



Assessing Students' Critical Thinking Skills in the Humanities and Sciences Colleges of a Middle Eastern University

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The level of critical thinking skills of Omani tertiary-level students is an area that has received only a limited amount of investigative attention. This study employed an adapted version of the Cornell Class-Reasoning Test, Form X to assess the critical thinking skills of students in the humanities- and science-based colleges of Sultan Qaboos University, Oman. The test featured 36 questions across six item groups that were associated with five critical thinking principles. Descriptive analysis was used to calculate overall correct percentages for the entire test and for each item group in order to determine whether participants had mastered or failed to master the critical thinking principle. Independent samples t-tests were also used to explore if statistically significant differences existed on item group totals based on the independent variables of gender and college of study, while a one sample t-test compared overall test results with those reported for foundation students at the research site who took the same test in a previous study. Results indicate that participants had either failed to master, or had neither mastered nor failed to master, all five of the assessed principles. However, they recorded significantly higher scores on four of the six item groups than foundation students in the earlier study. Female participants received higher overall test scores than their male counterparts, although there was no difference based on college of study.

Keywords: critical thinking, college students, Cornell Class-Reasoning, Oman, thinking skills, tertiary-level students

INTRODUCTION

The development of graduates' critical thinking skills, including analysis, inference, induction, and evaluation (Abu-Dabat, 2013), is often considered a core objective of higher education. Universities throughout much of the Middle East and North Africa

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(MENA) region have traditionally been characterised as more concerned with learner memorisation and content reproduction than with developing critical thinking skills and intellectual curiosity (Lagendijk, 2013). The lack of concern with learners' critical thinking skills has been detailed across educational settings in the region (Al-Dumairi & Al-Jabari, 2015; Allamnakhrah, 2013), and has been attributed to limited teacher training and pedagogical range (Chouari, 2016), and an overemphasis on content at the expense of analysis (Alnabhan, Alhamdan, & Darwish, 2014).

Describing the situation in the Arab world, the Dubai School of Government (2013) claims that, "Many young women and men have not been properly equipped with problem solving, critical thinking or communication skills due to the rote learning approach prevalent in secondary school and university curricula" (p. 3). It is this deficiency that is offered in the literature as one of the factors associated with the growing popularity of Western branch universities across much of the MENA region, due to their perceived concern with the development of their graduates' critical thinking abilities (Smail & Silvera, 2018).

Obstacles offered as preventing the effective integration of critical thinking skills into university-level programmes in the MENA region include a lack of teacher training in how to teach critical thinking, large class sizes with mixed ability learners, student mind-sets valuing memorisation over critical thinking, and structural obstacles in higher education systems (Chouari & Nachit, 2016). Despite the nature of these challenges, there is evidence that an awareness of the importance of developing learners' critical thinking skills is increasing among instructors, students and policymakers in at least some MENA nations (Muasher & Brown, 2018; Tawadrous, 2014), with this often being associated with education reform. Nonetheless, school and university students in the MENA region still generally do poorly on standardised critical thinking tests (Amrous & Nejmaoui, 2016; McLellan, 2009), including in the Sultanate of Oman (Kumar & James, 2015; Mehta, Al-Mahrooqi, Denman, & Al-Aghbari, 2018).

The current research sought to assess the critical thinking skills of students in the humanities- and science-based colleges of Sultan Qaboos University (SQU), Oman. The level of Omani tertiary students' critical thinking skills is an area that has received relatively little investigative attention. Studies in the area generally report that Omani college and university students significantly lag behind their international peers in the development of critical thinking skills (Kumar & James, 2015; Naqvi, Chikwa, Menon, & Al Kharusi, 2018). Research conducted at SQU by Mehta et al. (2018) and Neisler, Clayton, Al-Barwani, Al Kharusi and Al-Sulaimani (2016) reported that English foundation programme students had only developed critical thinking skills to a limited extent. The current research moves beyond the focus on foundation level students to examine the level of critical thinking skills of college-level learners at the research site.

LITERATURE REVIEW

Critical Thinking in the MENA Region

Although acknowledging its contested nature, this study took its definition from Al-Kindi and Al-Mekhlafi's (2017, p. 177) Omani investigation in which critical thinking

was conceived of as the practice of higher order cognitive skills associated with the domains of analysis, synthesis, and evaluation. Tuzlukova, Al Busaidi and Burns (2017) expanded upon these domains by highlighting the importance of reflection, clarity, accuracy, consistency, relevance, reasoning, fairness, empathy and so on, to critical thinking within a MENA education context.

Enhancing learners' critical thinking skills, and the abilities of teachers to help students develop these skills, often feature as key components of the various national educational reform plans that emerged in numerous Arab countries from around the turn of the century (see Akkary, 2014). In Oman, critical thinking, as part of learners' higher order thinking skills, has assumed a central role in the reformed public school Basic Education system since it was first introduced on a gradual basis from the academic year 1998/1999. Critical thinking also often features as a core graduate attribute of the sultanate's universities and colleges. This is true of the current research site of SQU where "critical analysis of complex information" and the ability to "exercise critical thinking in relation to ethical and cultural behaviour, research, and professional issues" are officially-recognised undergraduate and postgraduate attributes respectively (Sultan Qaboos University, 2019).

Despite the fundamental role that critical thinking plays across all education levels in the sultanate, the literature highlights the continued existence of numerous barriers to the development of learners' critical thinking skills both within Oman and across the wider MENA region. In her predictive model, Ladewig (2017) explored the socio-cultural factors that influence the propensity for critical thinking among female teacher education students at SQU. The model highlights the importance of five factors, including private religiosity, which encompasses individual religious beliefs and how they relate to behaviour management and approaches to problem solving, and student qualities, including learner motivation and participation. Other factors offered are socio-cultural capital, public religiosity, and family support. The author concludes that the necessary attitudes, cognition, and behaviour for critical thinking will not be apparent in Omani society unless they are endorsed by the family, religion, and the government.

In the Saudi Arabian context, Al Zahrani and Elyas (2017) offer a long list of barriers to critical thinking. These include teaching methods that encourage memorisation and shallow learning, limited student ability, classroom size, social attitudes that devalue questioning authority, a school curriculum that is not supportive of critical thinking, a lack of instruction in teaching critical thinking in pre-service teacher training programmes, and the marginalisation of critical thinking by school administrators and supervisors. The limited development of critical thinking skills has also been placed within the context of the lack of modern research cultures within many Arab nations, and of cultural barriers to creativity (Badi, 2007).

Assessment of Critical Thinking in Oman

Like many other nations of the MENA region (Amrous & Nejmaoui, 2016; McLellan, 2009), the literature often reports the limited development of learners' critical thinking skills within Oman. Kumar and James (2015) administered an adapted version of the

Watson-Glaser Critical Thinking Appraisal (WGCTA) to 281 diploma-level students at Nizwa College of Technology to determine their critical thinking levels, while also examining if statistically significant differences based on gender and department existed. The version of the WGCTA employed retained the five sub-scales of inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. Kumar and James reported that only a small percentage of respondents displayed high level abilities in terms of inferencing (25%), recognising assumptions and deduction (21% each), and interpretation and evaluation of arguments (12% each). Female participants displayed higher-level abilities in evaluation of arguments than males, while the department in which participants study also had a statistically significant relationship with sub-scale scores.

Mehta et al. (2018) examined the critical thinking skills of 60 students in their initial English foundation year at SQU to determine if participants, who had recently entered university, had developed critical thinking skills at the school level. The researchers administered the adapted version of the Cornell Class-Reasoning Test, Form X that is also used in the current research. Mehta et al. reported that participants failed to master four of the five critical thinking principles featured in the test, and achieved an overall average correct percentage of around 46% – roughly equivalent to the grade 4 learner results offered by the test creators, even though the test's original corrected for guessing formula was not applied. Female participants (51.0%) recorded better results than their male classmates (37.6%). Based on these results, the authors recommend reforming the ways in which critical thinking is integrated into the curriculum in Oman's government schools.

Neisler et al. (2016) conducted a longitudinal studying that explored, among other concerns, the critical thinking skills of four intakes (2010-2013) of SQU students enrolled across all nine of the university's colleges. More than 10,000 students entering the university were administered an Arabic language version of the California Critical Thinking Skills Test (CCTST) during orientation, in addition to 693 students from cohorts 2010-2012 who were selected for re-testing. The CCTST featured the five sub-scales of analysis, inference, evaluation, induction, and deduction. Neisler et al. reported that all featured SQU student cohorts received overall CCTST scores that placed them within the "weak" range. These scores were also lower than those reported in the literature for similar samples of learners in the USA who recorded scores that were moderate to strong. No statistically significant results occurred on test results based on students' college. In addition to weak overall test results, participants' five sub-scale scores all fell within the "not manifested" range, thereby offering no evidence of critical thinking having occurred. The authors interpreted these findings by stating that, despite the intent of Basic Education schools to develop Omani students' critical thinking skills, Oman's highest achieving school graduates – the generally top 5% accepted to SQU – still have not developed these skills to any meaningful level.

Naqvi et al. (2018) examined the core study skills of 201 undergraduates through the use of a self-rating inventory in a private college in Oman. Of interest to the current research is the authors' inclusion of the domain of critical and creative thinking, in addition to

comparisons between gender, department (computing, engineering, and business), and year of study (1st and 4th years). Participants were asked to rate themselves on a 5-point scale in terms of their preference for five critical thinking actions. A total domain score was then calculated and compared to the benchmark score – a number offered by the researchers to denote a level of minimal achievement.

For both male and female respondents across all specialisations, the average critical and creative thinking dimension score reported by Naqvi et al. (2018) was 19.3, with 20 set as the minimum benchmark. Only first year male engineering students ($M = 23.0$) and first year male ($M = 22.2$) and female ($M = 23.9$) business students exceeded this point. The authors stated that these results generally indicate the lack of critical thinking skills among participants. Interestingly, when compared with other study skill dimensions featured on the inventory, Naqvi et al. highlighted how respondents reported having much higher levels of memorisation than critical thinking skills. This outcome is characteristic of the way in which Arab education systems generally favour memorisation over analysis as described above.

METHOD

Research Questions

The above studies indicate the limited development of Omani tertiary students' critical thinking skills, including foundation-level learners at SQU. This research builds directly upon these studies by examining the critical thinking skills of SQU students in humanities- and science-based colleges, rather than at the foundation level. It addresses the following research questions:

1. To what extent have SQU college-level students developed critical thinking skills as assessed by the Cornell Class-Reasoning Test, Form X?
2. Are there statistically significant differences on Cornell Class-Reasoning Test, Form X results based on the independent variables of gender and college of study?
3. Do statistically significant differences exist between SQU college-level learners' Cornell Class-Reasoning Test, Form X results and those of SQU foundation learners as reported in the literature?

Critical Thinking Test

After considering a number of critical thinking test options, the Cornell Class-Reasoning Test, Form X was selected. The biggest challenges in selecting an appropriate test for the research context included the EFL status of participants, and the subsequent risk of conflating English ability with critical thinking skills (Al Ghamdi & Deraney, 2013), in addition to issues associated with translating a standardised test from English to Arabic, and time constraints on data collection. To address these challenges, the researchers employed the version of the Cornell Class-Reasoning Test, Form X (Ennis & Paulus, 1965) that was adapted by a research team, which included the current paper's authors, for use in Mehta et al.'s (2018) investigation.

The original test was selected due to the simplified form of the critical thinking questions featured, and the fact that it is one of the most widely-used assessments of critical thinking (Chouari & Nachit, 2016). Test takers are offered a small amount of information and a supposition before being asked if a final statement is true. Response options are 'Yes', 'No', and 'Maybe'. Selecting 'Yes' indicates that the final statement is true, 'No' that it cannot be true, and 'Maybe' that there is not enough information offered to make an accurate determination.

The adapted version of the Cornell Class-Reasoning Test, Form X featured 36 questions across six item groups, instead of the full-length 72 items from 12 item groups in the original. The 36 questions cover the three test content components of Concrete Familiar (CF), Symbolic (SY), and Suggestive (SU) with the same frequency as the full-length test. The content component of Concrete Familiar is concerned with concrete articles and qualities that test-takers are assumed to be familiar with, questions associated with the Symbolic component use symbols, such as 'X' and 'Y', instead of concrete items, and questions from the Suggestive component involve familiar content but where the content's truth or falsity is unknown. For each item group, the first four questions are Concrete Familiar, the fifth is Symbolic, and the final is Suggestive. The names of people and places (e.g. Jane, New York) and some common nouns (e.g. garage, baseball bat, pet show) were changed where considered necessary to make the test more culturally appropriate for Omani students. Despite these occasional changes in wording, question forms remained the same as on the original test.

Analysis

Ennis and Paulus (1965), developers of the Cornell Class-Reasoning Test, Form X, state that the main concern of the test is to determine whether test-takers have mastered the principle that item groups assess. To determine this, Ennis and Paulus state that mastery is demonstrated when a test-taker correctly answers 5 or 6 items from each group, while failure to master a principle is evidenced when 3 or fewer items have been answered correctly. According to the authors, four correct answers for an item group demonstrate neither mastery nor a failure to master the principle. For ease of interpretation, the researchers converted these numbers to percentages, with scores of around 83.3% or higher indicating mastery of the principle, scores of approximately 50.0% or lower indicating failure to master the principle, and scores of around 66.7% indicating neither mastery nor failure to master the principle.

Independent samples t-tests were conducted on overall test totals to determine if the independent variables of gender and college of study (science- or humanities-based) were associated with test performance. Finally, a one sample t-test was used to explore if SQU college participants' test scores differed significantly from SQU foundation student scores on the same test as reported in Mehta et al. (2018). Probability levels for all inferential tests were set at $p \leq 0.05$.

Sample

After receiving ethics approvals from the relevant authority at the research site, the research team asked permission from instructors across science- and humanities-based

colleges at SQU to seek their learners' participation in the study. Once permission was received, the researchers offered an overview of the research to students during their regular class times, including its nature and objectives, and asked for their participation. Potential participants were reminded of the study's voluntary and confidential nature, and that their choice to participate or not would in no way impact their standing in the class or at the university.

A total of 200 students (50.5% male, 49.5% female) agreed to sit the critical thinking test. The vast majority of participants were 20 years or older (89.0%), with 10.0% being 18 or 19 years old (two participants did not record age). The sample was evenly split between those studying in science-based colleges (50.0%) and those enrolled in humanities-based colleges (50.0%). Participants came from governorates across Oman, including: Al-Dakhilia (23.5%), Al-Batinah South (23.0%), Muscat (15.5%), Al-Batinah North (15.5%), Al-Sharqiya South (8.0%), Al-Dhahira (7.5%), Al-Sharqiya North (4.5%), and Al-Wusta (1.0%). In addition, one participant each (0.5%) came from Musandam, Al-Buraimi, and Dhofar.

FINDINGS

Respondents' overall percentage correct on the Cornell Class-Reasoning Test, Form X was 55.2%, with scores for the three content components being: Concrete Familiar (57.5%), Symbolic (50.4%), and Suggestive (50.3%). Item group 1 was concerned with principle 1: 'All As are Bs. : At least some As are not Bs.'. Table 1 indicates that the overall percent correct for this item group was 71.2%, which is slightly higher than the 66.7% mark offered above to indicate neither mastery nor failure to master the principle. Participants recorded correct percentages above this mark for all items associated with principle 1, with the highest correct percentages being for the Concrete Familiar items 32 (75.0%) and 5 (73.0%). The lowest correct percentages in this item group were for those items relates to Symbolic (69.5%) and Suggestive (69.0%) items.

Table 1
Item Group 1

Question Number	Percent Correct	Percent Incorrect
5 (CF)	73.0	27.0
32 (CF)	75.0	25.0
26 (CF)	70.5	29.5
13 (CF)	70.0	30.0
19 (SY)	69.5	30.5
36 (SU)	69.0	31.0
Total	71.2	28.8

Item group 2 was concerned with principle 2: 'All As are Bs. All Bs are Cs. : All As are Cs'. Respondents received an overall percentage correct of 64.1%, which again suggests neither mastery nor a failure to master the principle (see Table 2). The highest correct percentages from this item group were for item 24 (75.5%) and item 4 (69.0%), with the lowest being for Symbolic item 16 (57.0%). However, no item recorded an overall percent correct that fell below the 50.0% level, which is the cut-off point indicating failure to master the principle.

Table 2
Item Group 2

Question Number	Percent Correct	Percent Incorrect
4 (CF)	69.0	31.0
37 (CF)	60.5	39.5
24 (CF)	75.5	24.5
11 (CF)	62.5	37.5
16 (SY)	57.0	43.0
28 (SU)	60.0	40.0
Total	64.1	35.9

Table 3 features item group 3 which was associated with principle 3: 'All As are Bs. All Cs are Bs.: At least some Cs are As'. The overall correct percent for this item group was 40.2%, indicating failure to master the principle. All items associated with this principle recorded overall correct percentages below 50.0%, with the highest being for item 29 (49.0%) and the lowest for item 38 (31.5%).

Table 3
Item Group 3

Question Number	Percent Correct	Percent Incorrect
8 (CF)	34.5	65.5
21 (CF)	45.0	55.0
29 (CF)	49.0	51.0
34 (CF)	43.0	57.0
27 (SY)	38.0	62.0
38 (SU)	31.5	68.5
Total	40.2	59.8

Item group 4 was associated with the same principle as item group 3. Reinforcing findings from the previous item group, Table 4 indicates that participants again demonstrated a failure to master the principle with an overall percent correct of 40.4%. Only one item – the Concrete Familiar item 23 (55.0%) – recorded an overall percent correct above 50.0%, while the others all fell below this mark. The lowest percent correct was for the Symbolic item 31 (29.5%).

Table 4
Item Group 4

Question Number	Percent Correct	Percent Incorrect
6 (CF)	40.5	59.5
10 (CF)	35.5	64.5
23 (CF)	55.0	45.0
15 (CF)	43.0	57.0
31 (SY)	29.5	70.5
20 (SU)	39.0	61.0
Total	40.4	59.6

Table 5 features correct percentages for participants for item group 5, associated with principle 4: 'No As are Bs.: No Bs are As'. The average correct percent for this item group of 54.1% is slightly higher than the 50.0% mark that indicates failure to master the principle. Three of the items here, all of which were Concrete Familiar, recorded overall correct percentages above 50.0%, with two of these receiving percentages that

indicate neither mastery nor failure to master the principle. These were item 17 (69.5%) and item 14 (69.0%). Of the three items that recorded overall correct percentages below 50.0%, the lowest was for the Suggestive item 25 (37.5%).

Table 5
Item Group 5

Question Number	Percent Correct	Percent Incorrect
7 (CF)	57.0	43.0
14 (CF)	69.0	31.0
17 (CF)	69.5	30.5
30 (CF)	42.5	57.5
35 (SY)	49.0	51.0
25 (SU)	37.5	62.5
Total	54.1	45.9

Table 6 features percentages correct for item group 6, which was associated with principle 5: 'All As are Bs. No Cs are Bs.: At least some As are Cs'. The overall percent correct for this item group was 60.6%, which may indicate neither mastery nor failure to master the principle. All items recorded overall correct percentages above 50.0%, with the highest being for the Suggestive item 33 (64.5%) followed by two Concrete Familiar items – 18 (64.0%) and 22 (64.0%).

Table 6
Item Group 6

Question Number	Percent Correct	Percent Incorrect
9 (CF)	54.5	45.5
18 (CF)	64.0	36.0
39 (CF)	57.0	43.0
22 (CF)	64.0	36.0
12 (SY)	59.5	40.5
33 (SU)	64.5	35.5
Total	60.6	39.4

Independent samples t-tests were performed for the independent variables of gender and college (humanities- and science-based) to determine if statistically significant differences existed on overall test results. Differences ($p = .00$) were found between male and female participants, with the mean score for male participants on the test being 17.08 ($SD = 6.17$) and the mean female participant score being 22.69 ($SD = 6.59$). No statistically significant differences were found for the grouping variable of college.

A one sample t-test was next performed to compare the SQU college-level participants' total scores on the adapted Cornell Class-Reasoning Test, Form X with Mehta et al.'s (2018) SQU foundation student scores on the same test. A statistically significant difference existed between the overall test score for the current study's college-level participants (55.2%) and Mehta et al.'s foundation learners ($M = 45.8\%$) of 9.4% ($p = 0.00$). Table 7 indicates that statistically significant differences were also found at the $p \leq 0.05$ level for item groups 1, 2, 3 and 6, with SQU college students outperforming foundation learners on each of these groups. No statistically significant differences occurred for item groups 4 and 5.

Table 7
One Sample T-Test Comparisons by Item Group

Item Group	SQU College Students (current research)*	SQU Foundation Students (Mehta et al.)	Mean Difference	Sig.
1	71.2	61.7	9.5	0.00**
2	64.1	52.3	11.8	0.00**
3	40.2	23.8	16.4	0.00**
4	40.4	37.8	2.6	0.11
5	54.1	51.4	2.7	0.08
6	60.6	46.4	14.2	0.00**

*scores rounded to one decimal place

**significant at the $p \leq 0.05$ level.

DISCUSSION

The main purpose of the research was to examine SQU college-level learners' critical thinking skills as assessed on the Cornell Class-Reasoning Test, Form X. Based on the overall correct percentages from each of the test's item groups, it appears as though participants had neither mastered nor failed to master two or three of the critical thinking test's principles. That is, with reference to Ennis and Paulus's (1965) rule of thumb, respondents recorded overall correct percentages of around 66.7% for Principles 1 (71.2%), 2 (64.1%), and 5 (60.6%).

However, participants recorded overall correct percentages for the remaining two principles, measured across three item groups, that indicated failure to master their associated principles. That is, they recorded overall percentages of around 40.0% for Principle 3 (40.2% for item group 3 and 40.4% for item group 4) and of 54.1% for Principle 4. It is notable that none of the principles recorded overall correct percentages above 83.3%, which is the point above which scores indicate mastery. This is a trend that is also apparent across all three of the test's content components, with participants receiving overall correct percentages of 57.5% for Concrete Familiar, 50.4% for Symbolic, and 50.3% for Suggestive.

Ennis and Paulus (1965) offered a series of scores for school students which can be used as a benchmark by which to compare test results. When doing so, it becomes apparent that the SQU college-level participants featured in the study received overall correct percentages that were roughly equivalent to Ennis and Paulus's grade 4 participants across item groups. Ennis and Paulus's grade 4 participants recorded the following correct percentages across the item groups featured here: item group 1 (71.7%), item group 2 (60.0%), item group 3 (28.3%), item group 4 (41.7%), item group 5 (58.3%), and item group 6 (60.0%). However, when content components are examined, participants in the current study have correct percentages that are more similar to Ennis and Paulus's grade 6 and grade 8 learners – Concrete Familiar (63.3%), Symbolic (45.8%), and Suggestive (51.7%).

As detailed in the literature review, little research from Oman or the wider MENA region using the Cornell Class-Reasoning Test, Form X is available. However, the study by Mehta et al. (2018) using the same adapted version of the test employed here offers

similar results in that it indicates the overall limited level of Omani learners' critical thinking skills. The one sample t-test examining differences between Mehta et al.'s SQU foundation-level learners and the current study's college-level learners at the same university revealed statistically significant differences in overall test scores in favour of the latter group. SQU-college level learners also outperformed foundation students on four of the six item groups, with only scores on item groups 4 and 5 not being significantly different.

Based on these results, it may be possible to argue that participants' studies at the college level in SQU have contributed to this apparent higher level of critical thinking skills, even if Orszag (2015) reported that time spent in university is not correlated with the critical thinking skills of Finnish learners. Similarly, it could be argued that college students have more experience of sitting formal examinations, including standardized tests, than recent high school graduates, and that the higher test scores recorded by these participants may partly reflect this. Moreover, it must be kept in mind that, despite the apparently better performance of SQU college-level learners in the Cornell Class-Reasoning Test, Form X than foundation learners, their overall test average of 55.2% is still only equivalent to school learners in the USA as reported by the test creators.

This study offers support for the results of the research conducted by Neisler et al. (2016), which reported the lack of critical skill development on the CCTST across the sub-scales of analysis, inference, evaluation, induction, and deduction. Results here also appear to confirm the limited development of Omani tertiary-level learners' critical thinking skills as described by Naqvi et al. (2018) and Kumar and James (2015). Taken together, these studies provide a picture of higher education students in Oman who are seemingly not equipped with critical thinking skills upon entry to their universities and colleges, and who appear to only develop these to a limited extent during their tertiary studies.

When examining the potential impact of gender on test scores, it was found that female participants ($M = 22.69$) recorded higher overall scores than their male counterparts ($M = 17.08$). Differences in general academic performance and levels of achievement between male and female students have been described across all education levels in Oman (Barwani, 2011), and female learners were also found to outperform their male counterparts in Mehta et al. (2018) and Kumar and James (2015). Subsequently, this result was anticipated by the researchers at the commencement of the study, and adds weight to the call for the introduction of measures to help develop male learners' academic skills within the country. However, statistically significant differences based on whether learners' were enrolled in science- or humanities-based colleges were not found. This outcome supports the general lack of critical thinking differences between students across specializations reported by Naqvi et al. (2018).

CONCLUSION

The results of the study contribute more detail to the picture of the critical thinking skills of Omani tertiary level learners in general, and of students enrolled in the country's only public university in particular. While Kumar and James (2015) and Naqvi et al. (2018)

described the limited critical thinking skills development of Omani tertiary-level learners, and the investigations of Mehta et al. (2018) and Neisler et al. (2016) detailed similar concerns specifically in SQU's foundation programme, the current research offers a more detailed examination of SQU college-level learners. Despite the change in focus from foundation to undergraduate learners in Oman's top university, the results remain essentially the same. That is, even though there is evidence that SQU college-level learners performed better on the adapted Cornell Class-Reasoning Test, Form X than the foundation students in Mehta et al., their overall test scores are barely above the 50.0% mark. In fact, their overall score of 55.2% is similar to the American grade 4 and 6 school learners offered by Ennis and Paulus (1965).

A number of limitations with the current research need to be taken into account when interpreting these findings. The first is the limited number of participants ($N = 200$). Due to this, there is a risk in generalizing findings from this sample to an SQU student body that numbers more than 7,300 full-time or equivalent students. Moreover, the use of the adapted version of the Cornell Class-Reasoning Test, Form X means that, unlike the full-length original version, the test used to assess participants' critical thinking skills lacks thorough psychometric evaluation, even if the test creators did recommend using the abridged version of 6 item groups for younger learners. The adapted version also means that the marking formula detailed by the test creators could not be applied, with the simpler measure of percent correct employed instead.

Finally, the one sample t-test used here offered the opportunity to compare SQU college-level learners in the current research with Mehta et al.'s (2018) foundation learners at the same university. Although members of the research team worked on both projects upon which these papers were based during the same time period, it should be reiterated that they were, nonetheless, separate studies. Subsequently, the attempt to compare these two samples is performed in an exploratory way only, and is one that must necessarily take into account the influence of numerous extraneous variables on results.

Despite these limitations, it is perhaps fair to conclude that the SQU college-level learners featured in the current research have only developed critical thinking skills to a limited extent. These skills might be more developed in female learners, although whether students are studying in science- or humanities-based colleges seemingly does not impact upon this. The overall picture of Omani tertiary-level learners' critical thinking skills remains a cause for concern. Following other researchers in this area in the Omani context, this paper concludes by arguing for wide scale reform across all educational levels to ensure that learners' critical thinking skills are developed to the levels required for their future educational, professional, and social success.

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