

RESEARCH ARTICLE

Exploring the influence of cultural dimensions on formative assessment practices among science teachers in Cycle two schools of Oman

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ABSTRACT

There is a paucity of empirical research on the direct influence of culture on the employment of formative assessment practices in the classrooms. Consequently, this study employs Hofstede's cultural dimensions to investigate the influence of different dimensions of culture on formative assessment practices. Data were obtained from 91 science teachers in Cycle Two schools located in the Sultanate of Oman. A self-administered structured type of questionnaire was employed, and the primary data were analyzed using SPSS. According to the results, the formative assessment practices of the science teachers were significantly influenced by the five culture dimensions investigated: Power-distance, Collectivism-individualism, Masculinity-Femininity, Uncertainty avoidance, and Oriental view (long-term orientation and short-term orientation). The findings offer empirical validation and vital theoretical insights into how culture can interact and influence delivery of formative assessment practices in the classroom. Practically, valuable insights are offered to policy makers and implementers as they embark on the strengthening of teachers' competencies in formative assessment.

Keywords: Hofstede's cultural dimensions; Formative assessment; Assessment practices; Cycle two schools; Oman

1. Introduction

In order for learning to occur, learning objectives, instructional strategies, and the assessments deployed must be well linked and closely aligned so that they can mutually reinforce one another. While instructional strategies are executed to ensure that learning materials are adequately absorbed by learners, assessments show how well the learners have mastered the topic they have learned. Assessment encompasses various tasks carried out by teachers to gather data that can be utilized as feedback to adjust instructional and learning processes^[1, 2]. The main purpose of assessment is to improve teaching and learning, which are two interdependent processes.

Formative assessment practices play a crucial role in the science classroom by allowing teachers to provide ongoing feedback on students' understanding and progress. By regularly assessing students' understanding, teachers can identify areas where students may be struggling and adjust their instruction accordingly. This continuous feedback loop helps ensure that students receive the support they need to

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succeed. These essential techniques include classroom observations, effective questioning strategies, short tests, or prompts, as well as activating self and peer assessments. The primary objective of formative assessment is to improve the quality of teaching and facilitate deeper learning among students ^[3]. Transitioning from a traditional teacher-focused approach to a more student-centered approach in science classrooms necessitates that teachers possess a comprehensive understanding of effective methods for engaging with their students ^[4]. However, a lack of understanding of formative assessment ^[5] and a misalignment between understanding of formative assessment and formative assessment practices ^[6] have been identified as problems that prevent some teachers from successfully implementing formative assessment goals.

An area that has not been given adequate attention is the influence of cultural factors which may create obstacles to the efficient use of formative assessment techniques. Every area of human life is impacted by culture, which has been used literarily, metaphorically, and anthropologically to depict cultivation, civilization and communal modes of behaviour, thought, and emotion. The collective mental programming that distinguishes one group or category of people from another has been characterized as culture by Hofstede et al. ^[7] with the aim of characterizing the collective ways of acting, thinking, and feeling. As argued by Sutton et al. ^[8], local cultural aspects tend to hinder lasting improvements in assessment methods. This agrees with Troncon [9] who observed that the outcome of assessment practices on student achievement could also be influenced by local cultural dimensions, since some students often tend to view assessment procedures and examinations as techniques aimed exclusively at "rewarding a few students and punishing others" Consequently, it is crucial to conduct a research-based study that empirically examines the impact of cultural dimensions on the implementation of formative assessment practices.

According to a study conducted by Al Shabibi and Silvennoinen ^[10], it has been observed that Omani students exhibit a significant lack of proficiency in math and science subjects when compared to their international counterparts. International assessments on learning outcomes have consistently indicated low performance by Omani students in these areas.

This research suggests that the obstacles associated with formative assessment practices can be better understood by considering Hofstede's cultural dimensions. As a result, it is argued that cultural dimensions present challenges to science teachers during their practices of formative assessment. The purpose of this study is to empirically explore the influence of Hofstede's cultural dimensions on formative assessment practices among science teachers. The context of the study is Cycle Two schools (Grades 5 to 8) located in the Sultanate of Oman.

2. Literature Review

2.1. Formative Assessment Practices

Several researchers have discussed the nature of formative assessment practices, distinguishing between formal and informal approaches. Formal formative assessment refers to a type of assessment that is conducted within the framework of the curriculum. It involves incorporating assessment tasks directly into the curriculum, where students are expected to complete these tasks and teachers are responsible for evaluating their performance and providing feedback ^[11]. Informal formative assessment happens in a spontaneous manner such that as the students take an active role in the learning process, the teacher responsively and proactively provides feedback to help them move toward the learning goal ^[12].

Formative assessment constructs that are discussed in the educational literature with focus on science subjects include the following: Specifying the gap between the current level of students' learning and the

targeted learning objectives; Sharing learning objectives and assessment criteria; Constructive feedback; Good classroom discussion and Effective questioning; and Self and peer assessment.

2.1.1. Learning Gaps

According to Kumpas-Lenk et al. ^[13], it is essential for teachers to be aware of their students' current performance level and their expectations from the teacher to effectively plan and implement teaching and learning strategies. Diagnostic assessment plays a crucial role in achieving these objectives as it involves analyzing students' existing capabilities and skills in specific subjects. This analysis helps teachers identify the areas where students may need additional support or intervention, enabling them to alter their teaching and assessment methods accordingly to meet the current needs of the students ^[13]. This is advocated by Samuel et al. ^[14], who assert that the concept of formative assessment is commonly influenced by Sadler's ^[15] framework. Quality ideas held by teachers are usually considered tacit knowledge, mostly in their unarticulated form. The conventional belief that students must be informed by the teacher of their progress to enhance their performance perpetuates the learner's reliance on the teacher. According to Sadler ^[15], students should learn how to assess the quality of their own work, particularly when it's being produced.

2.1.2. Learning Objectives-Assessment Criteria

The scholars of formative assessment advocated for the incorporation of agreed standards or criteria in a specific subject to assess achievement and determine the next steps in learning. Different authors have proposed various models in this regard. For instance, Bloom emphasizes mastery learning ^[6], Sadler focuses on learning goals ^[17], and Lambert and Lines suggest a pre-designated set of explicit knowledge, understanding, and skills ^[18].

Research on formative assessment suggests that it is beneficial for teachers to clearly communicate the learning objectives to their students in a way that is easy to understand ^[2]. Furthermore, a fundamental component of formative assessment is continuous evaluation and feedback throughout the learning process. This approach, according to Samuel et al. ^[14] aims to enlighten and improve students' comprehension so they can actively participate in and fulfill predetermined learning objectives and standards. It also aligns with Panadero et al. ^[19] concept of evaluative judgment, which is centered on student self-regulation.”

2.1.3. Constructive Feedback

Most authors concur that feedback plays a vital role in formative assessment. It is widely argued that feedback is an integral component of effective teaching, and most teachers incorporate feedback as part of their regular instructional practices ^[20]. Researchers, such as Wiliam ^[21], Owen ^[22], Al-Hattami ^[23] and Irons & Elkington ^[24], have consistently affirmed the importance of providing constructive feedback to students. This feedback should be given regularly and in a timely manner, specifically addressing the task at hand. Furthermore, it should focus on highlighting the skills, knowledge, and attitudes that are considered most important within the subject being studied by the student ^[20]. Likewise, Samuel et al. ^[14] assert that it is essential for teachers to offer consistent descriptive feedback to students, which should emphasize both the strengths and weaknesses of their work. This feedback should also highlight the specific areas of learning that require attention. According to Cassambai et al. ^[25], feedback in formative assessment practices can greatly improve learning and achievement in bioscience courses when it is aligned with learning outcomes. This was stated in their study on co-creating a flipped feed-in approach to a virtual biochemistry lab assessment ^[25]. Similarly, formative assessment improvements like frequent feedback and mastery learning, according to Biggs, Tang, and Kennedy ^[26], result in significant learning gains for pupils. By encouraging proactive rather than reactive feedback creation and utilization, formative assessment and feedback can assist

students in developing into self-regulated learners ^[27]. Thus, formative assessment—which emphasizes feedback—should be given top priority in science education since it is essential for deep learning ^[28].

2.1.4. Engineering Good Classroom Discussion

It is suggested that teachers can enhance their assessment practices in science classes by utilizing assessment strategies, such as questioning techniques and responsive approaches to students' ideas. Black and Wiliam ^[29] proposed that assessment for learning can be informal, primarily achieved through effective questioning, and is often formative in nature. For instance, teachers can employ questioning strategies to investigate students' prior knowledge and make their thinking explicit to the entire class. This can be done through various learning tasks that provide evidence of student comprehension ^[29].

According to some researchers ^[30], The utilization of open-ended questions during classroom discussions provides an opportunity for all students to express their thoughts and enhance their cognitive abilities in relation to a particular task ^[22].

2.1.5. Self and Peer Assessment

According to Samuel et al. ^[14], teachers should enable students to absorb the assessment criteria, understand how to apply the knowledge to do self- or peer assessment, and then express their thoughts or feedback to their peers. Similarly, according to the research conducted by Cagasan et al. ^[31], it was determined that teachers at an advanced level possess the ability to instruct students on how to become evaluators of their own learning processes. Additionally, these teachers can support the evaluation processes of their peers, offering feedback that is specifically aimed at assisting students in evaluating their own progress. Furthermore, they provide opportunities for students to engage in peer feedback that goes beyond simply correcting answers or assigning grades. Moreover, these teachers create avenues for students to assess themselves beyond the scope of mere response correction or grading.

2.2. Cultural and Teachers' Formative Assessment Practices

Culture encompasses the collective behaviors and beliefs that are shared among individuals within a particular group or society ^[32]. It serves as a framework through which people interact, communicate, and understand the world around them. However, it is important to note that culture is not a static entity but rather a dynamic phenomenon that undergoes constant evolution and change ^[33]. Teachers incorporate their cultural backgrounds and personal histories into their teaching by expressing their beliefs and values ^[34]. Extensive research has indicated that teachers' cultural experiences and beliefs significantly influence their approaches to teaching and learning ^[35]. When a teacher actively creates teaching strategies based on his or her beliefs that are motivated by social and cultural interaction, traditions, values, experiences and professional development, and scholarly literature, it is said to be metacognitive ^[36]. The teaching approach that teachers choose is influenced by their epistemological views on learning and how individuals learn ^[35].

Asghar ^[37] explored the complexities of formative assessment by applying the cultural historical activity theory. Using a semi-structured interview and case study strategy, the findings of his study revealed that the cultural context of the community in which the students and teachers are situated can provide an explanation into the complexity of experiences observed in the outcome of formative assessment practices. This resonates with the observation of Al-Wassia et al. ^[38] who showed that the outcome from formative assessment practices in Saudi Arabian schools was significantly due to the impact of cultural values in the Saudi society.

Sortkaer ^[39] argues that in lower secondary mathematics classrooms, students' perceptions of teacher-student feedback practices are positively impacted by higher cultural capital, with a stronger relationship for

males than for girls in nations with higher levels of masculinity, like Oman. Even worse, local materials and implementation strategies clash with Oman's educational system's 'colonialist/culturalist' worldview, creating difficulties for second language tutoring ^[40]). The Arab cultural background in Oman and other Arab nations affects how social presence develops in online Arabic learning groups; users choose synchronous chat platforms and responsible relationships for greater immediacy [41]. Furthermore, feedback procedures for writing in a second language at Omani higher education institutions are negotiated between instructors and students and are influenced by a variety of contextual factors, making them situation specific ^[42]. According to Barwani, Mekhlafi, and Neisler ^[43], teacher preparation programs that use service-learning projects with feedback mechanisms in the classroom can successfully cross-cultural divides and enhance student results for the benefit of Omani students.

In a study conducted by Al-Wassia et al. ^[38] on attitudes towards formative assessment in a medical faculty, four categories of challenges to the implementation of formative assessment were identified. These categories include political and strategic challenges, economic and resource-related challenges, social and religious challenges, and technical/development challenges. The researchers found that a significant portion of the faculty and students, specifically 33% of faculty members and 43% of students, believed that there were social and religious obstacles to the practice of formative assessment. The findings regarding social and religious challenges were primarily derived from questionnaire items that focused on power dynamics between students and faculty. It was observed that some students felt unable to engage in debates or discussions with faculty members due to perceived power differences. This lack of opportunity for open dialogue was seen as a hindrance to effective formative assessment practices. Additionally, concerns were raised about the interaction between students and faculty members of the opposite sex, which was viewed as conflicting with religious rules or norms. This aspect further contributed to the perception of social and religious challenges in implementing formative assessment in the medical faculty. Oman is a Middle Eastern developing country with a high context culture that bears significant cultural ideological differences to other national identities of low context cultures, as a result the challenge may lie in the cultural influence which is yet to be properly addressed in the literature. Unsurprisingly, the result from the present study portrays those cultural leanings shortcomings and/or challenges to the science teachers in the way they practise formative assessment with their students in classrooms. These cultural challenges are in line with the challenges revealed internationally; however, cross cultural differences could also emerge from the community values, which are reflected in the philosophy and objectives of education in a country like the Sultanate of Oman, which basically emphasize the Omani cultural identity and the traditions, customs, and historical heritage of the Omani Society, alongside its commitment to the Islamic religious belief in equality between all citizens and social justice for all ^[44]. Accordingly, these Islamic cultural values coupled with the customs and traditions are expected to be adopted and practiced by both teachers and their students in the science classrooms.

2.3. Hofstede's Model of Cultural Dimensions

As the frequency of interactions across cultural boundaries has risen in the past few decades, there has been a growing necessity to comprehend and appreciate different cultures. In the 1970s, various models were formulated to forecast human behavior in cross-cultural settings. Among these models, the one developed by Geert Hofstede has emerged as the most influential and widely utilized in numerous empirical studies ^[45].

Hofstede ^[46] proposed four dimensions of national culture that can be used to compare the prevailing value systems across different countries. These dimensions provide a framework for understanding and analyzing cultural differences on a national level.

According to ^[47], Hofstede's original cultural dimensions can be summarized as follows: Power-Distance; Collectivism versus Individualism; Masculinity versus Femininity; Uncertainty Avoidance; Oriental view (Long-term orientation and short-term orientation dimension)

2.3.1. Power Distance

Power-distance is the extent to which people in an organization or culture tolerate hierarchical power structures. It measures how comfortable people are with power imbalances and authority. Hierarchical arrangements with centralized power and decision-making are more accepted in high-power distance countries and organizations. However, countries or organizations with low power distance tend to decentralize authority and adopt democratic leadership ^[48]

Teacher-centered education is common in high-power distant civilizations, where teachers are authority figures who teach students. Students don't speak or raise questions in this form of schooling unless asked. Information flows from teacher to student with little student interaction or discussion ^[49] In this study it is hypothesized that:

H₁: Power-distance significantly influences formative assessment practices among science teachers in Oman Cycle Two schools.

2.3.2. Collectivism versus Individualism

Individualistic societies are often called "behavioral" ^[50]. People demand fair treatment from peers and instructors in such cultures. Teachers in these societies must motivate passive learners by rewarding or punishing them. Conversely, "constructivist" civilizations have low individualism ^[50]. Teachers facilitate learning in these societies, while students learn through social relationships. Collectivism discourages students from speaking up in class ^[49]. Wursten and Jacobs ^[51] state that in a collectivist classroom, students only speak when spoken to, speak in small groups, embrace peace, do not lose face, and demonstrate ethnic and affiliation-based partiality. In a society that emphasizes individualism, teachers encourage pupils to discuss and share their viewpoints. These talks often occur in big groups where students may argue. Thus, one party may lose face, affecting their reputation or social status. However, teachers in such communities try to be neutral and treat all students equally.

In this study it is hypothesized that:

H₂: Collectivism-individualism significantly influences formative assessment practices among science teachers in Oman Cycle Two schools.

2.3.3. Masculinity-Femininity

Masculinity versus Femininity examines how education can prioritize different values and purposes. According to Cambridge ^[52], educational institutions might stress cooperation and security or recognition and growth.

Countries with a high masculinity-femininity index emphasize student rivalry. Excellence is encouraged and rewarded in education. Countries with a low masculinity-femininity index encourage a welcoming and collaborative learning atmosphere. Collective effort is emphasized above individual competitiveness. In cultures that value masculinity and traditional gender norms, women are less accepted as leaders in teaching or authority ^[49]. Wursten and Jacobs ^[51] found that masculine-oriented teachers use the best students as role models, promote academic rewards, view academic failure as a reflection of one's self-image, encourage students to make themselves visible, and help them choose subjects based on their career paths. However,

feminine professors laud average students, emphasize social adaptation, see failure as a natural part of learning, and encourage students to choose disciplines based on personal desire.

In this study it is hypothesized that:

H₃: Masculinity-femininity significantly influences formative assessment practices among science teachers in Oman Cycle Two schools.

2.3.4. Uncertainty Avoidance

How uncomfortable a person is with uncertainty and ambiguity is called uncertainty avoidance. This concept is strongly related to how students generate knowledge in a learning environment. Students emphasize getting the right answer from teachers in uncertain-avoidant societies. This cultural feature favors explicit rules, controlled learning environments, and limited ambiguity. Countries with a low uncertainty avoidance index have a more open-minded learning culture. Students are encouraged to participate in conversations and share their thoughts ^[48]. Structure and order are valued in learning environments in Uncertainty Avoidant cultures ^[49]. Students and teachers in these societies appreciate well-structured learning with clear objectives, precise assignments, and a rigid schedule. Teaching is mostly done by lecturing in such settings. Bissessar ^[47] found that students felt more comfortable in a less rigorous educational setting with a low uncertainty avoidance index score. In such environments, professors can say they don't have the answer and urge pupils to be creative, original, and critical. Sound intellectual arguments are also encouraged.

This study hypothesizes: H₄: Uncertainty avoidance significantly influences formative assessment practices among science teachers in Oman Cycle Two schools.

2.3.5. Oriental view (Long-term orientation and short-term orientation dimension)

Hofstede introduced Long-term and Short-term orientation as a fifth cultural factor in 1991 to include the oriental outlook ^[46]. The long-term orientation is futuristic and positive and ethical, unlike the short-term orientation, which prioritizes the past and present ^[53].

Tarhini et al. ^[54] found that student culture is important when adopting new learning technology. Previous studies have shown that long-term goals, such as determined and tenacious students, are significantly related to school success, despite learning challenges.

Kaur and Noman ^[55] found a favourable correlation between instructional approaches and cultural long-term and short-term orientation. In collectivist cultures, teachers taught pupils to contribute to society and improve family and community economic conditions, according to their research. In their study, they also found that teachers valued skill acquisition equally for success. Some teachers stated that they did not want students to know solely textbooks ^[55]. Most participants stressed deep learning to acquire skills. Teachers used inclusive pedagogical and evaluation strategies to demonstrate their belief.

In this study it is hypothesized that:

H₅: Oriental view significantly influences formative assessment practices among science teachers in Oman Cycle Two schools.

3. Methodology

This is a quantitative study that adopted a post positivist philosophy in a deductive approach using a questionnaire survey to examine the direct effects of cultural dimensions on the formative assessment practices among science teachers in Cycle Two schools in the Sultanate of Oman.

3.1. Research Sample

The sample of this study (N = 91) was selected using a two-stage cluster sampling design. The sample consists of science teachers with teaching experience of five years and above in Cycle Two (Grades 5-8) schools in the 11 educational governorates in Oman for the academic year 2022 to 2023. It is believed that in five years and more, they are assumed to have developed different levels of understanding of formative assessment and have employed various formative assessment practices in the classrooms. Deducing from Cohen ^[56] statistical power analysis, and using a G-Power analysis software, the 91-participant sample was deemed to be adequate as it exceeds all recommended values.

3.2. Research Instrument

A self-administered structured type of questionnaire served as the research instrument used to gather quantitative cross-sectional primary data. Responses were anchored on a 4-point Likert scale of strongly disagree (1), disagree (2), agree (3) and strongly agree (4). The decision to remove the mid-point of “neutral” was because it is expected that the teachers have definitive responses to the questionnaire statements, and to prevent respondents from misusing the mid-point as argued by Chyung et al. ^[57]. The same formative assessment constructs applied in Samuel et al. ^[14] were used in addition to one more added construct namely ‘specifying the gap between the current level of students’ learning and the targeted learning objectives. This construct is perceived vital and discussed in previous studies ^[58]. Moreover, due to incomprehensive sets of formative assessment practices measured in the previous studies, some new items were added to each set of construct measures of the questionnaire based on literature ^[59]. For example, in the construct of engineering good classroom discussion, two new items were added, and in the construct of descriptive feedback, three items were added. Cultural dimensions scale was adapted from Hofstede et al. ^[7]. The survey items used by Hofstede in the popular IBM study across three decades and his interpretation of the key differences in each dimension in the context of education and schools were adapted in the classroom context to reflect values and behaviours embraced by science teachers. The survey questionnaire measures and sources are detailed in the **Table I**. In addition, an internal consistency reliability test was carried out using Cronbach alpha. The results of the reliability test (**Table II**) shows that the Cronbach alpha scores for all the constructs ranged from 0.601 to 0.874, depicting acceptable reliability scores ^[60].

Table 1. Survey Questionnaire Measures.

Constructs	Dimensions	No of items	Sources
Formative Assessment Practices (FAP)	Specifying the gap between the current level of students’ learning and the targeted learning objectives	3	[14]
	Sharing learning Targets	2	[31]
	Engineering Good Classroom Discussions	5	
	Descriptive feedback	6	
	Self and Peer Assessment	5	
Cultural Dimensions (CD)	Power Distance (PD)	3	[7]
	Individualism-Collectivism (IC)	3	
	Masculinity-Femininity (MF)	3	
	Uncertainty Avoidance (UA)	4	
	Long-term orientation and short-term orientation dimension (OV)	3	
Total number of items		37	

Table II: Reliability Test Results using Cronbach Alpha

Variables	Constructs	Number of Items	Cronbach Alpha	Remarks
Formative Assessment Practices (FAP)	Specifying the gap between the current level of students' learning and the learning objectives	3	0.696	Acceptable
	Sharing learning objectives	2	0.685	Acceptable
	Engineering Good Classroom Discussions	5	0.874	Very good
	Descriptive Feedback	6	0.755	Good
	Self and Peer Assessment	5	0.790	Good
Culture Dimensions (CD)	Power Distance (PD)	3	0.738	Good
	Individualism-Collectivism (IC)	3	0.751	Good
	Masculinity-Femininity (MF)	3	0.701	Good
	Uncertainty Avoidance (UA)	4	0.753	Good
	Long-term orientation and short-term orientation dimension (OV)	3	0.752	Good

3.3. Data analysis

The responses obtained from the questionnaire survey were analyzed using the SPSS software due to its usefulness for analyzing quantitative data, it offers reliable and fast answers and utilizes diverse data sets which can be represented in useful tables and graphs.

The components of the formative assessment practices were computed into the same variable (FAP) to represent the predicted variable, using the SPSS function, while the 5 predictor variables (PD, IC, MF, UA and OV) represent the Hofstede's cultural dimensions. The single response of a science teacher made up the unit of analysis of this study. The mean and standard deviation of the constructs were analyzed. The primary data were then subjected to a multiple regression analysis for inferential testing of the research hypothesis.

4. Results and findings

4.1. Descriptive statistics of research variables

The research variables' means and standard deviations (SD) measures of central tendencies—were computed. As shown in **Table III**, the formative assessment practices among the science of Cycle Two schools in the Sultanate of Oman is relatively high moderate at 2.7013 (SD= 0.85561). The variables relating to cultural dimensions also reveal moderate mean scores.

Table III: Mean and standard deviation of the research variables

	FAP	PD	IC	MF	UA	OV
Mean	2.7013	2.7713	2.1055	2.4311	2.6955	2.3117
SD	0.8556	0.7210	0.7358	0.8240	0.8021	0.8119

FAP = Formative Assessment Practices; PD = Power Distance; IC = Individualism-Collectivism; MF = Masculinity-Femininity; UA = Uncertainty Avoidance; OV = Long-term orientation and short-term orientation dimension

4.2. Hypothesis Testing

Screening for outliers revealed that there was no significant deviation of responses from the trend of the majority of the sample; consequently, a Shapiro Wilks test (**Table IV**) affirmed that the normality of the data distribution in the formative assessment practices for each category of the independent variables were significantly normal for the variables: PD ($W = 0.727$, $p > 0.05$), IC ($W = 0.604$, $p > 0.05$), MF ($W = 0.921$,

$p > 0.05$), UA ($W = 0.634$, $p > 0.05$), and OV ($W = 0.536$, $p > 0.05$). Moreover, a variance inflation factor (VIF) output (**Table V**) also indicated the absence of any multicollinearity challenges (Cohen, 1988). Given that there were no violations of the multiple regression assumptions, a multiple linear regression was conducted as a statistical inferential analysis to test the research hypotheses. The coefficient determination (R^2) value of 0.216, indicates the level of prediction, and indicates that the cultural dimensions (PD, IC, MF, UA and OV) are responsible for 21.6% of the total variance in the formative assessment practices of the science teachers. In addition, the ANOVA results $F(4, 91) = 276.003$, $p < 0.05$ gives an indication of a good data fit for the regression model.

The results of the hypotheses testing using multiple regression analysis (**Table VI**) reveal the following: Power Distance as a dimension of culture has a significant influence on formative assessment practices of science teachers (t value = 1.788 at $p < 0.05$), thus supporting the research Hypothesis (H1). Individualism-Collectivism as a dimension of culture has a significant influence on formative assessment practices of science teachers (t value = 2.332 at $p < 0.05$), thus supporting the research Hypothesis (H2). Masculinity-Femininity as a dimension of culture has a significant influence on formative assessment practices of science teachers (t value = 1.696 at $p < 0.05$), thus supporting the research Hypothesis (H3). Uncertainty Avoidance as a dimension of culture has a significant influence on formative assessment practices of science teachers (t value = 1.907 at $p < 0.05$), thus supporting the research Hypothesis (H4). Oriental view as a dimension of culture has a significant influence on formative assessment practices of science teachers (t value = 1.907 at $p < 0.05$), thus supporting the research Hypothesis (H5).

Table IV: Test for Normality of Data Distribution

Variables	Statistic (W)	Sig (p)
Power Distance (PD)	0.727	0.456
Individualism-Collectivism (IC)	0.604	0.280
Masculinity-Femininity (MF)	0.921	0.112
Uncertainty Avoidance (UA)	0.634	0.200
Long-term orientation and short-term orientation dimension (OV)	0.536	0.093

Table V: Test for Multicollinearity (VIF)

Variables	VIF
Power Distance (PD)	2.513
Individualism-Collectivism (IC)	2.085
Masculinity-Femininity (MF)	2.307
Uncertainty Avoidance (UA)	1.996
Long-term orientation and short-term orientation dimension (OV)	3.048

Table VI: Summary of Multiple Regression Output

Variable	R Square (R^2)	F	Beta	Std Error	t	p (sig).	Remarks
Power Distance (PD)	0.216	276.003	0.288	0.161	1.788	0.000	Supported (H1)
Individualism-Collectivism (IC)			0.114	0.049	2.332	0.000	Supported (H2)
Masculinity-Femininity (MF)			0.297	0.175	1.696	0.003	Supported (H3)
Uncertainty Avoidance (UA)			0.213	0.112	1.907	0.000	Supported (H4)

Variable	R Square (R ²)	F	Beta	Std Error	t	P (sig).	Remarks
Long-term orientation and short-term orientation dimension (OV)			0.174	0.077	2.270	0.027	Supported (H5)

Predictors: (Constant), PD, IC, MF, UA, OV

Dependent Variable: Formative Assessment Practices

4.3. Discussion

This study examined the influence of PD, IC MF, UA, and OV as components of Hofstede's cultural dimensions, on the formative assessment practices among science teachers of Cycle Two schools in the Sultanate of Oman.

Measures of central tendencies show the mean score of formative assessment practices of the science teachers to be 2.701 inferring a moderate practice of formative assessment which could be explained by the significant influence of cultural dimensions as explored. This moderate practice of formative assessment could be explained by the significant influence of CD as analysis has indicated in this study. In line with the mean scores of the culture dimensions, the aggregated responses of the science teachers who took part in the survey show, for instance, that in the Sultanate of Oman, the science teachers may tend to deal with students collectively and do not encourage students to individually speak up in the class (collectivism). Moreover, they tend to praise excellent students, giving weak students little attention in the classroom (masculinity); the teachers tend to have clear strict guidelines and rules that students need to comply with (high UA), and they also tend to think that students' low marks in science are attributed to less effort, rather than criticizing their role in teaching (OV).

After carrying out a multiple regression analysis to test the research hypotheses, it was observed that the formative assessment practices of the science teachers were significantly influenced by their cultural dispositions in line with the Hofstede's cultural dimensions. These results are in line with Hofstede ^[48] who showed that the deeply embedded values of diverse cultures influence not only how people with different cultural backgrounds behave, but also the way they will potentially behave when placed in a work or learning associated context. Practically, Clark ^[61] suggests that students develop a deeper understanding of their learning when the essential components of formative assessment practices and cultural responsiveness are effectively incorporated. Moreover, Asghar ^[37] explored the complexities of formative assessment by applying the cultural historical activity theory. Using a semi-structured interview and case study strategy, the findings of his study revealed that the cultural context of the community in which the students and teachers are situated can provide an explanation into the complexity of experiences observed in the outcome of formative assessment practices. This resonates with the observation of Al-Wassia et al. ^[38] who showed that the outcome from formative assessment practices in Saudi Arabian schools was significantly due to the impact of cultural values in the Saudi society.

Results obtained from the testing of hypotheses one (H1), postulating that PD significantly influences formative assessment practices among science teachers in Oman Cycle Two schools, was supported. This is in congruence with the argument of Hofstede ^[48] who posited when authority is decentralized, leadership is a bit more democratic. In this regard, in Oman, which is a high context culture, students tend to see their teachers at higher status, and therefore, they show full respect and obedience to them and often wait for their permission to talk or answer questions or to sound their ideas. This cultural power-difference could lead to teacher-directed approach, restricting the activity-based learning in science classrooms, which is, according to MOE ^[62], central to the new Omani basic education system, in which resources for hands-on activities are incorporated into the science curriculum to provide for active learning classrooms. From another angle, the

challenge of employing effective formative assessment practices in the classrooms is disputed with the previous examinations culture which might still be dominant and could lead teachers and students to perceive formative assessment methods as extra burdens used to assess students learning, rather than using them to inform learning and teaching. Moreover, in the study of Ghazarian and Youhne ^[63] who focused on the implications of cultural dimensions for assessment in the Korean classroom; they implicitly adopted the perspective that formative assessment practices go counter to the culture of respect and obedience and draw attention to the concept of power distance. In cultures where small differences in power are assumed between teachers and students, there is an implicit assumption that formative assessment will be more acceptable.

In much of the literature, there appears to be an equating of discussion between teacher and student within the teaching and learning process with cultural deficiencies. In another study to reflect characterizations of teacher–student interaction styles across different cultural dimensions, Liem et al. ^[64] note clear differences in classroom interaction between the Indonesian and Australian higher education contexts. They refer to the early work of Hofstede ^[46] and the collectivist–individualist dichotomy as well as power distance. Liem et al. ^[64] hypothesized that Australian, Filipino, Singaporean, and Indonesian students would endorse these two dimensions (collectivist–individualist) differently, and of relevance to this study, that Filipinos – together with Singaporeans and Indonesians – would prove more deferential to teachers and be more collaborative with peers than Australians. These different perspectives on barriers to the implementation of formative assessment in several cultures present a complex picture of the cultural dimensions that might impact how the assessment practices can be implemented in classrooms. Whether this assumption is reasonable does not appear to have been contested empirically or given the required attention in previous studies, hence giving credence to the present study which found out that the hypothesis 2 (H2: Collectivism-individualism significantly influences formative assessment practices among science teachers in Oman Cycle Two schools) is supported.

Furthermore, in support of the results obtained in this study in which there was a significant influence of masculinity-femininity, uncertainty avoidance, oriental view as cultural dimensions on formative assessment practices of science teachers obtained in this present study (H3, H4, H5), Hofstede divides cultures on the prevalence of gender roles. Western cultures display more masculine traits of assertiveness, competition, and material success, whereas Eastern feminine traits display quality of life, interpersonal relationships, and concern for the weak. These dimensions affect teacher roles in relation to classroom management and student support. Unlike the masculine culture teachers, a feminine culture teacher will praise and support weak students and is not likely to create open competition conditions in the classroom or show failure as a calamity [65-67] In addition, according, to Bissessar ^[47] within the teaching and learning setting, a low uncertainty avoidance index score shows that students are more comfortable when there is less structure. Teachers can say “I don’t know, and students are encouraged to be creative and innovative, and critical thinking and analysis with intellectual sound arguments being encouraged. Moreover, the findings of Kaur and Noman ^[55] suggest the existence of a positive relationship between teaching practices and the cultural dimension of long-term orientation and short-term orientation. In their research, they opined that in collectivist cultures, teachers made it evident that the students must learn in order to contribute towards society and aid in raising economic conditions of the family and community.

5. Conclusion

This study contributes to the growing academic body of knowledge on formative assessment, particularly on the practice of science teachers in the non-Western context. In addition, the findings from carrying out an evaluation of the influence of cultural dimensions on the formative assessment practices will

add to the literature on cultural dimensions that affect teaching and learning in Oman. The findings will have implications for policy makers in refining their understanding of how the cultural inclinations of the teachers influence their implementation of formative assessment practices in the classroom. This would also be useful to the government in devising better strategies for implementing formative assessment after considering the cultural realities of Oman. To the researchers, the findings will add to the literature on cross-cultural difference in teaching and learning. A significant practical implication of the findings from this study is the potential to apply pedagogic innovation into teaching across cultural backgrounds as this study has shown the influence cultural dimensions has on applying pedagogic initiatives.

It is reasonable to believe that the shift of Oman's students' assessment system from an entirely inherited summative culture adopting teacher-centred approach for about three decades to an integration with continuous formative assessment, adopting student-centred approach, might still present challenges and conflict to parents, policy makers, and teachers. Thus, the challenge of employing effective formative assessment practices in the classrooms is disputed with the previous assessment culture which might still be dominant and could lead teachers to not practice the assessment methods formatively, taking into consideration also that documents of formative assessment and training programs designed by assessment specialists and approved by policy makers could also mis-inform teachers if they are not carefully and explicitly introduced in a clear distinguished formative manner.

In this study, the following limitation are acknowledged. Firstly, this study relied on quantitative data gathered from a questionnaire field survey. The findings would have been more robust if the quantitative data were complemented by qualitative evaluation of formative assessment practices from classroom observations which will yield valuable information about teachers' understanding of formative assessment.

Conflict of Interest

The authors declare no known conflicting interest in the preparation of this manuscript.

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