Specifying clearly and exactly what you want to assess;
- Designing test items that require students to demonstrate this knowledge or skill-
- Deciding what you will take as evidence of the degree to which students have shown this knowledge or skill.

However, in addition to these three basic principles above (which applies to lower and higher-ordered thinking), assessing higher-ordered thinking further requires three more principles (Brookhart, 2010). These include:

- Presenting something for students to think about, usually in the form of introductory text, visuals, scenarios, resource material, or problems of some sort;
- Using novel material (material that is new to the student, not covered in class and thus subject to recall; and
- Distinguishing between the level of difficulty (easy versus hard) and level of thinking (lower-ordered thinking or recall versus higher-ordered/critical thinking), and control for each separately (Brookhart, 2010).

Generally, higher-ordered test items should present real-world situations that stimulate students' mentality towards using their knowledge and experiences to apply, analyse synthesize, or create a solution to the problem. HOTIs can be used in different test formats- multiple choice, essays, matching, filling the blanks and so on.

Advantages of using higher-ordered test items

The following are some advantages of the utilization of HOTIs in educational assessment

1. ***They boost the critical thinking skills of learners:*** HOTIs can enable students to apply, analyse, synthesize, evaluate, and interpret the text they are reading at complex levels. They can

process test at deep levels, make judgements, and detect shades of meaning. They can make critical interpretations and demonstrate high levels of insight and sophistication in their thinking. They can make inferences, draw relevant and insightful conclusions, use their knowledge in new situations, and relate their thinking to other situations and their background knowledge.

2. ***They promote reflective and analytical thinking skills:*** Students who can fare well on standardized tests where HOTIs are used are considered to be advanced. They will indeed be prepared to function as outstanding workers and contributors in a fast-paced workplace where the emphasis is on using information rather than just knowing facts.
3. ***They can be used to reduce the rate of examination malpractice:*** Examination malpractice can be reduced using HOTIs due to their advanced, practical and contextual nature. Some HOTIs appear so real that searching the problem (as it is presented by the examiner) on the internet does not bring a direct answer. Good HOTIs are not set in a way that test-takers can easily gain answers from textbooks or other available sources. Therefore, tests or examinations can even be given to students to do at home or with little or no supervision. By this nature, a student who cheats in the examination as a norm, cannot be able to do where HOTIs are used.
4. ***They can be used to test for power:*** If HOTIs are properly developed, they can discriminate clearly between very brilliant, dull and malpractice-oriented students. Essay test items in higher-ordered require critical thinking to decode their meaning. Therefore, only very intelligent students with a good understanding of the situation through deep learning can decode such meanings. Furthermore, only students with a high rate of verbosity and analytical thinking can break down an item in a very thorough manner. Therefore, it is very difficult or near impossible to cram or cheat in a test where HOTIs are in use.
5. ***They can be used to detect/eliminate guessing during a test or examination:*** In cases where multiple-choice HOTIs are used in such a way that answering a previous question would enable you to answer the next question, guessing can be easily detected/eliminated. That is, students who fail the previous question, are expected to fail the next question and vice versa.

However, where a student failed the previous question but failed the next item is more likely to have guessed the former. E.g. in the first item of a Mathematics test, the equation $4x - 6 = 10$ was given to students to find the value of x . The following options (a) 5 (b) 4 (c) 3 (d) 2; were given to them as options. In the next item (question 2) students are expected to substitute the answer (value of x) obtained in the previous item (question 1) into the new equation $Y = 3(x) + 3$. The following options were also given as response options (a) 15 (b) 17 (c) 18 (d) 16. From the example, a child who ticked the option “(b)” in the first question is correct but the child has to tick the option “(a)” also in question 2 to be considered as having not guessed (a). There must be consistency and unity in the answers of the preceding and the succeeding test item in such a situation.

Disadvantages of using higher-ordered test items

The following are the disadvantages of using HOTIs:

1. ***It is time-consuming to develop:*** It is cognitively very demanding for a teacher to develop test items at the higher-ordered levels. This is because, they require a lot of thinking processes for their construction.
2. ***It requires a lot of skills:*** HOTIs are used to assess students at the application, analysis, synthesis and evaluation levels of the cognitive order. For teachers to be able to construct items that measure at these levels, they must possess sound analytical, synthetical, reflective, evaluation and critical thinking skills.
3. ***They are not suitable for use with young learners:*** HOTIs imposes complex cognitive demands on the test-takers (learners). Thus, they are not suitable nor recommended for use with young learners who are still undergoing cognitive development. More precisely, these items are not recommended for primary and secondary school learners; but could be used for higher education students in colleges, polytechnics and universities.

Implications of using HOTIs on e-learning and health safety

The use of HOTIs in higher education has some key implications for e-learning and health safety. The use of HOTIs applies because

pandemics, like the coronavirus, for instance, has prevented academic and non-academic activities from taking place in regular classrooms, creating a need for a switch to e-learning. E-learning has presented itself as a very valuable platform of immense usefulness to promote teaching and learning during health pandemics. This is not surprising considering the power or importance of e-learning to take classrooms or instructional environments to the comfort of students' and teachers' homes. Furthermore, most serious health pandemics, such as COVID 19 are infectious diseases that spread from one individual to another. To contain the spread, social or physical distancing is usually one of the interventions that should be applied. At the time of writing this chapter, the pandemic has led to the closure of schools across different countries, as nations are making effort to mitigate the spread of the virus. This incident has rendered the traditional classroom interactions useless as learners' health safety needed to be given the priority. E-learning is imperative here with its attendance positive health implications on account of social or physical distancing.

Considering students' high rate of involvement in examination malpractice in regular classrooms (even with supervision) malpractice is most likely going to increase during e-learning where supervision is minimal or nonexistent. Students are likely going to use textbooks or the internet to search for answers to test/examination items if such items are developed at the knowledge and comprehension levels (lower-ordered test items). HOTIs become very valuable in reducing or eliminating examination malpractice since test items raised at the application, analysis, synthesis and evaluation levels require critical thinking, and therefore, cannot be easily searched in textbooks and on the internet for answers. Also, there may not be other examinees immediately around for their counterparts to copy from. Thus, the use of HOTIs would enable e-learning to thrive while ensuring that learners stay safe across remote locations with little or no examination malpractice.

Conclusion

Testing is inherent in educational assessment, and different situations would call for appropriate testing or assessment approaches, techniques or practices. During traditional classroom situation, when

teachers and learners should meet face to face (physically) is restrained during a pandemic, e-learning system could suffice or is recommended. E-learning has the power of taking activities of classrooms or instructional environments (such as students' assignments, quizzes, homework, tests and/or examinations) to the comfort of students' and teachers' homes to reduce the spread of the pandemic-health safety. With the high propensity of cheating tendencies among students, even during traditional classroom situations, what happens during e-learning, where physical interactions of learners, teachers and invigilators/supervisors are rare or nonexistent? This chapter concludes that higher-ordered test items (HOTIs) could be used to curb this menace called examination malpractice. Examination malpractice can be reduced using HOTIs due to their advanced, practical and contextual nature. Some HOTIs appear so real that searching the problem on the internet does not bring a direct answer. Good HOTIs are not set in a way that test-takers can easily gain answers from textbooks or other available sources. Consequently, HOTIs is recommended as an assessment practice for higher education students on the e-learning platform during health pandemic and beyond. If HOTIs are properly developed and utilized, they can discriminate clearly between very brilliant, dull and malpractice-oriented students. HOTIs as an assessment practice is also recommended for use by teachers seeking to reduce students' rate of cheating in higher education during regular classroom examinations.

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