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Predicting Students' Academic Achievement: Contributions of Perceptions of Classroom Assessment Tasks and Motivated Learning Strategies

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Abstract

Introduction. Students are daily exposed to a variety of assessment tasks in the classroom. It has long been recognized that students' perceptions of the assessment tasks may influence student academic achievement. The present study aimed at predicting academic achievement in mathematics from perceptions of the assessment tasks after controlling for gender and motivated learning strategies.

Method. The participants were 232 students enrolled in grade 11 mathematics classes selected from public schools in Oman. Data were collected using the *Motivated Strategies for Learning Questionnaire* and *Perceptions of Assessment Tasks Inventory*. Students' final grades earned in the subject were obtained from the school administration at the end of the semester.

Results. A hierarchical multiple regression analysis showed that consultation and transparency were significantly related to mathematics achievement after controlling for gender and motivated learning strategies.

Discussion. The findings contributed to the existing assessment literature by demonstrating the intersection between classroom assessment and self-regulation of learning and their effects on student achievement. Implications and recommendations for research and practice were discussed.

Keywords: classroom assessment, assessment tasks, student perceptions, motivational orientations, self-regulation.

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Resumen

Introducción. Los estudiantes están expuestos diariamente a una variedad de tareas de evaluación en el aula. Desde hace tiempo se ha reconocido que la percepción de las tareas de evaluación de los alumnos pueden influir en el rendimiento académico estudiantil. El presente estudio tiene como objetivo predecir el rendimiento académico en matemáticas de la percepción de las tareas de evaluación después de controlar por género y estrategias de aprendizaje motivados.

Método: Los participantes fueron 232 estudiantes matriculados en las clases de matemáticas de grado 11 seleccionados de las escuelas públicas en Omán . Los datos fueron recolectados a través del *Cuestionario de Estrategias Motivacionales* y un *Inventario de la percepción de las tareas de evaluación* en el aula. Las calificaciones finales de los estudiantes obtenidos en el sujeto se obtuvieron de la administración de la escuela al final del semestre.

Resultados. Un análisis de regresión múltiple jerárquica mostraron que la consulta y la transparencia se relacionaron significativamente con el rendimiento en matemáticas después de controlar por las estrategias de género y de aprendizaje motivado.

Discusión. Los hallazgos contribuyeron a la literatura de evaluación existente mediante la demostración de la intersección entre la evaluación en el aula y la autorregulación del aprendizaje y sus efectos en el rendimiento estudiantil. Se discuten las implicaciones y recomendaciones para la investigación y la práctica.

Palabras Clave: evaluación en el aula, tareas de evaluación , percepciones de los estudiantes, orientaciones motivacionales , autorregulación

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Introduction

Students are daily exposed to a variety of assessment tasks in the classroom. As might be expected, students develop certain perceptions about the classroom assessment tasks which may affect their academic achievement. The central role of classroom assessment in student academic achievement has been documented in a host of review studies over the past years (Black & Wiliam, 1998; Crooks, 1988; Harlen & Deakin-Crick, 2003; McMillan & Workman, 1998; Natriello, 1987; Struyven, Dochy, & Janssens, 2003). As noted in these reviews, the relationship between students' perceptions of the classroom assessment tasks and academic achievement is mediated by students' motivational beliefs and learning strategies. For instance, when students perceive an assessment task as being clear and attainable, they are more likely to develop high self-efficacy to do the task and employ deep learning strategies which in turn can lead to improved academic achievement. The present study moves in this direction by addressing the relationship between students' perceptions of classroom assessment tasks and academic achievement.

Specifically, the purpose of this study was to test the predictions of a model that explains the impact of perceptions of classroom assessment tasks on academic achievement for students enrolled in grade 11 mathematics classes in the Sultanate of Oman. Mathematics was chosen as a subject because of the national concern about the low performance of students with respect to mathematics in international tests such as TIMSS as well as national tests. Grade 11 was selected because it represents the culminating grade level of the first and second cycle of the basic education in the Sultanate of Oman. The model demonstrates how students' perceptions of the classroom assessment tasks predict their academic achievement in mathematics after controlling for gender and motivated learning strategies. The conceptual basis for this model comes from a synthesis of research and theory in classroom assessment. It is expected that the present study will help advance our understanding of the role of classroom assessment as perceived by students on academic achievement in mathematics.

The discussion of the classroom assessment role in student academic achievement has been broadened by the work of Brookhart and her colleagues. Using a synthesis of classroom assessment literature and social-cognitive theories of learning and

motivation, Brookhart (1997) developed a theoretical framework for the role of classroom assessment in motivating student effort and academic achievement. In this framework, it is postulated that students develop certain perceptions of the assessment tasks in terms of importance, complexity, demands, and utility based on their classroom assessment experiences shaped by the teacher. These perceptions are partly derived from students' motivational beliefs and affect their effort in performing the task and academic achievement. Brookhart and DeVoge (1999) tested Brookhart's (1997) theoretical framework about the role of classroom assessment in student motivation and achievement for third grade students using both quantitative and qualitative data. They found statistically positive correlations among students' perceptions of assessment tasks, self-efficacy, and academic achievement. These results imply that the relationship between perceptions of assessment tasks and academic achievement need to be considered after controlling for students' self-efficacy to accomplish the tasks. The present study responds to this need.

In another study using a multiple-case research design, Brookhart and Bronowicz (2003) found that the relationships of students' perceptions of the assessment tasks in terms of interest and importance to students' self-efficacy and goal orientation tended to be similar across various assessment events, grade levels, and subject areas. These results imply that the effects of the perceived characteristics of the classroom assessment tasks, standards, and feedback on academic achievement might be mediated by students' motivational beliefs. Along similar lines, Rodriguez (2004) tested Brookhart's (1997) framework about the role of classroom assessment in student achievement using TIMSS (Third International Mathematics and Science Study) data and found that classroom assessment practices interacted with student motivational characteristics in influencing academic achievement. Affirming the role of students' perceptions of assessment tasks in academic achievement, Brookhart, Walsh, and Zientarski (2006) found that students' perceptions of the assessment tasks and motivational beliefs predicted academic achievement after controlling for background variables.

Theoretically and empirically, students' perceptions of the assessment tasks has been well recognized. Ames (1992) argued for attending to the active role of the students in constructing meaning about the assessment tasks. She noted that perceived

characteristics of the assessment tasks can be conducive to adopting positive motivational beliefs and hence enhance academic achievement. McMillan and Workman (1998) postulated that the value placed on the assessment tasks by students is importance in motivating them to accomplish the tasks. Guilkens, Bastiaens, Kirschner, and Kester (2006) contend that students' perceptions of the assessment tasks in terms of authenticity and alignment with instruction have a direct positive influence on academic achievement as well as an indirect influence on the academic achievement through stimulating deep study strategies. Gijbels, Segers, and Struyf (2008) assumed that students' perceptions of the assessment tasks as being demanding might lead students to develop deep learning approaches.

Dorman, Wendy, and Knightley (2006) developed an instrument called the *Perceptions of Assessment Tasks Inventory (PATI)* to measure students' perceptions of the assessment tasks across five dimensions: congruence with planned learning, authenticity, student consultation, transparency, and diversity. Congruence refers to the alignment of the assessment tasks with learning objectives. Authenticity focuses on using assessment tasks that resemble real-life situations. Student consultation emphasizes involving students in the assessment tasks. Transparency is concerned with clarity of the assessment process. Diversity involves giving students an equal chance to do the assessment tasks. Alkharusi, Aldhafri, Alnabhani, and Alkalbani (2014c) found that high degrees of congruence, authenticity, consultation, and diversity were associated with a learning-oriented assessment environment that emphasizes mastery of learning.

Using PATI, Dhindsa, Omar, and Waldrup (2007) found that upper secondary students in Brunei tended to perceive their assessment tasks in science classrooms as having low levels of congruence with planned learning, transparency, student consultation, authenticity, and diversity. They also found statistically significant gender differences in congruence favoring females and student consultation favoring males. They called for a need to improve students' perceptions of assessment tasks through classroom practices. Several studies conducted by Alkharusi and his colleagues have shown that students' perceptions of assessment tasks influence their academic motivation and achievement.

For example, Alkharusi et al. (2013b) found that students' perceptions of the assessment tasks in terms of congruence with planned learning, student consultation, and transparency were collectively related to academic achievement whereas task authenticity and diversity did not correlate with academic achievement. When considered in relation to students' motivated strategies, perceptions of assessment tasks were found to be associated with students' motivational beliefs and learning strategies. Specifically, Alkharusi (2013) found that high degrees of perceived task authenticity and transparency tended to be associated with positive self-efficacy and task value. In addition, high degrees of perceived task authenticity, transparency, diversity were associated with a high emphasis on deep learning approaches whereas a low degree of perceived task authenticity was associated with a high emphasis on surface learning approaches. Furthermore, Alkharusi et al. (2013a, 2014a) demonstrated that students' perceptions of assessment tasks had both direct and indirect effects on self-efficacy and their perceptions of task importance, interest, and utility. Recently, Alkharusi and Al-Hosni (2015) revealed that students' perceptions of assessment tasks tend to vary as a function of gender, subject area, and grade level. They concluded that students differ in their perceptions of the assessment tasks due the nature of the classroom assessment activities driven by the subject area and grade levels.

Purpose of the Study and Research Question

This study aimed at investigating the relationship between students' perceptions of their classroom assessment tasks, motivated learning strategies, and mathematics achievement for grade 11 students. The study was guided by the following research question: How do students' perceptions of the classroom assessment tasks predict their mathematics achievement after controlling for gender and motivated learning strategies?

The main *research hypotheses* for the investigation of the relationship between students' perceptions of their classroom assessment tasks, motivated learning strategies, and mathematics achievement for grade 11 students are presented below:

1. Gender; motivated learning strategies in terms of extrinsic goal orientation, task value, self-efficacy for learning and performance, rehearsal, and metacognitive self-regulation, and perceptions of assessment tasks in terms of congruence with planned learning, authenticity, student consultation, and

transparency will explain a significant portion of the variance in mathematics achievement.

2. Congruence with planned learning will positively predict mathematics achievement after controlling for gender and motivated learning strategies.
3. Authenticity will positively predict mathematics achievement after controlling for gender and motivated learning strategies.
4. Student consultation will positively predict mathematics achievement after controlling for gender and motivated learning strategies.
5. Transparency will positively predict mathematics achievement after controlling for gender and motivated learning strategies.

Method

Participants

The participants in this study were 232 Omani students (115 females and 117 males) enrolled in grade 11 mathematics classes. They were selected using a cluster sampling process from public schools across all governorates in the Sultanate of Oman. Their ages ranged from 15 to 19 years with an average of 17 and a standard deviation of .80.

Procedures

Permission was requested from Ministry of Education and school principals to collect data from the students during regular scheduled mathematics classes. The students were informed that a study about their perceptions of the classroom assessment tasks, motivated learning strategies, and mathematics achievement is being conducted. They were informed that they were not obligated to participate in the study, and if they wished to participate, their responses would remain confidential. They were also told that participation in the study would not influence their grades or relations with the teacher in any way. Students who wished to participate were asked to respond to a self-report questionnaire, which will be described in the next section of this study. The questionnaire was administered by assistant researchers during a scheduled class. The administration took about one class period, and was preceded by a brief set of instructions about how to complete the questionnaire. The students were asked to write their names on the questionnaire in order to match their responses with their final

grade in the subject at the end of the semester. The final grades earned in the subject were obtained from the school administration.

Instrument

The instrument used was a self-report questionnaire with three main sections: Basic information, motivated learning strategies, and perceptions of assessment tasks. The questionnaire items were translated into Arabic language and subjected to a content validation process done by a panel of five experts in the areas of educational measurement and psychology from Sultan Qaboos University and Ministry of Education. They were asked to judge the clarity of wording and appropriateness of each item for the use with the targeted participants and its relevance to the construct being measured. Their feedback was used for refinement of the items. Internal consistency reliability was established using Cronbach's alpha. Following is a description of the three sections.

Basic information. The basic information of the questionnaire covered gender and age.

Motivated learning strategies. This section of the questionnaire included 81 items from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich, Smith, Garcia, and McKeachie (1993). The items were divided into 15 scales measuring intrinsic goal orientation (4 items, $\alpha = .74$), extrinsic goal orientation (4 items, $\alpha = .62$), task value (6 items, $\alpha = .90$), control of learning beliefs (4 items, $\alpha = .68$), self-efficacy for learning and performance (8 items, $\alpha = .93$), test anxiety (5 items, $\alpha = .80$), rehearsal (4 items, $\alpha = .69$), elaboration (6 items, $\alpha = .76$), organization (4 items, $\alpha = .64$), critical thinking (5 items, $\alpha = .80$), meta-cognitive self-regulation (12 items, $\alpha = .79$), time and study environment (8 items, $\alpha = .76$), effort regulation (4 items, $\alpha = .69$), peer learning (3 items, $\alpha = .76$), and help seeking (4 items, $\alpha = .52$). The aforementioned alphas represent internal consistency coefficients reported by Pintrich et al. (1993). Responses were obtained on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

In this study, only MSLQ scales with reliabilities $\geq .60$ as measured by Cronbach's alpha were considered in the analysis after excluding items that contribute

to the reduction of the overall scale reliability as indexed by alpha if item deleted. These scales were extrinsic goal orientation (3 items, $\alpha = .66$), task value (6 items, $\alpha = .73$), self-efficacy for learning and performance (8 items, $\alpha = .73$), rehearsal (3 items, $\alpha = .62$), and meta-cognitive self-regulation (11 items, $\alpha = .62$). Scales were constructed by averaging ratings of the students' responses across all the items pertaining to the respective scale.

Perceptions of assessment tasks. This section of the questionnaire included 35 items from Dorman and Knightley's (2006) Perceptions of Assessment Tasks Inventory (PATI). The items measure students' perceptions of assessment tasks in terms of congruence with planned learning (7 items; $\alpha = .73$), authenticity (7 items; $\alpha = .75$), student consultation (7 items; $\alpha = .74$), transparency (7 items; $\alpha = .85$), and diversity (7 items; $\alpha = .63$). The aforementioned alphas represent internal consistency coefficients reported by Dorman and Knightley (2006). Responses were obtained on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

In this study, only PATI scales with reliabilities $\geq .60$ as measured by Cronbach's alpha were considered in the analysis after excluding items that contribute to the reduction of the overall scale reliability as indexed by alpha if item deleted. These scales were congruence with planned learning (7 items; $\alpha = .61$), authenticity (7 items; $\alpha = .62$), student consultation (7 items; $\alpha = .60$), and transparency (7 items; $\alpha = .70$). Each scale was constructed by averaging its corresponding items.

Statistical Analysis

In relation to the aforementioned purpose of the study, the following statistical procedures were employed:

1. Descriptive statistics in terms of means, standard deviations, and Pearson product-moment correlation coefficients to describe the variables under investigation.
2. Hierarchical multiple linear regression analysis to investigate the ability of perceptions of assessment tasks to predict mathematics achievement after controlling for student gender and motivated learning strategies. The dependent variable was mathematics achievement as measured by the final grade earned in mathematics at the end of the semester. The independent variables were student gender; motivated learning strategies.

ning strategies in terms of extrinsic goal orientation, task value, self-efficacy for learning and performance, rehearsal, and meta-cognitive self-regulation, and perceptions of assessment tasks in terms of congruence with planned learning, authenticity, student consultation, and transparency. Student gender was dummy coded (0 = male and 1 = female). Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, homoscedasticity, and multicollinearity.

Results

Descriptive Analysis

Table 1 presents means, standard deviations of mathematics achievement, motivated learning strategies, and perceptions of assessment tasks along with their bivariate correlations. As shown in Table 1, on average, the students tended to hold positive perceptions of their classroom assessment tasks in terms of congruence with planned learning, authenticity, student consultation, and transparency. Also, they tended to have high levels of extrinsic goal orientation, task value, self-efficacy, and self-regulation in mathematics. Further, they reported using rehearsal as a study strategy with a high degree. Moreover, the dummy variable, which is female, correlated significantly and positively with all variables except student consultation. This indicates statistically significant gender differences in mathematics achievement, motivated learning strategies, and perceptions of assessment tasks favoring females.

All independent variables except consultation correlated significantly and positively with mathematics achievement ranging from .15 to .37. The motivated learning strategies correlated significantly and positively with each other ranging from .41 to .64. The perceptions of assessment tasks correlated significantly and positively with each other ranging from .25 to .62. There were statistically significant positive correlations between motivated learning strategies and perceptions of assessment tasks with correlations ranging from .14 to .51. There was no statistically significant correlation between extrinsic goal orientation and student consultation.

Table 1. Means, standard deviations of mathematics achievement, motivated learning strategies, and perceptions of assessment tasks and their bivariate correlations ($N = 232$)

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11
1. Math achievement	2.63	1.15	-										
2. Female	-	-	-	-									
3. Extrinsic goal orientation	4.23	.72	.21*	.37*	-								
4. Task value	3.96	.67	.26*	.19*	.45*	-							
5. Self-efficacy	3.78	.61	.28*	.32*	.50*	.64*	-						
6. Rehearsal	3.72	.76	.24*	.29*	.41*	.46*	.48*	-					
7. Self-regulation	3.64	.46	.37*	.37*	.46*	.52*	.56*	.64*	-				
8. Congruence	3.90	.54	.25*	.27*	.35*	.51*	.49*	.33*	.40*	-			
9. Authenticity	3.73	.57	.15*	.15*	.35*	.45*	.48*	.37*	.47*	.58*	-		
10. Consultation	3.82	.62	-.08	-.06	-.01	.16*	.14*	.23*	.17*	.25*	.32*	-	
11. Transparency	3.97	.57	.30*	.34*	.29*	.39*	.45*	.41*	.43*	.62*	.54*	.39*	-

* $p < .05$

Hierarchical Multiple Regression

A hierarchical multiple linear regression analysis was performed to investigate the ability of perceptions of assessment tasks to predict mathematics achievement after controlling for gender and motivated learning strategies. The analysis was conducted in three steps. Gender was entered at step one of the regression, the motivated learning strategies (extrinsic goal orientation, task value, self-efficacy, rehearsal, and self-regulation) were entered at step two, and perceptions of assessment tasks (congruence, authenticity, consultation, and transparency) were entered at step three. Table 2 summarizes results of the hierarchical multiple linear regression of mathematics achievement on perceptions of assessment tasks after controlling for gender and motivated learning strategies.

At the first step, gender contributed significantly to the regression model, $F(1, 230) = 49.68$, $p < .001$; and accounted for 18% of the variation in mathematics achievement. Introducing the motivated learning strategies explained an additional 6% of the variation in mathematics achievement. This change in R^2 was statistically signifi-

cant, $F(5, 225) = 3.74, p < .01$. Finally, the addition of the perceptions of assessment tasks to the regression model explained an additional 4% of the variation in mathematics achievement. This change in R^2 was also statistically significant, $F(4, 221) = 2.72, p < .05$. In the final regression model, four out of ten predictor variables were statistically significant. Gender was positively related to mathematics achievement ($\beta = .28, p < .001$), suggesting that females outperformed males in mathematics after controlling for motivated learning strategies and perceptions of assessment tasks. Self-regulation was positively related to mathematics achievement ($\beta = .23, p < .001$) after controlling for gender, motivated learning strategies, and perceptions of assessment tasks. Consultation was negatively related to mathematics achievement ($\beta = -.17, p < .001$) after controlling for gender and motivated learning strategies. Transparency was positively related to mathematics achievement ($\beta = .17, p < .001$) after controlling for gender and motivated learning strategies. Task value, self-efficacy, rehearsal, congruence, and authenticity were not significant predictors of mathematics achievement. Together the ten independent variables accounted for 28% of the variance in mathematics achievement.

Table 2. *Summary of hierarchical multiple regression analysis for variables predicting mathematics achievement (N = 232)*

Variable	B	SE	β	R	R^2	ΔR^2
Step 1				.42	.18*	
Female	.97	.14	.42*			
Step 2				.49	.24*	.06*
Female	.79	.15	.34*			
Extrinsic goal orientation	-.11	.12	-.07			
Task value	.19	.14	.11			
Self-efficacy	.04	.16	.02			
Rehearsal	-.04	.12	-.03			
Self-regulation	.56	.21	.23*			
Step 3				.53	.28*	.04*
Female	.64	.16	.28*			
Extrinsic goal orientation	-.13	.12	-.10			
Task value	.17	.14	.10			
Self-efficacy	-.002	.16	-.001			

Rehearsal	-.02	.12	-.02
Self-regulation	.59	.21	.23*
Congruence	.11	.18	.05
Authenticity	-.16	.16	-.08
Consultation	-.32	.12	-.17*
Transparency	.36	.17	.18*

* $p < .05$.

Discussion

Enhancing student academic achievement is widely accepted as one of the goals of classroom assessment (Brookhart, 1999). Previous research has built a theory based on students' perceptions regarding the role of classroom assessment tasks in elevating academic achievement (Ames, 1992; Brookhart, 1997; Natriello, 1987). Understanding how classroom assessment tasks as perceived by students can strengthen student learning is highly important to the instructional process. As such, the purpose of the present study was to determine how well students' perceptions of assessment tasks predict mathematics achievement after controlling for gender and motivated learning strategies.

The findings showed that the control variables combined were significantly related to academic achievement and explained 24% of the outcome variance. The perceptions of assessment tasks combined were significantly related to academic achievement and added predictive power by accounting for an additional 4% of the outcome variance. The final regression model showed that the most useful combination of statistically significant predictors of academic achievement included gender, self-regulation of learning, and perceived student consultation and transparency in assessment. Although student consultation had a statistically significant positive relationship with academic achievement, its negative weight in the final regression model reduces the irrelevant variance in assessment transparency. Future research should focus on the unexplained variance in academic achievement by investigating other possible classroom assessment influences.

Although the association between classroom assessment and academic achievement is well established (Popham, 2008), little is known about the specific features of the classroom assessment as perceived by students that might be conducive for effective learning. The findings of present study offer unique contributions to the literature by adding to the understanding of the link between self-regulation of learning and classroom assessment and offer valuable information to heighten student academic achievement through evincing classroom assessment as a regulatory process.

Research has proven that self-regulation is associated with better learning and achievement (Kitsantas, Winsler, & Huie, 2008). It entails setting specific goals; applying study strategies such as elaborating, organizing, and rehearsing; showing high levels of self-efficacy and intrinsic motivation; monitoring the progress, and making necessary adjustments in the actions towards the goals (Zimmerman & Schunk, 2011). An effective classroom assessment process should capitalize on the aforementioned phases of the self-regulation. Specifically, the findings of the present study imply that classroom assessment process should be transparent in order to cultivate student learning. Transparency involves clear articulation of the learning targets, informative feedback about the progress toward the targets, and appropriate adjustments to instruction and student work. When the purposes of the assessment tasks and the assessment standards and criteria are clearly communicated to the students in advance, the students would be able to match the requirements of the assessment to the effort necessary to demonstrate a high level of academic achievement (Cauley & McMillan & Workman, 1998). In other words, the current study emphasizes that clarity of the classroom assessment process are likely to enhance student academic achievement.

These findings do not permit drawing conclusions with respect to causality due to the inability to manipulate the variables. In addition, the external validity of the findings is reduced by the specific grade level and subject area considered in the study. Expanding the understanding of the classroom assessment variables that might predict academic achievement in other grade levels and subject areas might have more practical implications. Further, the study lacks information about the psychometric properties of the mathematics grades as measures of the academic achievement, thus questioning the validity of such measures. Moreover, despite the examination of mul-

multiple predictors, the majority of the outcome variance remained unexplained in the model. Thus, it is extremely important to examine the potential role of additional predictors such as more direct measures of teachers assessment practices. It is also crucial to examine the relationship between classroom assessment predictor variables and academic achievement in a longitudinal way given the disparate assessment practices across grade levels as documented in past research.

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