Using Classroom Observation to Investigate Productive Student Participation in Higher- and Lower-Performing Qatari Schools

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In 2002, Qatar established key elements of educational reform in schools including national curriculum standards; emphasis on critical thinking through student-centered teaching; establishment of charter (independent) schools; standards-based assessment; English as the language of instruction in math and science, and extensive teacher professional development. In the classroom, the reform provides "an emphasis on encouraging a spirit of inquiry and hands-on learning" (www.education.gov.qa) often referred to as student-centered teaching because students are actively involved in activities and discussions that promote deep conceptual learning, knowledge construction, and autonomy. This emphasis requires a change in student and teacher interactions. For example, Standard 4, establishes classrooms that "engage all students in purposeful and intellectually challenging learning experiences, encourage constructive interactions among teachers and students, and enable students to manage their own learning and behaviour" (p.25). The reform focus on student inquiry, critical thinking and problem solving requires that students participate actively in classroom activities designed to foster these outcomes and that they engage in self-regulation of motivation and strategy use to emerge as independent, life-long learners.

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Theoretical Framework

The current Qatari educational curriculum standards emphasize student-centered classrooms where students are actively engaged in critical thinking, inquiry and problem solving. The focus on student-centered classrooms suggests that specific models of learning (Bransford, Brown & Cocking, 1999, 2000); instructional approaches (Grossman, 2005); and professional development (Darling-Hammond, 2000; Hawley & Valli, 1999; Loucks-Horsley et al, 1998; Putnam & Borko, 2000) form the framework of the goals and activities of the Qatari reform (Knight et al, 2011). These constructivist-based models emphasize the importance of engaging initial understanding before subsequent learning can occur; the necessity of deep foundational knowledge so that meaningful conceptual frameworks can develop; the need to describe, implement, and monitor learning goals and strategies; effective use of technology; development of dispositions that encourage critical thinking and reflection; and the need for professional development based on current principles of how teachers learn (Brown et al., 2000); Knight et al, 2011; Putnam & Borko, 2000). This paradigm shift in teaching and learning from rote memorization to meaningful learning places tremendous pressure on students, who must assume responsibility for motivational and cognitive processes that underlie learning, and on teachers, who must provide the kinds of instructional strategies and assessment practices that foster student engagement and autonomy while engaged in inquiry (see e.g., Blumenfeld, Kempler, & Krajcik, 2006; Bransford, Brown, & Cocking, 1999, 2000; Donovan, Bransford, & Pellegrino, 2000; Knight et al, 2011). While classrooms characterized by these reform elements should emerge as more successful on Qatari standards-based assessments, little research has been done to examine the

relationship between these characteristics and standards attainment or even to determine whether these classroom teaching and learning elements exist (Knight et al., 2011).

Student Behaviors and Outcomes in Student-Centered Classrooms

Student engagement has been studied extensively in the past as a precursor and predictor of student achievement (Brophy, 2000; Brophy & Good, 1986). However, current views of student active engagement reframe the notion of time-on-task in ways that connect it more closely to the disciplines that form the context for engagement. The recent NRC report, *Taking Science to School* (Duschl, et al, 2007) refers to "productive participation" (p.194) that extends participation to participation in ways that facilitate disciplinary learning. Engle and Conant (2002) discriminate between engagement, disciplinary engagement, and productive disciplinary engagement. Consistent with previous research, engagement involves students in speaking, listening, and working while exhibiting high levels of persistence in on-task behaviors. While this is positive, it does not ensure that students are engaging meaningfully with content. On the other hand, "disciplinary engagement" expands our previous notion of engagement to include content and activities specifically related to a discipline such as science. Going one step further, "productive disciplinary engagement" specifies intellectual progress as a result of this engagement and is demonstrated by change over time in "student investigations, complexity of argumentation, and use of previous investigations to generate new questions, new concepts, and new investigations" (Duschl et al,2007, p. 195). This engagement depends on the discipline, task, and topic being studied and is influenced by student characteristics (e.g., motivation and attitudes) as well as teacher behaviors and

classroom environment. Although this is an area of increasing interest in classroom research, few studies of productive participation have been conducted (Duschl et al, 2007).

Teacher Role in Student-Centered Classrooms

Because learning in schools is traditionally dominated and controlled by adults, it is not often that students make decisions about their own learning. Even though educational philosophies aim to produce students who become responsible citizens capable of participating thoughtfully in society, our educational practices have a tendency to foster dependence, passivity and a "tell me what to do and think" attitude (Goodlad, 1984). In the student-centered classroom, instruction focuses on the student. Decision-making, organization, and content are largely determined by the student's needs and perceptions. Even assessment may be influenced or determined by the student. In the student-centered classroom, the role of the teacher changes to a facilitator rather than a director. This shift in teacher instruction is effective in helping students make progress in their academic achievement, social skills, and acceptance of diversity. Stuart (1997) suggests that a student-centered teaching technique helps teachers and instructional designers set up an effective instructional environment for every member of the classroom, regardless of the diverse learning needs of students. Although the idea of student-centered teaching is not new, it is a challenging task since it requires the development of instructional practice and curriculum that has as its focus the development of student intellectual autonomy, motivation, persistence, and use of inquiry learning and problem-solving strategies. In a student-centered teaching environment, the instructor provides support to students,

demonstrates flexibility with curriculum choices without compromising learning goals, and utilizes a variety of assessments (Motschnig-Pitrik & Holzinger, 2002). Also, the teacher facilitates active engagement of students through discussion. In contrast to the traditional classroom characterized by the initiation, response, evaluation (IRE) discourse format, student-centered classrooms feature discussion among students with teacher facilitation rather than domination (Sawyer, 2006).

Research Questions and Design

Three phases of research were conducted in a research project funded by the Qatar National research Foundation over a period of three years. The first phase provided descriptions of teaching and learning in reform-focused schools (see Akhlef & Knight, 2011). The current study extends the profiles developed in Phase I through further investigation of observed differences in student-centered instruction and productive participation of elementary math and science students in higher and lower performing Qatari schools implementing the reform. More specifically, the research questions are:

1) What student-centered instructional strategies do teachers implement in third and fourth grade math and science classes in Qatari independent schools?

2) To what extent do Qatari elementary students engage in productive classroom participation during math and science classroom activities?

3) Are there differences in the student-centered instructional strategies observed in higher and lower performing Qatari schools?

4) Are there differences in productive classroom participation in higher and lower performing Qatari schools?

Methods

Data were collected in the Fall of 2008 in 17 schools randomly selected from 46 schools that had implemented the Qatar standards for at least 3 years. Three to five third and fourth grade math and science classrooms were randomly selected from these schools for participation. The sample included 67 teachers and approximately 1150 students.

The extent to which interactions and activities in the classroom were student-centered and based on challenging content and processes related to the disciplines of math and science was determined through observations using two instruments: the Stallings Observation System Snapshot (SOS; Stallings, 1975) and the Teacher Attributes Observation Protocol (Fouts, Brown, & Thieman, 2002). Teachers were asked to conduct a 'typical' class on the observation day. While the observations do not provide an exhaustive profile of classroom interactions, they provide a snapshot of what is occurring on a given day in Qatari elementary math and science classrooms.

The Stallings Snapshot was developed and validated to evaluate a broad array of educational programs through investigation of the materials, activities, grouping arrangements, instructional strategies, interaction patterns among teachers and students and student engagement rate (Stallings & Giesen, 1977). The Snapshot has exhibited good reliability and validity in previous studies (Knight, 2004) and reliability was calculated for this study as well. Observers had to obtain reliability of .80 with the expert (observation trainer) prior to doing field observations. Qualified observers were paired and interrater reliability also was determined in field settings. The average percentage of agreement for observers in the field setting was .85.

The TAOP is a combined qualitative/quantitative measure. Observers were asked to divide the class time into five equal segments, after allowing the first 3-5 minutes for administrative details. The Stallings Snapshot was implemented at each of these intervals. Between snapshots, observers took qualitative notes focusing on the seven major categories in the TAOP. The TAOP has seven components consisting of 27 indicators including evidence of student conceptual understanding, activities that encourage meaning through reflection, application of knowledge to real world contexts, student active participation and exploration, student use of diverse experiences of for learning, challenging curriculum to develop depth of understanding, and summative assessment that focuses on higher-order thinking. At the end of the observation period, observers review their notes and complete the 27 summative Likert-type items designed to capture constructivist approaches to teaching based on the qualitative data. TAOP scales range from Not Observed (0) to Observed Very Often (4). Interrater reliability for the TAOP, calculated as percent agreement, was .79.

Results from the Qatar Comprehensive Educational Tests (QCET) were obtained for each school in math/science from reports of the Qatar Evaluation Institute (2009). Three classification lists were issued which, when considered together, give a picture of overall performance of schools in three areas: extent to which schools meet standards; level of academic achievement, and academic progress from 2007-2008. Each list was divided into three levels of schools depending on performance. For purpose of this analysis, sample schools in the top tier of the three lists were used to define higher-performing schools in comparison with schools in the remaining tiers which were considered lower-performing. The results yielded 6 schools in the top tier for Meets

Standards, two of which were included in our sample; 18 schools in the top level of Academic Achievement, five of which were included in our sample; and 10 schools in the Overall Change Academic Outcomes 2007-2008; four of which were included in our sample. Since some schools in our sample were represented in the top of more than one level, the total number of higher-performing schools was 8 schools. From the lower-performing tiers of the three lists, 9 schools were included in our sample. However, some data are missing from schools in both groups.

Results and Discussion

To address the first two research questions, descriptive statistics were generated for overall Student-Centered Instructional Strategies and Productive Classroom Participation. For the third and fourth research questions, descriptive statistics by higher-and lower performing schools were compared and t-tests were conducted to determine statistically significant differences.

Student-Centered Instruction

The Stallings Snapshot yielded information about kinds of grouping used by the teacher, the activities engaged in by teachers and students, and materials used in the activities. An aggregate variable including activities and materials characteristic of student-centered instruction was compiled from the data. The aggregate included amount of discussion, project-based instruction, the use of manipulatives by students, technology integration (computers and multimedia), and cooperative learning activities (See Table 1). These variables were selected because they reflect student active participation in activities, rather than teacher-centered activities. Classrooms emerged as fairly teacher-centered

with over 70% of the instruction occurring in large group settings delivered by the teacher and about 25% involvement with small group or individual configurations. The variables depicting teacher involvement in Table 1 support a teacher-centered approach. Student-Centeredness, as defined by the aggregate variable, was observed less than 25% of the time within this framework. Examination of the aggregate variable representing elements of classrooms characterized by student-centered inquiry teaching and learning reveals some use of Discussion, Manipulatives, and Multimedia, but little evidence of Projects or Cooperative Learning. The use of small groups noted in the Grouping section does not appear to be cooperative groups, but a more superficial structure. However, there was a great deal of variation by school in the variables comprising Student-Centered Instruction as determined by the large standard deviations.

Table 1: Stallings Observation System Snapshot - Means and Standard Deviations of Student-Centered Instruction (n=63)

GROUPING	**Mean %**	**SD**
1 student	8.89	17.52
Small	17.38	18.53
Large	48.04	29.64
All	24.10	24.28
STUDENT INVOLVEMENT	**Mean %**	**SD**
Discussion	6.75	14.46
Projects	.63	5.04
Computers/Calculators	.63	3.53
Manipulatives	4.44	10.44
Multimedia	7.83	17.98
Cooperative learning	4.13	10.87
Student Off Task	29.66	19.34
TEACHER INVOLVEMENT	**Mean %**	**SD**
Monitoring Seatwork	10.56	17.60
Direct Instruction	67.25	24.88
Organizing/Managing	20.29	22.47
Working Alone	1.59	5.45

While the Snapshot looked at the percent of time of activities and materials, the TAOP investigated the nature of the content of classroom instruction, activities, and materials including the depth of conceptual understanding elicited and the degree to which the curriculum was challenging for students. Constructs were measured using a scale of 0 (not observed) to 4 (observed very often). Results were low overall with Real World Applications, Active Student Participation, and Differentiation in strategies and curriculum observed rarely (see Table 2). Teaching for Conceptual Understanding and Challenging Curriculum were observed considerably more often than the other variables, but were still low.

Table 2. Teaching Attributes Observation Protocol - Means and Standard Deviations of Scales (n=63).

Attributes	**Mean**	**SD**
Conceptual Understanding	.86	.66
Reflection	.64	.65
Real World Applications	.23	.36
Active Student Participation	.37	.33
Diverse experiences	.50	.39
Challenging Curriculum	.84	.69
Assessment	.48	.61
Overall	.56	.40

Note: Scales range from 0 (Not Observed) to 4 (Observed Very Often)

Productive Classroom Participation

As previously described, Productive Classroom Participation refers to student engagement in discipline-based activities in ways that should lead to self-regulation and

motivation. This construct was measured by comparing the amount of off-task behavior and the kinds of activities representing student participation observed by the Stallings snapshot and the kind and level of content and instruction depicted in the Teaching Attributes Observation Protocol. Results indicated that students overall were off-task and not productively engaged about a third of the time Observed (see Table 1). While there was a great deal of variation as noted by the standard deviations, percentages were generally low across classrooms for the discipline-based content and processes that underlie Productive Classroom Participation, including evidence of student conceptual understanding and use of a challenging curriculum that develops student depth of understanding. A class characterized by productive classroom participation by students would exhibit a low off-task rate, student-centered activities, and evidence of curriculum and instruction that facilitated meaningful learning and exploration by students. These elements were not documented in the classes observed.

Part of the problem may reside in the imposition of learning math and science in English. The descriptions and discussion of student-centered classrooms and productive participation in the previous sections highlight the importance of student interactions with the teacher and other students. While interactions based on discussion in one's native language are challenging enough, the added challenge of teaching and learning in a second language and in a reform context drawn from western cultures may make the task of developing self-regulated learners in an Arab country even more difficult (see e.g., Krashen, 1985; McInerney, 2008). Effectiveness of student-centered approaches may depend on teachers' abilities to provide comprehensible input in the second language together with linguistically and academically appropriate tasks in settings where students feel comfortable interacting with others in their second language (Grassi & Barker, 2010).

Another problem may relate to classroom and instructional management. The off-task behavior is particularly disturbing since it reflects reduced opportunity for student learning of any type, whether teacher- or student-centered. This finding may be related to the type of school included in the sample. Classroom management in boys' schools is perceived as more difficult than in girls' schools and higher off-task rates in boys' schools, which comprised 7 of the 15 schools included in this analysis, could have inflated the off-task level. In fact, comparison of off-task rates reveals that off-task behavior is observed about 10% more in boys' schools, and the range for off-task in boys' schools is much greater (17.22% to 69.98%) compared to girls' (11.27% to 43.05%). The off-task level for both girls' and boys' schools also may be related to difficulties in management of higher-level learning activities noted in previous research (See e.g., Brophy & Good, 2000; Doyle, 1986).

Differences by Higher- and Lower-Performing Schools

Questions 3 and 4 focused on differences by performance level of schools. Findings indicated few differences statistically by level of school performance, perhaps because performance in general was quite low and observed behaviors related to the standards were also quite low. The lack of variance in standards achievement indicated through examination of descriptive statistics and display of data using a histogram is a problem in the use of statistical analyses. For observed behaviors using the SOS, four composite variables related to student-centeredness were considered: Teacher interactions with individuals and small groups, Student-centered activities, Discipline-based Content and

Processes, and Student off-task behavior. Table 3 depicts the means and standard deviations for each of these composite variables and their subscales.

Table 3. Differences by Higher- and Lower-Performing Schools

	HPS		**LPS**	
	Mean %	**SD**	**Mean %**	**SD**
Teacher Interactions	30.77	22.08	23.11	25.26
Individuals	10.00	17.21	8.11	17.92
Small groups	20.77	17.42	15.00	19.15
SS Student-Centered Activities Overall	21.54	27.67	26.44	32.60
Discussion	6.15	14.72	7.16	14.46
Projects	0	0	1.08	6.58
Manipulatives	6.15	12.35	3.24	8.84
Computer/Calculator	0	0	1.08	4.59
Multimedia	3.85	16.02	10.63	18.95
Cooperative Learning	5.38	12.08	3.24	10.02
Student Off-Task	30.53	20.16	29.05	18.99
	Mean	**SD**	**Mean**	**SD**
TAOP Overall	.54	.34	.57	.44
Conceptual Understanding	.82	.58	.88	.72
Reflection	.73	.60	.57	.68
Real World Applications	.30	.39	.19	.33
Active Student Participation	.34	.34	.39	.45
Differentiation	.55	.43	.92	.66

Challenging Curriculum	.74	.72	.92	.66
Assessment	.38	.51	.56	.67

Teacher Interactions with Individuals and Small Groups. No significant differences were found in the teacher interaction patterns of Higher-Performing Schools (HPS) and Lower-Performing schools (LPS; F=1.56; p=.22), a finding which may be due to low power to detect differences (.233). Descriptively, HPS were characterized by more teacher interactions with individual students and small groups. However, a significant correlation between teacher interactions with individuals and small groups and student off-task behavior (r=.45; p=.0001) suggests that teachers were experiencing difficulties with off-task behavior when they implemented interactions with smaller groups rather than relying on the easier to manage large or whole group configurations. This finding lends support to the possibility mentioned previously that teachers are experiencing management difficulties as they try to move away from whole-group instruction and toward more student-centered configurations.

Student-Centered Activities. LPS exhibited more student-centered instruction than LPS, although the differences were not statistically significant (t=.63; p=.54) and both groups were low in this area. LPS had higher use of Discussion, Projects, and Multimedias; while HPS used more Manipulatives and Cooperative Learning than their lower-performing counterparts.

Discipline-based Content and Processes. The TAOP, which focused on instruction from a constructivist perspective consistent with the standards, also showed no significant differences between higher-and lower-performing schools (t=-.10; p=.92).

Descriptive statistics indicated similar use overall of discipline-based content and processes by LPS than HPS, but there was extremely low use in general by both groups. Lower-performing schools had higher means for challenging curriculum and assessment, but again usage was extremely low for both groups.

In summary, no significant differences in profiles by performance level of the school on Qatari standards emerged. However, variations by achievement level were noted descriptively, with the LPS group often exhibiting greater student-centeredness. Several explanations might address this unexpected finding. Since the standard deviations were extremely high, even when considering teacher and student behaviors by school performance level, other variables may have a greater influence than school performance and need to be further investigated. In particular, language facility of both teachers and students may be an important area for further study. In addition, the lack of variance in the performance measures makes it difficult to detect differences with this measure.

Another possibility, common in the U.S., is that the measures used may not be consistent with the actual standards. Teaching to the test, particularly if the test is more oriented to basic skills, often works against more student-centered approaches. On the other hand, traditional direct instruction has been successful in raising standardized test scores. Since the performance is so low, and variance so restricted, it is difficult to investigate this possibility.

Another explanation is that the instructional behaviors related to student-centered instruction and productive student classroom participation are emerging and have not yet been implemented to the extent that we can see a relationship between achievement and

instruction. Both observations and student outcomes indicate low levels of standards implementation. The top tier of Meeting Standards only achieved 10-20% of standards. Teachers and students may not yet have acquired and practiced the actual skills needed to implement student-centered instruction and impact student achievement. The high student off-task rate signals problems in general with management of the new, unfamiliar behaviors related to student-centeredness. That the LPS classes have high off-task rates and more evidence of student-centered activities, but with lower achievement lends support to this hypothesis.

Qualitative data also provide support. During one observation, field notes indicated that the teacher would turn to the observer frequently and give the 'label' for the instruction she was providing (e.g., this is tying the content to student lives). However, in most cases the observer noted that the example was either incorrect or of low quality. Teachers are aware of the constructs underlying student-centered instruction and discipline-based productive participation and can label them, but cannot enact them procedurally (See Ikhlef & Knight, 2011 for results of teacher and student surveys).

Educational Significance

Although the idea of student-centered teaching is not new, it is a challenging task since it requires the development of instructional practice and a curriculum that has as its focus the development of student intellectual autonomy, motivation, persistence, and use of inquiry learning and problem solving strategies. Previous research and evaluation on the processes, activities, and outcomes of the initial Qatari "Education for a New Era" reform efforts highlighted issues and challenges associated with the program that included the

ambitious scope of the reform, the short time period for implementation, and the limited capacity for implementation (Brewer et al., p.24). Observation of the classroom processes necessary for actualization of student-centered teaching and learning and results from the QCET administered to students provide little evidence that the reform has been successfully implemented at this point. However, actual change in performance may take longer due to the pressures that this approach places on students and teachers (See e.g., Boekarts, 1999; Schunk & Zimmerman, 2008). In addition, evidence from the current study suggests that the level of the content is not as challenging as it may need to be to achieve goals set through the standards. The observed behaviors and achievement in schools has implications for implementation of reform in general and professional development in particular. Next steps might include examination of the measures used to gauge progress to insure a match between standards and assessment of the standards as well as identification and case studies of schools that are making progress with the goal of providing models that can assist teachers and administrators in implementation of the standards. In addition, the change in teacher role may require more extensive, targeted professional development that goes beyond general awareness of appropriate instructional strategies and includes intensive practice and coaching with feedback. (See e.g., Hawley & Valli, 1999). Addressing the challenges associated with the mandated language of instruction is also warranted.

Findings from this study emphasize the 2011 AERA theme involving the use of educational research that contributes to public policy and public good. This research provides information about teaching and learning in student-centered classrooms at two

levels – the professional knowledge base and the Qatar educational context and can inform Qatari policy makers who are involved in the reform movement.

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