Arab World English Journal
INTERNATIONAL PEER REVIEWED JOURNAL ISSN: 2229-9327
Arab World English Journal (AWEJ) Special Issue on Covid 19 Challenges April 2021 Pp. 160-171
DOI: https://dx.doi.org/10.24093/awej/covid.12

Tapping into Bloom Taxonomy's Higher-Order Cognitive Processes: The Case for Multiple Choice Questions as a Valid Assessment Tool in the ESP Classroom

Iryna Lenchuk
Department of English Language and Literature
College of Arts and Applied Sciences, Dhofar University
Salalah, The Sultanate of Oman
Corresponding Author: ilenchuk@du.edu.om

Amer Ahmed
Department of English Language and Literature
College of Arts and Applied Sciences, Dhofar University
Salalah, The Sultanate of Oman

Received: 3/4/2021 Accepted: 4/1/2021 Published: 4/26/2021

Abstract
This article describes the results of Action Research conducted in an ESP classroom of Dhofar University located in Oman. Following the call of Oman Vision 2040 to emphasize educational practices that promote the development of higher-order cognitive processes, this study raises the following question: Can an online multiple choice question (MCQ) quiz tap into the higher-order cognitive skills of *apply*, *analyze* and *evaluate*? This question was also critical at the time of the COVID-19 pandemic when Omani universities switched to the online learning mode. The researchers administered an online MCQ quiz to 35 undergraduate students enrolled in an ESP course for Engineering and Sciences. The results showed that MCQ quizzes could be developed to tap into higher-order thinking skills when the stem of the MSQ is developed as a task or a scenario. The study also revealed that students performed better on MCQs that tap into low-level cognitive skills. This result can be attributed to the prevalent practice in Oman to develop assessment tools that tap only into a level of Bloom's taxonomy, which involves the cognitive process of retrieving memorized information. The significance of the study lies in its pedagogical applications. The study calls for the use of teaching and assessment practices that target the development of higher-order thinking skills, which is aligned with the country's strategic direction reflected in Oman vision 2040.

Keywords: Bloom's taxonomy, critical thinking skills, COVID-19 pandemic, ESP**,** multiple choice questions (MCQs), Oman vision 2040, online assessment

Cite as: Lenchuk, I., & Ahmed, A. (2021). Tapping into Bloom Taxonomy's Higher-Order Cognitive Processes: The Case for Multiple Choice Questions as a Valid Assessment Tool in the ESP Classroom. *Arab World English Journal (AWEJ) Special Issue on Covid 19 Challenges* (1) 160-171.
DOI: https://dx.doi.org/10.24093/awej/covid.12

Introduction

One of the strategic directions of Oman that is reflected in Oman Vision 2040 (Oman, 2040) is to develop a high-quality, performance-based educational system, the goal of which is to equip university graduates with competitive qualifications and higher-level thinking skills. These qualifications and skills are to ensure the employability of university graduates and their readiness to cope with tremendous international challenges faced by Oman in its transformation from an oil-dependent economy to a more diversified and sustainable economy. At present, graduates of Omani universities face challenges similar to those faced by graduates in other countries. As stated by Delosa (2015), in today's world, a university degree is no longer considered an important stepping stone and a prerequisite for landing a lucrative job and a successful lifelong career. Many employers assign more value to soft skills, such as creativity, collaborative problem, and critical thinking skills than to a university degree.

Educational institutions in Oman are aware of the necessity of bridging the gap between knowledge and skills acquired at the university and those required by the employers of a highly competitive modern labor market. Thus, the essential graduate attributes include critical thinking skills, creativity and innovation that university graduates should demonstrate (Dhofar University, 2021a). This emphasis on critical thinking resonates with the agenda set by other universities to prioritize the development of higher-order thinking skills in teaching and assessment (see e. g., Momsen, Long, Wyse & Elbert-May, 2010).

Following the research on the role Multiple Choice Questions (MCQs) can play in the assessment of higher-order thinking skills (Scully, 2017), the purpose of this paper is to raise the question of whether or not an MCQs quiz is a valid assessment tool of higher-order thinking skills that ensure students' academic and professional success. Specifically, the action research presented in this paper raises the following questions: Is it possible to develop a formative classroom assessment tool (i.e., an online quiz) that taps into different levels of Bloom's taxonomy? The significance of the study lies in the fact that by administering an online MCQ quiz to 35 ESP students and comparing their performance on the MCQs that tap into lower and higher-order thinking skills, it is possible to identify the cognitive processes that students have problems with and address them in future pedagogical practices.

Literature Review

Bloom's Taxonomy

To reflect the current needs of the labor market, the development of higher-order thinking skills (i.e., problem-solving, creativity, and critical thinking skills) is included in the course syllabi developed at the university where the present study takes place (Dhofar University, 2021b). Instructors teaching in this university are required to develop course learning outcomes for teaching and assessment purposes as statements that target different levels of cognitive processes reflected in Bloom's taxonomy, such as *remember, understand, apply, analyze, evaluate* and *create* with more emphasis on higher levels of Bloom's taxonomy that are associated with higher-order thinking skills.

Several scholars (see e.g., Scully, 2017) have noted that the original taxonomy of thinking processes proposed by Bloom et al. (1956) (as cited in Scully, 2017), does not separate them into the cognitive processes of lower and higher orders. The separation is due to the

interpretation of the taxonomy by other scholars who believe that higher-order thinking skills include application, evaluation and creation of novel ideas based on the knowledge and skills acquired in the course. Moreover, the base level of Bloom's taxonomy (i.e., *knowledge*) does not represent a cognitive process that requires thinking skills of a higher order (e.g., critical thinking skills or creativity), as this level reflects a cognitive process associated with a simple recall from long-term memory.

According to Anderson et al. (2001), this interpretation of the taxonomy is inaccurate. While proposing a revised version of Bloom's taxonomy, Andersen et al. (2001) expanded the knowledge dimension by fine-tuning it and presenting it as (i) factual knowledge (e.g., knowledge of terminology used in a subject area), (ii) conceptual knowledge (e.g., knowledge of theories), (iii) procedural knowledge ('how to' knowledge), and (iv) metacognitive knowledge or self-regulation (e.g., awareness of one's knowledge level). Simple recall of information (i.e., reproducing a definition of a term on a test) and understanding of one's learning processes (e.g., awareness of lack of knowledge in a specific area) require thinking skills of a different order.

In a study of introductory-level biology classes, Momsen et al. (2010) categorized the learning objectives (as stated in the syllabi of faculty members) and assessment items in the high-stake assessment tools (quizzes and exams) of 50 faculty members teaching 77 introductory biology classes in the USA against the six levels of cognitive skills (knowledge = 1, comprehension = 2, analysis = 3, application = 4, synthesis = 5, evaluation = 6) of Bloom's (1956) taxonomy of educational objectives. The findings of the study are the following: (1) 93% of the assessment items and 69% of the learning objectives used by faculty members in quizzes and exams targeted levels 1 (i.e., knowledge) and 2 (i.e., comprehension) of Bloom's taxonomy, (2) the assessment items were not aligned with the learning objectives. Based on the results of the study, the authors recommend that students should be exposed to multiple levels of cognitive processing skills from the beginning of their studies. The researchers expressed the belief that "students should begin practicing the skills of connecting, transferring, and modeling scientific concepts at the start, not end, of their degree programs" (Momsen et al., 2010, p. 439)

The present study contributes to the ongoing debate in the literature (see e.g., Javaeed, 2018) on the use of MCQs by bringing empirically-based evidence to support the view of the proponents of the use of MCQs as a valid assessment tool that teachers can use to tap into higher-order thinking skills.

Method

The goal of this paper is to describe the results of an Action Research (AR) study. This AR was undertaken by an ESP instructor who taught an undergraduate online ESP course for engineering and sciences during the time of the COVID-19 pandemic. The purpose of the AR is to investigate the use of MCQs as an assessment tool that taps into different levels of Bloom's taxonomy.

According to Burns (2015), AR is centered around localized practices. Its purpose is to bring change to the teaching and learning practices. AR represents an alternative research approach to a more traditional (quantitative/ qualitative) type of research due to its flexible, dynamic, and adaptable nature. Burns claims that AR is more meaningful to practitioners due to

its cyclical nature since it starts with a practitioner's reflection on his/her current teaching practices. This reflection leads to raising questions, developing an action, implementing changes, and reflecting on the results brought about by this action. AR brings a conceptual shift in a practitioner's understanding of his/her current practices.

Burns (2015) states that AR is not a method but rather an approach to doing research, the validity of which lies in its contribution to the improvement and change of current educational practices. Since AR as an approach to doing research utilizes different data collection methods, for the purpose of this study, the following data collection method has been implemented. The questions included in an online quiz, as a formative type of assessment that assessed students' progress in the ESP course, were first coded for one of the levels of Bloom's taxonomy that it targeted. To achieve inter-raters' reliability, a co-instructor who taught a different section of the same course verified the codes. The average scores for each question that reflected a level of Bloom's taxonomy were calculated and compared to identify the most challenging levels of the taxonomy for the students enrolled in the course. This information was then used as feedback to inform future teaching and learning practices.

Multiple Choice Questions (MCQs) as a Valid Measure of Higher Order Thinking Skills: Pros and cons

A typical MCQ consists of the following components: (i) a stem, (ii) the correct answer, and (iii) a choice of response options or distractors. In example (1) presented below, the question is a stem; the word *permitted* shown in (c) is the correct answer, and the words presented under (a) and (b) are distractors.

Example (1)

Which of the following words is the best choice to be used in the sentence: **Smoking is not _____ on the company premises?**

a. authorized
b. prohibited
c. permitted

Baker and Gravran (2019) claim that MCQs, when used for assessment purposes, are easy to administer and score. On the one hand, MCQs satisfy the principle of practicality. They are easy to grade, especially on Moodle, since the instructor can see the results immediately after the students submitted their answers to the questions. On the other hand, MCQs can be challenging in creating plausible distractors for the best possible answer and time-consuming while creating MCQ quiz banks on Moodle. Well-developed MCQs possess high reliability in scoring since the lack of proficiency in writing does not affect a test-taker's ability to choose the best possible answer. MCQs can have a positive washback on teaching and learning since the results, which are available right after the students' submission of their answers, can be used as feedback to inform future educational practices.

Opponents of the MCQs' use of for assessment purposes claim that MCQs can test only a limited number of cognitive processes by tapping into the lower levels of Bloom's taxonomy. MCQs are called pseudo-assessment since they can not assess the highest level of Bloom's taxonomy (i.e., *create*). The central argument is that the process of identifying the best possible answer is not equal to creating a novel answer. Thus, MCQs can assess only surface knowledge

and rote learning. Moreover, MCQs block critical thinking rather than encourage it, as it is suggested that there is one correct answer for any given situation.

Proponents of the use of MCQs for assessment purposes deny their limiting capacity. They argue that when properly developed, MCQs can access all the levels of Bloom's taxonomy except for *create*. For example, MCQs can tap into the cognitive process of *evaluation* by asking students to make judgments based on a set of guidelines. MCQs can assess a test-taker's ability to *apply* the knowledge acquired in the course to new situations. MCQs can assess problem-solving skills and the ability of making inferences based on the information provided to test-takers. All of these elements (*evaluation, application, making inferences*) constitute the components of critical thinking. The position that is taken in this paper is that MCQs can be used to tap into critical thinking skills represented as higher levels of Bloom's taxonomy when a stem of an MCQ is developed in the form of a task or a scenario.

Participants

35 participants (24 male participants and 11 female participants) enrolled in an ESP course for engineering and sciences took part in this AR study. The participants completed the requirements of the General Foundation Program. This program is a bridging program that prepares high-school graduates for academic studies at the university. All the participants had already finished taking the required prerequisite courses in English before their enrolment in this course. Their level of English proficiency is assessed at band five of the academic module of the International English Language Testing System (IELTS), which is a prerequisite for entering the university academic program in Oman. According to this band, the participants are described as modest users of their additional language. This level of proficiency means that they had "partial command of the language and cope[d] with overall meaning in most situations, although they [were] likely to make many mistakes. They [were] able to handle basic communication in their own field" (IELTS, n. d., paragraph 5).

The Context: Teaching During the World Pandemic

The institutions of higher education in Oman followed the government's decision to suspend face-to-face classes and switch to online learning. The suspension of face-to-face classes was a preventive measure against the novel coronavirus (COVID-19). Since March 2020, teaching and learning have been taking place through the BigBlueButtonBN (BBB) activity module available through Moodle, where real-time online lessons can be delivered. BBB provided public and private chat rooms, video and screen sharing (BigBlueButton, 2021). An abrupt switch from face-to-face to online teaching and learning presented challenges to both university instructors and students. Before the pandemic, Moodle (Dhofar University, n. d.) was used as a teaching and learning platform for uploading class handouts, submitting assignments, and posting announcements. Before the switch to online classes, Moodle provided a supplementary platform that was not fully utilized by all the students to enhance face-to-face teaching and learning in the classroom. While learning during the pandemic, many university students encountered challenges. These challenges were weak Internet connection, lack of laptops and other electronic devices except for smartphones, lack of experience with online learning and assessment, and low level of computer literacy skills. For example, some students did not know how to upload their assignments on Moodle, access class handouts, and format their assignments according to the course requirements. Course instructors also had to go through

the learning curve of using BBB for online classes and Moodle for online assessment within a brief period of time. There was an abrupt switch from face-to-face to online teaching and learning, and course instructors did not have time to transfer to the online teaching mode.

The university administration informed the course instructors that the instructors had to administer online assessment through the quiz activity module available on Moodle (2020). This module allows course instructors to create quizzes that include various questions, such as MCQs, true-false questions, short answer questions, drag and drop questions, among many other types of assessment. Questions can be stored in question banks for later use. The Moodle quiz module allows for the time setting, the number of quiz attempts, type of feedback, and options for viewing students' answers after the quiz attempt. The quiz module also provides course instructors with automated grading and with quiz reports. These reports contain information about the average quiz scores as well as average scores obtained on each question. In this context, the course instructor was facing the dilemma of developing a valid assessment tool that would (i) measure students' progress in the ESP class and (ii) tap into different levels of cognitive processes represented as levels of Bloom's taxonomy reflected in the course learning outcomes. Since one of the options presented in the Moodle quiz module was MCQs, the instructor decided to investigate this type of questions for assessment purposes. The next section provides a description of what Multiple Choice Questions are and the challenges and opportunities they represent for assessment purposes.

Research Tools

The course learning outcomes of the ESP course target the improvement of students' specialist language knowledge in engineering and sciences and their professional communication skills. It also aims to expose students to a range of learning techniques and strategies, critical thinking, basic study and research skills to increase their academic, professional, and employment potential (Dhofar University, 2021b). Health and safety procedures and precautions was one of the themes included in the course syllabus. The teaching materials included in the lesson plan were structured around Unit seven of the prescribed course textbook (Ibbotson, 2008) and supplemented with a New York Times' adapted article on safety measures to be taken while cleaning (Kerr, 2020), a video on the procedures to be followed during the workplace fire alarm drill (BBC learning English, 2016), and an excerpt from the Labour Laws in Oman that regulate health and safety rules in such areas as lighting, ventilation, heat stress, noise, uniforms, personal protection equipment, first aid and occupational diseases (Oman law blog, n. d.). At that time, the students were working with the following corpus of English words and expressions: (i) eight key vocabulary items related to the legal aspect of following health and safety procedures and precautions, for example *stipulated by law, legislation, compulsory, contravene, adhere to*; (ii) 21 key words related to health and safety procedures that have to be followed while cleaning your house or office during the pandemic, such as *hazardous, fumes, inhale/exhale, sodium hypochlorite* (i.e. *chlorine bleach*); (iii) six key expressions that are related to the fire alarm drill procedures, such as *if you see a fire, raise the fire alarm, walk calmly to the nearest fire exit, meet at the fire assembly point, no smoking on company premises.* In terms of language structure, students were implicitly introduced to the English passive, e.g., *legal requirements are stipulated by law, you are not allowed to smoke on company premises, safety hats should be worn at all times,* to name just a few. These key words, expressions, and grammatical structures were presented to the students and then recycled in reading, listening, and speaking activities. Many

activities introduced in the course targeted students' critical thinking skills by asking them to apply the knowledge they received in the course, critically evaluate new situations, and make inferences. For example, the students were surprised to learn that Oman has the mandatory midday break rule during the summer, according to which blue-collar workers should not work outdoors between 12.30 pm and 3.30 pm. The students were engaged in discussing this regulation and a follow-up scenario of what might happen when this regulation has not been followed, and one of the company's employees has had a stroke. The students and the instructor discussed the legal consequences of this incident.

While planning for a formative online assessment, the teacher faced the challenge of developing an assessment that would satisfy the main principles of assessment as well as adhere to the principles of academic integrity. The goal was to develop a test that should meet the following principles of assessment: (i) the principle of validity, that is, a valid test assesses what students learn in the course, (ii) construct validity, that is, a communicative test should tap into students' ability to use language rather than to check their knowledge of grammar rules and decontextualized vocabulary items; (iii) positive washback to students and other stakeholders, that is, to ensure that the results of the test are valid from the point of view of academic integrity and its importance for further learning; (iv) face validity, that is, to develop a test that is considered fair to students. The teacher developed an MCQ quiz that satisfied the major principles of assessment, provided formative feedback on the progress made by the students in the course, and tapped into their higher-order thinking skills as specified in the course learning objective and course learning outcomes. The following section discusses the results of the MCQ quiz.

Results

Table one summarizes the results of the students' performance on the MCQ quiz.

Table 1. *A breakdown of the MCQ quiz items that target different levels of Bloom's taxonomy*

No of the items included in the test pool	No of the items on the test	The targeted cognitive process according to Bloom/ Anderson (Anderson et al., 2001)	Examples (the correct answer is provided in italics)	Average score/ total score
7 items	3	*Remember*, as in locating knowledge of words and expressions in the long-term memory and retrieving that knowledge.	In this class, we studied several idioms, e. g., *from the ground up, back to the drawing board*. Which of the following best describes the meaning of the idiom? Please select one: The meaning of the idiom is nonsensical The meaning of the idiom is compositional. *The meaning of the idiom is non-*	2.59/ 3

			compositional. Which of the following words is the best choice to be used in the sentence? Smoking is not _____ on the company premises. authorized prohibited *permitted*	
7 items	3	*Apply*, as in applying knowledge to a familiar or an unfamiliar situation or task based on the knowledge acquired from reading passages introduced and discussed in class	You work as an engineer on a construction site. Which of the following violations can have serious legal consequences for you? Please choose one of the following: *when you do not wear safety boots* when you call in sick when you do not show up for work	1.49/ 3
2 items	1	*Analyze*, as in breaking a situation or a task into its constituent parts and determining how the parts relate to one another for the purpose of coming up with the right solution	You work as an engineer on a construction site. Your workers do not wear any protective gear. Suddenly one worker injured himself. Who is responsible for the worker's injury? Please choose the best possible answer: *His injury is the stakeholders' responsibility since everyone is responsible for adhering to health and safety rules.* His injury is his own responsibility since it was his choice not to wear a safety hat. His injury is the management's responsibility since your boss is responsible for the company. His injury is your responsibility since you did not enforce safety rules.	0.19/ 1
5	2	*Evaluate*, as in making a judgment based on criteria	At the time of the COVID-19 pandemic, it is important to wear a mask. Which is of the following	1.51/ 2

		and standards	should you do after washing your mask with soap? Please select one: *rinse it with water* rinse it with alcohol rinse it with chlorine	
Total questions included in the pool: 21	Total questions included in the test: 9			Average test score: out of 5.78/ 9 (64%)

Nine questions were selected out of a pool of 21 questions and included in the MCQ quiz. MCQs were presented according to the following categories that reflected the levels of Bloom's taxonomy except for the highest level named *create*. Seven items included in the question bank targeted the cognitive process located at the foundation of Bloom's taxonomy known as *remember*. Out of the seven items included in the question banks, the students randomly chose three MCQs that tested their knowledge of key words and expressions included in the lesson on health and safety procedures and precautions. The average score of the students' performance for this category was 2.59 out of 3. The following seven items included in the question bank targeted the level of Bloom's taxonomy known as *apply*. Out of the seven items included in the question banks, the students randomly chose three MCQs that tested their ability to apply knowledge obtained in the course to an unfamiliar situation related to health and safety procedures and precautions. The average score for this category was 1.49 out of 3. There were two items included in the question bank for the purpose of testing students' ability to *analyze*, that is, their ability to break a given situation into its constituent parts and analyze their relationships to one another. On the quiz, the students randomly selected one situation out of the two included in the question bank. The average score of students' performance on this question was 0.19 out of 2. Five items included in the MCQ quiz assessed the students' ability to *evaluate*, i.e., to be able to make judgments based on the criteria and standards presented to them. Out of five items, the students randomly selected 2 MCQs from the quiz question bank. The average score of students' performance on this question was 1.52 out of 2.

Table two summarizes the students' performance according to the levels of Bloom's taxonomy.

Table 2. *Students' performance according to the levels of Bloom's taxonomy in a descending order*

Bloom's level	Average scores obtained for each level of Bloom's taxonomy
Remember	2.59

Evaluate	1.51
Apply	1.49
Analyze	0.19

Table two shows that the students demonstrated the best performance on the level titled *remember* in Bloom's taxonomy. This level reflects a cognitive process that involves a simple recall from long-term memory. With regards to the higher-order thinking skills, such as *apply*, *analyze* and *evaluate*, the students show the following results, 1.49, 0.19, and 1.51, respectively, with the categories of *applying* and *evaluating* being the highest and *analyzing* the lowest results.

Discussion

The results of the study showed that an MCQ quiz could be used as a valid type of assessment that would tap into cognitive processes represented as different levels of Bloom's taxonomy, such as *remember*, *apply*, *analyze*, and *evaluate*. The study showed that the students demonstrated the best performance on the MCQs that were developed to test a simple recall from memory. With regards to the MCQs that were designed to assess the higher-order thinking skills, such as *apply, analyze*, and *evaluate,* the students obtained low average scores. The overall average score on the MCQ quiz was 5.78 out of 9, which is equal to 64%. According to the university grading system, the score of 64% is the next score after *Fail*, and it represents the passing grade (DU Grading System, 2021). The test results showed that the students experienced difficulties while answering the MCQs that were supposed to tap into the cognitive processes of the higher-order thinking skills. These results can be explained by the fact that most of the time while writing quizzes in the EFL and ESP courses, the students are exposed to questions that tap into one level of Bloom's taxonomy, namely *remember,* when teachers ask the students to retrieve relevant knowledge from long-term memory. The findings of the study have significant pedagogical implications as they signify students' inability to apply higher-order thinking skills in a formative assessment, and these are precisely the skills that are needed to succeed in their academic studies and to be employable in a highly competitive market. The students' low performance on the MCQ quiz also reflected their experiences with studying and assessment where, for the most part, they are taught for the test and are asked to memorize the knowledge that is tested on the test. This pedagogical practice has been noticed by several Omani researchers who attempted to investigate the reasons behind the inadequate development of skills and abilities of Omani students. For example, Denman and Al-Mahrooqi (2019) have stated that despite the continuous educational reforms that took place in Oman, memorization and information retrieval are still widely used as some of the teaching methods in educational institutions of Oman. In a way, the results of the MCQ quiz reflect the experiences of the students who expect to be quizzed on the knowledge that they have to memorize and retrieve for assessment purposes. When presented with questions that are developed to assess students' higher-order thinking skills, the students experienced challenges. These challenges are due to the fact that the students do not have the experience of writing MCQs quizzes that measure their abilities to use high order cognitive skills, such as apply, analyze and evaluate.

The researchers believe that the results of this study are significant from a pedagogical perspective. MCQs are one of the most widely used assessment tools both at the pre-university

level and the university level. They are also commonly used in high-stakes standardized tests. For practicing teachers, MCQs are also very convenient to use and very easy to mark, especially when teachers are teaching classes with a large number of students. The widespread use of MCQs in various educational and professional settings points to the urgency of addressing their (in)validity as an assessment tool to measure high-level cognitive skills. Against this background, this paper is an attempt to reassure practicing teachers that MCQs, when they are well-structured in the form of a scenario, do indeed tap into the high-level cognitive skills that teachers are required to address in their assessment items (i.e., quizzes and test) and their learning objectives. The findings of this study are also in line with some recent studies which have made similar claims regarding the use of MCQs (Baker & Gravran, 2019; Scully, 2017).

Conclusion

In the context of the present study, Bloom's taxonomy of cognitive processes is used when instructors develop the course learning outcomes. The taxonomy includes cognitive processes, which range from lower-order thinking skills, such as the ability to recall from memory to higher-order thinking skills, such as the ability to apply, analyze and evaluate.

The spread of the COVID 19 pandemic and the switch to the online mode of learning has posed significant challenges to institutions of higher education in Oman, which strive towards realizing Oman Vision 2040 that prioritizes higher-order thinking skills.

Against this backdrop, the researchers have conducted the AR study in one of the ESP classes, namely English for Engineering and Sciences, in an attempt to answer the following question: Can higher-order thinking skills, such as the ability to apply, analyze and evaluate, still be targeted in online MCQ quizzes considering the fact that some researchers have questioned their validity as an assessment tool to target higher-order thinking skills?

To answer this question, the researchers have developed an online quiz and created several MCQs that targeted both lower-order thinking skills, such as the ability to recall from memory, as well as higher-order thinking skills, such as the ability to apply, analyze and evaluate. The study results showed that the students performed better on lower-order thinking skills than on higher-order thinking skills.

The following conclusions can be drawn from the results of the study: (a) MCQs can be used to tap into both lower-order thinking skills and high order thinking skills; (b) the results of the study corroborate a claim made recently in the literature on the tertiary education in the Sultanate of Oman, namely, modes of teaching where students are asked to study for the test and to memorize rather than engage in critical thinking, are still regrettably rampant in the Omani context.

About the Authors:

Iryna Lenchuk is an Assistant Professor, Department of English Language and Literature, Dhofar University. Her research interests include task-based instruction, interlanguage pragmatics, and pedagogy and methodology of second and foreign language learning. She has been teaching ESL, TESL and courses in applied linguistics in Canada and Oman.
https://orcid.org/0000-0002-9248-5636

Amer Ahmed is an Assistant Professor, Department of English Language and Literature, Dhofar University. His research interests are in the areas of linguistic interfaces, second language acquisition, second language pedagogy and methodology, and Arabic diglossia. He has been teaching ESL and courses in linguistics in Canada and Oman.
https://orcid.org/0000-0003-2455-1790

References

Anderson L. W., et al.Krathwohl D. R., Airasian P. W., Cruikshank, K. A., Mayer R. E., Pintrich P. R., Raths J., Wittrock M. C. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of educational objectives.* New York: Addison Wesley Longman.

Baker, B., & Gravran, M. (2019, Dec. 19). *All of the Above? Examining Multiple-Choice Questions.* TESL Ontario Webinar. https://www.teslontario.org/content/tesl-ontario-webinar-109.

BBC learning English. (2016). *Language for emergencies: Episode 24.* [Video]. YouTube. https://www.youtube.com/watch?v=N_wjnJiDB3I

BigBlueButton. (2021). *Engage your online students*. https://bigbluebutton.org/.

Burns, A. (2015). Chapter 12: Action research. In J. D. Brown, & and C. Coombe, (Eds.), *The Cambridge guide to research in language teaching and learning* (pp. 99-105). Cambridge: Cambridge University Press.

Delosa, J. (2015, December). *The future of education is not what it used to be.* TEDx Talks [Video]. YouTube. https://www.youtube.com/watch?v=c2irSBECc-4

Denman, C., & Al-Mahrooqi, R. (2019). *Handbook of research on curriculum reform initiatives in English education: IGI Global.* https://doi.org/10.4018/978-1-5225-5846-0.

Dhofar University. (2021a). *Graduate attributes*. *Vision, mission, core values.* https://www.du.edu.om/vision-mission-core-values/

Dhofar University. (2021b). *Course syllabus: ENGL203E English for engineering and sciences II.* Salalah, Oman: Dhofar University.

Dhofar University. (n. d.). *Dhofar University: Moodle*. https://moodle1.du.edu.om/login/index.php

DU Grading System. (2021). *College of Engineering*. Available from https://ce.du.edu.om/master-of-science-in-chemical-engineering/du-grading-system/

Ibbotson, M. (2008). *Cambridge English for engineering*. Cambridge: Cambridge University Press.

International English Language Testing System (IELTS). (n. d.). *How IELTS is scored*. Available at https://www.ielts.org/about-the-test/how-ielts-is-scored.

Javaeed A. (2018). Assessment of higher ordered thinking in medical education: Multiple choice questions and modified essay questions. *MedEdPublish*, *7*(2), 60. https://doi.org/10.15694/mep.2018.0000128.1

Kerr, J. (2020, April 2). Cleaning your home: Good. Accidentally poisoning yourself: Bad. *The New York Times: Smarter Living.* https://www.nytimes.com/2020/04/02/smarter-living/coronavirus-clean-home-house-disinfect.html

Momsen, J. L., Long, T. M., Wyse S. A., & Ebert-May, D. (2010). Just the facts? Introductory undergraduate biology courses focus on lower-level cognitive skills. CBE – *Life Sciences Education*, *9* (4), 435-440. https://doi.org/10.1187/cbe.10-01-0001

Moodle. (2020). *Quiz activity*. https://docs.moodle.org/310/en/Quiz_activity.

Oman 2040. (n. d.). *National priorities*. https://www.2040.om/en/national-priorities/

Scully, D. (2017). Constructing multiple-choice items to measure higher order thinking. *Practical Assessment, Research and Evaluation, 22*, 1-13. DOI: https://doi.org/10.7275/ca7y-mm27

Oman Law Blog. (n. d.). *Health and safety in the workplace*. https://omanlawblog.curtis.com/2012/02/