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SCHOOL WALK-THROUGH STUDY AS PART OF THE EDUCATION REFORM FOR THE KNOWLEDGE ECONOMY

Abstract

This study was designed to assess classroom conditions and activities based on a structured school walkthrough. Classroom instructional activities and practices, technology utilization, teacher support and school management were observed. A criteria sample of twelve schools was selected for the visits. Ten were public schools and 2 were public selected as a comparison group. Public schools included discovery schools, non discovery schools, boys and girls school. Overall, students seemed to have managed the transition to changes mandated by the ERfKE initiative more readily and easily, especially students who formerly lagged behind or struggled with the course content, than the teachers and school administrators. Significant gender differences are associated with effectiveness in using ERfKE inputs. Among the public schools visited, the school that best exemplified the ERfKE's vision of a student-centered learning institution that infused technological applications into its teaching and learning activities was a girls Discovery school located in a comparatively impoverished district of Amman. Challenges to the implementation of ERfKE related to: unanticipated and unprecedented escalation of student enrollments; limited access to the required technology; insufficient experience among teachers on the use of technology in instructions and the student-centered teaching approaches; lack of experience, training and understanding regarding new modalities of assessment. It has been also observed that there is an increasing frustration among teachers who describe themselves as knowledge economy professionals with advance expertise in education and technology but who still remain underappreciated and underpaid.

SCHOOL WALK-THROUGH STUDY AS PART OF THE EDUCATION REFORM FOR THE KNOWLEDGE ECONOMY

Executive Summary

This study used a structured school walk though approach with the purpose to assess schools in areas related to inputs of the Education Reform for Knowledge Economy (ERfKE) in its first phase of implementation. Established to prepare Jordanian students for the knowledge economy, ERfKE was designed to transform the entire Jordanian education system (K-12) to produce graduates prepared to compete in a global knowledge economy requiring highly specialized knowledge, skills, attitudes and competencies. Success requires nothing less than a complete transformation of school culture to radically shift from emphasis on teacher-centered lectures that require students to engage in rote learning, memorization, passive and individual learning strategies, to an emphasis on inquiry-based learning activities, active Constructivist learning strategies.

This evaluation study was designed to assess the effectiveness of ERfKE inputs based on a school and classroom walkthrough. A sample of selected schools in Amman was visited. Classroom activities were observed and semi-structured interviews were also conducted with principals, teachers and students. Instructional practices, teaching and learning dynamics were observed in the classrooms. Educators at all of the schools visited were asked about the effectiveness of ERfKE inputs like training, new curriculum material, and technology resources. Consideration was also given to teacher motivation and support, implementation of the new teaching methods that teachers were trained on and given the resources to implement.

Results obtained indicate that:

(1) Progress in the implementation of the ERfKE strategies and curriculum is evident in student activities inside observed classrooms. Teachers do make concerted efforts to engage students and promote student interaction. Still, many teachers exert control and direct activity, and although students may be engaged and students do interact, the classroom activity is not student centered or student team-based in the true spirit of the ERfKE initiative.

(2) In general, even when the technology was in good working order at the schools visited, it was not really used effectively to promote the critical thinking of student groups or teams. Although many schools are making progress in the right direction, most schools are still a long way from incorporating ICT into a meaningful Constructivist learning approach. Aside from problems with internet connectivity, initiatives like EduWave constitute technological enrichment activities but still far short of genuine technological tools for instruction. Some of the programs used to facilitate English or even Arabic language instruction may come closer but these applications still fall short of technological advances realized in educational programs like MIT's project Athena or some of the programs created by older technologies like interactive videodisc. Computer adaptive assessments have been successfully implemented that efficiently realize authentic performance assessment of a wide variety of subjects including counseling, management and a veritable host of simulated activities including driving, provision of medical interventions like surgery, and many other applications.

(3) Special groups seem to have benefited from the new inputs and practices. It was clear the students who formerly lagged behind or struggled with the course content have been positively affected by ERfKE's initiatives. Even economically disadvantaged students from overcrowded schools with few resources located in impoverished districts appeared fully engaged

by new ERfKE practices. It is clear that there are significant differences between schools. In a country like Jordan with socioeconomic factors exerting substantial influence over the academic performance of its students, ERfKE is helping to reduce gaps. Notably, one of the schools located in a poor neighborhood and relatively overcrowded exemplified the mission and vision of ERfKE and came very close to realizing the best practices envisioned by the architects of this initiative. Previously, students lacked access to technology at their homes or in the neighborhood but now the school offers them such resources and the students have responded with enthusiasm and great interest. Students were able to demonstrate complex critical thinking skills, knowledge and understanding of subjects like finance. They showed that they could analyze information, use the information they had acquired in a new way, synthesize information and make critical judgments relevant to real life situations that professionals in the field often encounter.

(4) Based on the follow-ups with teachers, the averages of struggling students have risen due to performance based assessments. These below average students have become more confident and more engaged. However, students do not study for performance based assessments as much as they do for more traditional "paper and pencil tests." Both teachers and students advocated changing the current emphasis on performance based assessments by offering two paper and pencil exams and one performance based assessment instead of the reverse.

(5) Significant gender differences are associated with effectiveness in using ERfKE inputs:

a. School staff and students at girls' schools seemed generally more engaged, constructive and focused than male counterparts.

b. Principals at the girls' schools seemed to be more goal oriented, than many, but by no means all of their male counterparts.

c. There seemed to be more disruption in technology services offered (e.g. internet connectivity, computer repair) for boys' compared to girls' schools.

(6) Public schools, especially Discovery schools appeared more likely to embrace and realize the ERfKE mission and vision than private schools which have traditionally served as models of academic excellence. Although the instruction provided by private school faculty was excellent, teachers were reluctant to relinquish their traditional role as lecturer or supervisor responsible for orchestrating the delivery of instruction. Thus, teachers would actively engage students in a teacher directed Q&A session. In contrast, teachers in public Discovery schools were more inclined to take a backseat to their students who assumed responsibility for their own learning. In this student centered context, teachers were resources available to support students who were active agents in self-directed learning activities that naturally incorporated team-building and technology.

Although the instruction provided by private school faculty was excellent, teachers were reluctant to relinquish their traditional role as lecturer or supervisor responsible for orchestrating the delivery of instruction. Thus, teachers would actively engage students in a teacher directed Q&A session. In contrast, teachers in public Discovery schools were more inclined to take a backseat to their students who assumed responsibility for their own learning. In this student centered context, teachers were resources available to support students who were active agents in self-directed learning activities that naturally incorporated team-building and technology.

Significant Challenges to the implementation of ERfKE include:

- Unanticipated escalation of student enrollments,
- Limited access to the required technology,
- Lack of experience, training and understanding regarding new teaching methodology that incorporates technology
- Lack of experience, training and understanding regarding new modalities of assessment.
- Increasing frustration among teachers who describe themselves as knowledge economy professionals with advanced expertise in education and technology but who still remain underappreciated and underpaid.

Teachers and school building administrators often described themselves as disenfranchised or marginalized from the Ministry of Education (MOE) in its implementation of ERfKE. Although many researchers and evaluators have visited the schools, results of these studies have not been disseminated to the schools. In addition, there are few established communication channels for the schools to provide meaningful input relating to the school's perspective to the MOE's implementation of ERfKE. Principals complain about their lack of authority. All of the principals interviewed acknowledged how teachers were overwhelmed and overburdened by the demands of ERfKE in the face of escalating enrollments in the fiscally austere economic climate of Jordan. Teachers complained about their burgeoning workload which entailed unnecessary duplicative activity, and their lack of knowledge and professional development in critical areas like authentic performance assessment, and implementation of instructional applications with technology.

Some Recommendations for Change

Although the educational school system has made huge advances in providing technological access, the implementation of technology in the classroom is - more often than not - cosmetic. Occasionally, the introduction of technology for technologies sake was also evident (i.e. learning how to use EXCEL to generate statistics or mathematical functions without enhancing genuine understanding of these statistics or functions).

Technological tools have been developed to promote instruction. This constituted the focus of attention for major projects like MIT's project Athena. Computer Adaptive technologies are also available to address authentic performance assessment. Some of these applications are readily available on internet and warrant serious consideration in the promotion of the ERfKE initiative.

In Jordan as in the United States although the emphasis of pedagogy is radically different, the teaching profession warrants renewed "professionalism." Especially in Jordan where teachers play a major role as models of knowledge economy workers, it is imperative that the profession warrants transformation. If teachers are to succeed in reshaping Jordan's educational systems and developing successful cohorts of knowledge workers, the profession cannot continue to enjoy second class status. Accordingly, teachers cannot continue to be overworked, underappreciated and underpaid. At the very least, the burgeoning workload cannot sustain duplicative activity that deflects teachers from their primary instructional role. Additional professional development is warranted to help teachers meaningfully incorporate technology in instruction. Teachers also need more help with authentic performance assessment in subjects like math and science. Creative solutions for coping with overcrowded classrooms and limited technological resources need to be addressed.

SCHOOL WALK-THROUGH STUDY AS PART OF THE EDUCATION REFORM FOR THE KNOWLEDGE ECONOMY

This walkthrough evaluation study of the Education Reform for Knowledge Economy (ERfKE) responds to the first phase of the implementation of this initiative. In preparation for Jordanian participation in the global knowledge economy, ERfKE, was designed to transform the entire education system (K-12) to produce graduates prepared to successfully compete in a global knowledge economy requiring highly specialized knowledge, skills, attitudes and competencies. Success requires nothing less than a complete transformation of school culture to radically shift emphasis on teacher-centered lectures with students depending on rote learning, memorization, passive individual learning strategies, to an emphasis on inquiry-based learning activities, with students engaged in active Constructivist team learning classes.

Introduction or Background

In the five years since the ERfKE project was first implemented, many stakeholders of the educational enterprise were brought together. A new curriculum was developed and implemented. Professional development was designed, and is underway to transform teaching. The infrastructure has been enhanced, refurbished and even overhauled to meet the demands of teachers and students who are being transformed into "knowledge workers" keeping up with technological and communication advances.

This ambitious undertaking included four major components:

1. ***Re-orientation of Educational Policy Objectives and Strategies***
2. ***Transform Education Programs and Practices for the Knowledge Economy***
3. ***Quality Physical Learning Environments***
4. ***Promote Readiness for Learning through Early Childhood Education (ECE)***

1. ***Re-orientation of Educational Policy Objectives and Strategies*** designed to redefine the vision and associated policy objectives of the Jordanian educational system to promote and attain the transformation and change needed for reform. Five sub-components were also articulated including:

    a. ***A redefined vision and comprehensive integrated national education strategy***
    b. ***Revised governance, management and decision-making mechanisms to achieve and support an education system delivering basic skills, core competencies and essential learning for the knowledge economy***
    c. ***An Education Decision Support System (EDSS) to facilitate efficient policy analysis and effective management as well as to promote transparency***
    d. ***Comprehensive and coordinated educational research, policy analysis and monitoring and evaluation activities***
    e. ***Effective management and efficient coordination of educational investments directed toward reform efforts.***

Developing the information technology sector became a rallying call to private sector associations and companies, non-governmental organizations as well as to government ministries and agencies (Ministry of Education, 2002) . This provided the impetus for significant investment to reform the current education system to reflect the new and emergent demands for individuals to contribute and participate in the knowledge economy of the future. Out of ERfKE's $410 million budget, $120 million was provided in soft loans by the World Bank, $45 million by

the European Investment Bank, $40 million by Kuwait's Arab Fund, $33 million by Saudi Arabia's Islamic Development Bank, and around $10 million by Germany's development bank KfW. Grants also came from USAID — $35 million — and the Canadian International Development Agency - around $15 million. In addition, the UK and Japan have also contributed with small grants. The rest - more than $110 million —was provided by the Jordanian government, which is, however, financing it mainly through the Socio-Economic Transformation Plan, which is made up for the greatest majority of foreign grants.

To develop required basic skills and core competencies as well as content mastery, emphasis was accorded to critical thinking, problem solving, decision-making, using numbers, communication skills, managing information, being responsive, learning continuously (lifelong learning), entrepreneurship, adaptability, teamwork, innovation and creativity. Previously, the Jordanian curriculum focused primarily on coverage and mastery of subject matter content, not all of it relevant or essential for a knowledge economy.

Many challenges in the education sector were envisioned by the architects of ERfKE, foremost among them were the needs to:

- Build an Information Communication Technology (ICT) infrastructure of high quality to meet the needs of all within the system.
- Equip all teachers with high level ICT skills and competencies.
- Eradication of a digital divide among students.
- Use highly skilled ICT students to teach ICT to other students.
- Develop partnerships with the private sector and the community at large.
- Learn from the private sector, hardware alone will not work.
- Put in place a coherent system of research and evaluation to examine the impact of ICT in education *(Meeting of OECD Ministers of Education, 2001).*

The ICT revolution has exerted a profound impact upon the Jordanian education sector forcing it to respond to the prerogative to reform the "culture" of education content towards more know-why, know-how and know-who (Bengtsson, 2002). However, unanticipated challenges were identified during the course of this study that warrant special consideration.

Transform Education Programs and Practices for the Knowledge Economy by transforming teaching and learning process to achieve learning outcomes consistent with the requirements of a knowledge economy. This includes three sub-components:

*f. **Development of new curriculum and assessment tools***
*g. **Professional development of Ministry of Education(MOE) personnel***
*h. **Provision of required resources to support effective learning***

Anticipated characteristics of the "knowledge worker," the intended final product of ERfKE, include ICT skills, mobility, mastery of a second or even third language, initiative and problem-solving skills, and a capacity for teamwork and responsibility (Bengtsson, 2002). This is exemplified by the **Jordan Information Communication Technology Literacy Curriculum describing** age appropriate thematic strategies such as:
1) Guided discovery lessons designed to guide the student through safe, interactive discovery themes,
2) Adventure thematic lessons built on adventure themes draw on the desire for learning through interaction and role play,
3) Problem Solving & Real life situations or simulations of challenging tasks and problem solving scenarios with interactive real life situations,
4) Critical thinking and higher order thinking skills through individual and class projects , and
5) Advanced learning outcomes and strategies for future career developments .

Ideally, this shift in learning entails presentation of creative, exciting, entertaining and visually stimulating objects and situations that motivate the students to "want" to learn. In addition, learning contexts must promote confidence in technology through interactive and cross curricula integration. Accordingly, students should be able to apply critical thinking and judgment skills that improve learning in and out of the lab. Learning should entail presentation of challenging problems, situations and tasks that enable every student from the academically challenged to the academically gifted the opportunity to learn and succeed.

The Jordan ICT literacy curriculum employs international standards as benchmarks to measure the skills of the Jordanian student by adopting and developing international standards of technology Education (ISTE) standards. But **t**he shift transcends simple incorporation of information and communication technologies requiring a fundamental shift in the approach to learning per se.

In accordance with the Jordanian Information Communications Technology (JICT) Literacy Curriculum Jordanian students were supposed to be taught five essential technology knowledge skills including**:**

1. Basic Operations
2. Social, ethical and human issues
3. Productivity Tools
4. Communication Tools
5. Problem Solving and Decision making Tools.

More specifically, upon completion of the curricula, Jordanian students should have acquired enough proficiency to:

- Successfully pass the international Computer Driver License (ICDL) and internet and Computing Core Certification (IC).
- Use and apply appropriate applications in and out of the classroom:
    - Word Processing (Microsoft Word)
    - Database (Microsoft Access)
    - Spreadsheet (Microsoft Excel)
    - Presentation and Multimedia (Microsoft Power point)
    - Internet (Internet Explorer)
    - Desktop Publishing (Microsoft Publisher

2. ***Quality Physical Learning Environments*** by ensuring that there is adequate structurally safe school buildings and improved learning environment. This entails two sub-components:
    a. ***Replacement of structurally unsafe and overcrowded schools***
    b. ***Upgrading of schools to support learning in the knowledge economy through provision of computer and science labs***

3. ***Promote Readiness for Learning through Early Childhood Education (ECE)*** entails public provision of Kindergarten (KG) in low-income areas of the Kingdom.

Methodology

This walk-through evaluation study was designed to address how much and how well ERfKE inputs are used. Semi-structured interviews were conducted with principals and teachers in selected schools in Amman. Educators at all of the schools visited were asked about the impact on their school of ERfKE inputs like training, new curriculum material, and technology resources. Consideration was also given to teacher motivation and support, implementation of the new teaching methods that teachers were trained on and given the resources to implement. The relationships/support between school principals, supervisors, local and central education authorities, teachers, support staff and students was also examined. In summary, lessons learned at the school level from the implementation of ERfKE Phase I in terms of instructional activities and practices, school activities, technology utilization, teacher support and school management were identified and subsequently discussed.

Principals and teachers were first asked to describe their reactions to the initiative's education strategies and policies and to the new curriculum and assessment tools. In addition, these educators were asked to describe their satisfaction with the schools infrastructure, the availability of computer and science labs, the ICT training provided and received the availability of internet connectivity and student access to computers and the internet. School facilities were visited and classes were observed. Classes were observed and observations were organized to respond to a modified rendition of the Teachscape Walk-through instrument (See Appendix B).

Classes in nine of twelve schools visited were observed. Observations were structured by the by Teachscape Walkthrough instrument. The walkthrough tool addresses curricular emphases, instruction, learners, the classroom environment and differentiation to address diverse learning needs. In terms of the curriculum the Walkthrough addresses learning objectives, whether these are evident to students and whether or not these are on target for grade level standards. In terms of instruction, the classroom walkthrough addresses instructional practices. These include:

- **Coaching**
- **Discussion**
- **Hands on Experience**
- **Learning Centers**
- **Lecture**
- **Modeling**
- **Presentations**
- **Providing directions / instructions**
- **Providing opportunities for practice**
- **Teacher-directed Q & A (Question and answer)**

The Walkthrough also addresses group format defined as either whole group, small group, pairs, individuals or any combination of these. The tool also facilitates identification of research-based instructional strategies, including:

- **Identifying similarities and differences**
- **Summarizing and note taking**
- **Reinforcing effort and providing recognition**
- **Homework and practice**
- **Nonlinguistic representation**
- **Cooperative learning**

- **Setting objectives and providing feedback**
- **Generating and testing hypotheses**
- **Cues, questions and advance organizers**

The tool also facilitates description of student actions like Listening, Reading, Speaking, Writing, and Working with hands on materials, Observing demonstration (e.g. Live, PowerPoint, other), and/or Math (e.g. calculations, analysis).

In addition, , the tool deals with instructional materials including: Computer software, Content specific manipulative, Hand-held technology, Lab / activity sheet, ,Overhead board / flip chart, Student created materials, Real world objects, Worksheets, Published print chart, Video, Web Sites, Oral interchange and/or Textbook(s).

Then the walkthrough addresses the level of student work. This entails focus on: Recalling information (knowledge), Understanding information (comprehension), Using information in a new way (Application), Breaking down information into parts (Analysis), Putting information together in new ways (Synthesis), and Making judgments and justifying positions (Evaluation).

In addition, this instrument addresses various level or degrees of student engagement. In this context it is important to distinguish between authentic engagement pertaining to the engagement of students in a task, activity or work that is meaningful and has immediate value to the student. Strategic compliance relates to activity that has little or no inherent value to the student who engages in this activity because he/she associates it with an extrinsic reward like a good grade. Ritual compliance describes student engagement as a consequence of the students desire to avoid negative deleterious consequences. "Retreatism" describes student disengagement that is not disruptive while rebellion describes students' active refusal to work (Schlechty, 2004).

The walkthrough tool addresses the classroom environment focusing attention on processes and procedures that support student learning, the availability of resources for student use, the extent to which the classroom arrangement supports learning goals, and the presence (absence) of displayed work providing models of quality. Classroom environment generally encompasses routines and procedures, available materials, student work, rubrics, exemplars that support the learning objective. (see Appendix B).

Finally, this instrument addresses differentiation describing whether or not diverse learning needs are addressed and supports are in place to help students meet their individual learning needs

In two schools, it was possible to observe two classes each so a total of eleven classes were observed. Excerpts from principal and teacher interviews were organized to respond to the first three ERfKE components and sub-components previously highlighted. The study was organized to address the ERfKE components outlined above.

Although plans were originally made to address schools' capacity for the Kindergarten component, none of the schools sampled participated in this component. Two schools had a nursery for the children of its teachers. None were equipped to participate in the Early Childhood Education (ECE) program.

Results obtained are subsequently detailed.

Setting the Stage for ERfKE Implementation: Description of Principals' Attitude toward ERfKE Mission and Vision

Most of the principals interviewed in this study had been the principal of their school for two years or less although most had been principals elsewhere for many years (with a range of 10- 25 years). Over half had a Doctorate.

To ascertain attitudes and perceptions of principals and teachers toward the implementation of the ERfKE initiative, a series of questions were asked of principals and teachers about the ongoing effort.
Principals were asked how they and their school responded to the new ERfKE strategies and standards – "How well are these working for you?" Typically, when asked for their impression and reaction toward ERfKE strategies and standards, most principals initially expressed satisfaction with the initiative. Many maintained that, at least in principle, the proposed ERfKE reforms are promising. For one principal of a boys' Discovery school, the emphasis on computers fit with his vision for his school. "Students in this school are encouraged to learn and to use Internet. The problem-solving approach and the use of learning centers at this school are endorsed wholeheartedly. Students at this school depend on themselves. The teachers act as guides and resources. Students are self-directed and do work at home. In this economically privileged school, students are eager to learn." But this school had a comparatively affluent student population. The school had little difficulty incorporating ICT applications, and classes were generally not overcrowded as they were in other schools.

Still at a less affluent boys' school, the principal maintained that there were significant benefits of ERfKE standards and strategies for both teachers and students. For teachers, there are more professional development opportunities and training. The initiative has also enhanced student awareness and expanded exposure to new learning opportunities. As one principal of a girls' Discovery School remarked "It [ERfKE] promises to make students not only *consumers* but *producers* of the knowledge economy." However, , the same principal maintained there are a lot of constraints due to the limited amount of time in the daily 8-2 school day to achieve successful implementation of the ERfKE standards and strategies. "This is a poor school. Parents experience this all as a big change. Follow-up with the parents indicates they feel inadequate to the challenge. Information overload is a big limitation. More flexibility is needed to achieve the desired outcomes. The main outcomes translate into proper curriculum for the average student. If the teacher has the ability, skill and time, they can use the strategies and standards advanced with their gifted students. Otherwise they can only focus on the average student. It is also up to the teacher to find time to deal with raising the achievement level of struggling students." This school had a comparatively high student to teacher ratio: 3-4 students often had to share a computer. In addition, most students did not have access to computers at home.

At one of the private schools visited, the staff was described as the key ingredient to the school's success. "The staff operates as a family – very close knitted. The *spirit de corps* was always high – Staff moral was high. There are always lots of activities always going on like a chess tournament that recently went on for two days. But while the school had attained a good reputation in the past and still maintained it, now the school is on a very fast track. Keeping up is becoming more of a challenge that is beginning to take a toll: teachers are beginning to leave because they have to work a lot harder and harder and endure a lot of stress. The faculty is still

wedded to older educational methodologies. Most staff acquired subject matter-expertise through the years but now they are challenged by the new shift to newer methodologies."

When asked how well implementation of the new learning outcomes was going, the principal replied "Too fast – everything is proceeding very fast – the teachers need a little more time to get their bearings."

One other principal of a boy's school was more skeptical and maintained that in order to make a difference in achievement more support is needed. "Progress depends on the cooperation between the Ministry of Education, the students and the community. Together they can make things work – but without mutual cooperation nothing can happen. Using computers is not a choice but a mandate. Directing student learning in conformity with rules, regulations and prescribed routines is a limitation.. "The principal has very limited authority to make decisions. The teachers are stressed and complain a lot. In this economy, the parents are not responsible. The school must assume responsibility. There is a of hard copy paper work. The teacher is generally depressed. Everyone blames the teacher and it's not fair – how can they manage all of this? It is too complicated to use this model – and not necessary."

Still another principal of a school for boys noted that the ERfKE standards and strategies worked better for some subject matter fields than others depending on the extent of resistance from teachers. 'There is definitely a gap between theory and practice. Many teachers just go to class and lecture. Only about 10% are highly motivated and another 60% are doing ok. The rest have no motivation at all. '

Thus, the implementation of ERfKE was generally regarded as a laudable goal but one that could not be attained without overcoming formidable challenges. The number and magnitude of challenges perceived was described across a continuum of responses. While impoverished schools in poorer districts of Amman generally confronted more challenges, even private schools recognized their own challenges mostly attitudinal barriers toward the emphasis on a student centered approach and the heavy emphasis on technology. Nonetheless, impoverished, overcrowded schools described challenges which affected implementation but which still not necessarily impede progress.

Several principals described the standards were seen as applicable across all student levels (e.g. gifted, average or struggling – above average, average – grade level – or at risk below grade level). Assessments are designed to be responsive to the needs of gifted or advanced students as well as average and struggling students. About 10% of the items were developed and designed to challenge above average students. [1] Standards also help the school identify student weaknesses. The descriptions were regarded as particularly useful and helpful when a new student who moved or transferred comes to another school.

However the standards were also described as overly detailed by both principals and teachers. In addition, teachers complained to the principals because they need more time to decide on the proper rating / ranking of student level.

[1] Student grades must be entered into EDUWAVE every month – this is necessary to ensure accreditation.

Conclusion

Although the ERfKE mission and vision are broadly appealing to principals, implementation has been challenged by many factors. The radical and dramatic changes that are being called for require more work from school staff who are already overwhelmed, often confused and even frustrated by requirements which are complicated, challenging and confusing.

Most of the principals interviewed addressed their lack authority, and described their teachers as underpaid and overwhelmed by a burgeoning workload. Feelings of frustration were also described as exacerbated by perceived the lack of coordination from central administration and other authorities.

Description of Teachers' Attitudes toward ERfKE Mission and Vision

Teachers from one of the highest performing girl's school described how the new ERfKE policies and strategies initially met with some student resistance. Currently, the resistance has abated, and the new methods are commonly used. Still, it has been most difficult on the weaker students because it is tough to find the time to do the necessary diagnosis, and remediation required.

Teachers at many of the schools visited had very heavy teaching loads (4-5 classes per day across different grades) and the large number of classes made it difficult to adequately prepare for all of them. Absences were described as a "nightmare" by several groups of teachers interviewed because it meant other teachers had to absorb the shortfall. In addition, there is a lot of administrative work – so much so - the teachers describe themselves as "scribes" more than teachers. They must write out information and then re-enter the information for the computer. This effectively doubles their administrative workload.

As one group of teachers from one of the girl's schools noted, 'Compiling reports due at the end of the year takes a long time to complete. In the end, these reports did not even seem make an impact. No action or reaction occurs; there were no consequences of the report. "Teachers felt they could not complete this task realistically. As a result, there was no accurate description of standards met for a given student. "The descriptions are prepared in a rush and are based on grades or marks obtained in subject matter classes. Teachers teach all their classes to 40-50 students. If the teacher teaches 11 classes they would need to describe 400-500 students which they simply can't do, especially since there is no planning time. Teachers are only allocated two free periods – 20 /week – but they need this time to prepare their classes as well."

Similarly, the teachers at one school for boys were also unhappy with ERfKE standards. With 25 periods – 5 classes a day – the workload was overwhelming. They suggested that smaller classes and more computer access would go a long way in alleviating the burden.

The teachers' perceptions often depended on their area of expertise. Accordingly, a math teacher affiliated with a dual shift girl's school described the curriculum as very intensive, requiring a week to cover a lesson. But teachers at that school are constrained by time and the class load: Up to the last day teachers are delivering lessons with no time for review. Grade 9 is especially intensive especially for the 1st semester – not so much for the second. This model doesn't work for all classes or disciplines."

A science teacher at the same school described the 8th grade curriculum as good in principle, but given class sizes and time constraints it is impossible to realistically cover the curriculum to

specification. "It is impossible to cover everything. Even though the girls show up early in the morning for extra time, we are unable to cover the curriculum. If we need to set up or reconfigure the class for a discussion it takes 10 minutes from our allocated 35 minutes. How can we do it?"

"For geology in grade 9 we have just one class a week – we have to use peer classes to supplement our coverage. We just can't do it."

The teacher responsible for geography and history at this school described how implementation of a student centered approach was used to get around some of these problems. "Students generally don't like this subject. But we are student centered so after a while students took over the design of class worksheets. Each week we prepare for the next week with magazines, games, questions. We also try to focus on struggling students and share, participate – even if this is limited."

The Arabic teacher described how Grade 10 the lessons are not computerized. "We try to have the class take this on ourselves – it is very intensive."

Although the dual shift school was not one of the best performing schools, it was not one of the poorest either, though the challenges confronted were formidable. The overcrowded classes lasted only 35 minutes. Teachers made a concerted effort to work with struggling students before the school day began they could not do this after school because that is when the second shift came in. Students who lacked access to computers at home would often go to libraries where they could have access. The teachers made a concerted effort to realize the ERfKE mandate, but the obstacles confronted seemed virtually insurmountable.

a. Revised governance, management and decision-making mechanisms to achieve and support an education system delivering basic skills, core competencies and essential learning for the knowledge economy

Both principals and teachers anticipated questions relating to management and decision-making mechanisms in their responses to questions about their general satisfaction with ERfKE standards. This was a major issue for both groups.

Principals

School staff and students alike at girls' schools seemed generally more upbeat and positive than male counterparts. While teachers at all schools described their work as stressful, and poorly compensated, teachers at some of the boys' schools appeared more demoralized. The level of teacher dissatisfaction was recognized by every principal interviewed. Most were very sympathetic toward their teachers' plight. But principals at the girls' schools seemed to be more goal oriented, than many, but by no means all of their male counterparts.

Despite huge challenges, schools for girls often appeared to be managed better. Services – especially internet connectivity and other ICT services - were not interrupted as much. Computer labs were all operational. In contrast, computer labs at schools for boys seemed to have more problems with servicing equipment and connectivity.

It was also interesting to note that, at two of the girls' schools visited, there was a nursery for the small children of staff. This was never the case at the boys' schools although one male teacher bitterly complained about the difficulties that he and his working wife experienced because it was so difficult to make childcare arrangements for their small children.

Principals generally complained about their lack of authority and autonomy to more successfully implement the ERfKE initiative. The recurrent theme that economic factors constitute the most significant and critical constraint confronting all levels of educational leadership constituted a major concern for most of the principals interviewed. This was often related to descriptions of the deleterious consequences of low teacher salaries.

According to at one principal of a boys' school, "There is definitely a gap between theory and practice. Do to social and economic forces beyond the control of any principal, many teachers are resistant and lack the motivation work. The principal has no authority to meaningfully intervene. In addition, schools are needlessly constrained by the bureaucracy. For example when one teacher left the school with their allocated laptop it was not possible to get it back."

Another principal from another school for boys noted that economically secure teachers would be in a much better position to professionally develop.

Again, yet another principal from a boys school remarked that ideally, the principal would like more freedom and authority. Although things are basically ok for this principal's teachers, he knows they are frustrated. The economy is bad. The economy is the most pressing problem right now. "Teachers need more support and encouragement – more financial support as well. If they get more they can give more. In order to get by, many teachers work a second job (tutoring) after school. This leaves the teachers tired the next day when they still have to prepare 2-4 lessons. Teachers need more time to prepare for their students. The teaching profession is not a great profession because it has low status – this undermines teachers. Teachers should enjoy the same status as a university professor. They should also have better equipment in their labs. There is also the huge administrative work burden. "

For another principal of a girls' Discovery school, success was contingent upon the reduction of the number of students, and the reduction of the stress that is overwhelms teachers who struggle to keep abreast of changes, and constant revisions in plans. Behavior management, especially for grades 8, 9, and 10 was another issue she felt warranted more attention. For teachers from this school, absences are a nightmare because it means teachers have to absorb the shortfall. In addition, there is a lot of administrative work for teachers who must write out information and then re-enter the information for the computer. This effectively doubles the administrative workload.

A principal of a girls' Discovery School in a poorer section of town took issue with the disorganization of professional development activity. Field supervisors didn't do much about training. Implementation of training is not efficient or organized - instead it is confused. She went onto describe there lack of organization, and the lack of coordination. Professional development programs or activities are initiated and then abruptly cut off. There is no scientific foundation for the training that is offered. There is no cost benefits analysis for ICDL or Intel or Word Links. There is no follow-up from the administration. She also noted that because the parents are not well educated, the school assumes a lot of additional responsibility. Parents resist new initiatives and programs like ERfKE. Lots of rules are not implemented in the proper way. Students are not disciplined in accordance with the proper rules, yet there is still a great need to take action otherwise students eventually leave the school to dropout. This particular school most consistently and successfully implemented ERf?KE with fidelity despite many challenges confronted.

At one of the private schools visited, an administrator noted that teachers reject change. They do use their free periods to discuss and evaluate these – but these sessions are not particularly

structured or organized. Similarly most have received technology training – the ICDL should suffice – but faculty is still resistant to change. Another principal recommends that the principal have more support in decision-making and has more authority and more funding as well

Teachers often described themselves as overloaded having to prepare for their classes with a new computerized curriculum across different grades for different levels of students. There is not enough planning time and there is a lot of administrative work to do even without the technology to master and apply creatively. Right now there are a lot of reports to generate that are not even related to the core. If a teacher is absent this only adds more to the burden of others who have to fill in. Management needs to address this.

Conclusions

Similar themes pertaining to management and decision-making mechanisms characterized all the schools. Although the ERfKE mission and vision are broadly appealing, implementation has been challenged by many factors. The radical and dramatic changes that are being called for require more work from school staff already overwhelmed, often confused and even frustrated by requirements which are inherently complicated and challenging to implement.

Essentially principals want to have more authority and more autonomy. Teachers are underpaid and overwhelmed by a burgeoning workload. Both principals and teachers are increasingly frustrated by the lack of coordination from central administration and other authorities.

Both principals and teachers agreed that attention needs to be directed on reducing the amount of administrative work by eliminating duplication of effort to streamline this activity. Some principals as well as teachers described stress experienced by teachers who had to fill in for other teachers who were absent. MoE certainly needs to address the need for substitute teachers who might be able to alleviate the burden teachers must assume when co-workers are ill or have some emergency that results in absences.

The lack of coordination from the central administration only exacerbates difficulties making it even more difficult to keep abreast of changes.

School staff and students alike at girls' schools seemed generally more upbeat and positive than male counterparts. There were some indications that the schools for girls were better managed, experienced fewer disruptions in technology, provided more staff support (e.g. child care).

b. An Education Decision Support System (EDSS) to facilitate efficient policy analysis and effective management as well as to promote transparency

and

c. Comprehensive and coordinated educational research, policy analysis and monitoring and evaluation activities

and

e. Effective management and efficient coordination of educational investments directed toward reform efforts.

Many of the schools sampled were Discovery schools. Theoretically, every Discovery school should receive a programmer from the directorate. In addition, the school is targeted for regular visits by Company representatives for maintenance two times per month. These schools also qualify for membership to the JEI as well as JEI cooperation and coordination. But schools must also fulfill some requirements. For example, the principal must follow- up classes and

observations. The principal must generate reports and the school must have education supervisors attending classes meeting teachers , assessing teachers, providing assistance in problem – solving.

At least some of the schools visited appeared to deviate from anticipated expectations associated with a Discovery School. Connectivity was slow, subject to interruption and elicited a lot of complaints from teachers.

The principal of one boys' school described teachers as stressed and complaining that they have a lot to do, but there are a lot of barriers in their way. They must implement a curriculum that they had no role in preparing. There is a real gap between the field and the strategy the Ministry of Education has developed and continues to develop. The teachers don't want to accept the changes ERfKE mandates. They still want to teach the way that they were taught. Meanwhile their standard of living continues to deteriorate. So the teachers are depressed.

According to another principal of a girls' Discovery school, there is not enough financial support for schools – 5000 JD does not go a long way to procure materials or maintenance. In addition, professional development activity is often disorganized. Field supervisors didn't do much about training. Implementation of training is not efficient or organized - instead it is confused. There is no organization, no coordination. Professional development programs or activities are initiated and then abruptly cut off. There is no scientific foundation for the training that is offered. No cost benefits analysis for ICDL or Intel or Word Links. There is no follow-up from the administration.

These sentiments were echoed by another principal of a boy's school who described how little 3500 JD could buy.

Principals and teachers often alluded to visits by various teams of evaluators and researchers, who listened to the school administrator and teaching staff when they detailed their needs and problems. But nothing seemed to ever change.

Teachers - from both boy's and girl's schools - maintained that more research and more evaluation is needed along with better dissemination of the results of ongoing research and evaluation. Schools should also have more input as to the contents of the research and evaluation agenda. The schools need more and better feedback.

The curriculum needs to be revised on the basis of teacher and student input rather than by some outsiders who know nothing about our students, our teachers and our needs.

Another principal of another boys' school remarked that we have described all this many times before, and still nothing happens. Teachers from a one of the girls' schools also maintained that more research and evaluation is needed. In addition, better dissemination of the results of ongoing research and evaluation is also needed. Schools should also have more input as to the contents of the research and evaluation agenda. The schools need more and better feedback.

Realizing the ERfKE Transformation through Curricular Development and Implementation

The second component of the ERfKE initiative addressed transformation of educational programs and practices. Key inputs pertained to development of a new curriculum, assessment tools, professional development activity and the provision of required resources to support effective learning

2. ***Transform Education Programs and Practices for the Knowledge Economy*** by transforming teaching and learning process to achieve learning outcomes consistent with the requirements of the knowledge economy. This includes three sub-components:

a. Development of new curriculum and assessment tools

In 2004, ERfKE made the creation of a new curriculum a priority. The new curriculum that was introduced was outcome- based instead of input-focused, student or learner centered instead of teacher -directed, and emphasized implementation of a "core" curriculum. The learning outcomes of this core curriculum were expected to be achieved through different approaches with many different learning resources in concert with a "supplemental" curriculum designed to meet the various learning needs of different individuals rather than a "one-size fits all" approach to curriculum. Incorporating a "lifelong" learning approach to the provision of education rather than the closed terminal approach that traditionally guided educational programs was another consideration influencing development of the new curriculum. In addition, results-based and multi-media-based perspectives were integrated into this new curricular approach.

Essentially, students were expected to learn knowledge skills and attitudes needed to participate in the global knowledge economy by actively engaging in inquiry activities that involved use of information computing technologies and other learning resources and tools. Teachers were asked to focus their classroom activities on significant learning outcomes and to use relevant assessment tools to both monitor and enhance students' mastery of learning outcomes. The magnitude of change varied as a function of subject matter content.

A three year plan (2005-2007) was developed for writing school textbooks for all subjects and all grades (1-12) and for training teachers to use the new textbooks. In September 2005, new textbooks for grades 1, 4, 8 and 10 were introduced. School principals and supervisors were enlisted to follow-up on teachers' implantation of the new curriculum. In September 2006, new textbooks for grades 2, 5, 9 and 11 were introduced and in September 2007, new textbooks for grades 3, 6, 7 and 12 were introduced (Sawila, 2005).

Five e-curricula - 1) Math Online, 2) E-Science, 3) ICT e-curricula, 4) English Online, and 5) Arabic Online were developed. The e-curricula development aims to support the Government of Jordan's vision of building a knowledge economy by providing lifelong learning opportunities to young entrepreneurs and communities across Jordan. In cooperation with international companies, MOE also developed and introduced digitalized content for some school content – especially mathematics.

The shift to a new, e-learning-based approach was a dramatic one for teachers and students. Ian McLellan, executive director of the development coordination unit at the Ministry of Education (MoE), sums up the changes introduced with the new curricula: "We are no longer telling

students: `This is what you have to memorize and remember.' We are telling them: `This is what you have to think about'."

Concurrently, new approaches to assessment along with new assessment tools were introduced. Under a new evaluation system, students were no longer graded according to the results of quiz-like tests, but on the basis of a "portfolio" — a collection of samples from their work, which they themselves agree upon with the teachers and update regularly. This new evaluation process was designed to encourage students to self-monitor and assess themselves. The adjustment required to adapt to this different approach varied as a function of subject matter content. In addition, schools with many students but only the two required computer labs experienced the assessment process as more cumbersome.

Training all public schoolteachers on relevant ICT skills and on the new curricula was demanding but still successful. The introduction of new curricula and textbooks in four grades in all 3,000 public schools across the country was considered the most tangible achievement to date of the $410 million, two-year-old Educational Reform for a Knowledge Economy (ERfKE) strategy. (Sawalha, 2005).

Reactions to the ERfKE curricula were addressed in this study through interview and small focus groups of principals, teachers, and students**. Principals were asked** (See Appendix A.1)::

How do you find the new curriculum?
What about the textbooks, workbooks and related materials?
How are these working for the teachers and students at your school? How is the implementation of learning outcomes going?

Teachers were asked (See Appendix A.1)::

How do you find the new curriculum?
What about the textbooks, workbooks and related materials?
How are these working for the teachers and students at your school?
How is the implementation of learning outcomes going?

Students were also asked how they felt about their education (see Appendix A.3a and Appendix A.3b).

Principals

In response to the questions about the curriculum, a principal of a boy's school in one of the more affluent districts maintained that the curriculum adequately reflects and outlines everything it needs to. "As for the assessment tools, these are beneficial for the student, especially the performance based assessment which has helped students raise their academic averages. Reliance upon a multiple methods approach: a mix of performance based tests and paper and pencil tests, constitutes a major effort especially given a weekly load as high as 23-25 subject matter classes – at least 14 classes per week. Still, the assessment measures seem reliable." But this school had affluent students almost all had access to their own laptop computers at home and in school most did not even have to share a computer. The classes were comparatively small (about 22 students in a class).

These sentiments were more or less echoed by another principal of a high performance girls' Discovery School, the curriculum is perfect and fosters critical thinking. The texts and

workbooks are also beneficial – but long and intensive. Consideration should be given to either simplifying the curriculum or the teaching load. The assessment tools still require more time for adequate development. They have improved over time and are better than they were at the beginning of this initiative. These work very well for average and struggling students but NOT for high achievers or gifted students. Implementation of the assessment tools elicited a lot of complaints (from teachers) – it was difficult for them to specify standards or criteria for achievement – some teachers may require additional training in this area. This school was located in an affluent area and teachers were highly trained in ICT applications. The teacher to student ratio is 1:30. Almost all of the students (except about 10) have access to computers at home (it is a fairly affluent section of Amman). There are 20 teachers most have their International Computing Driver's License(ICDL) an additional 5 want to take the test – and 10 received special training in authoring.

At one of the boys' schools, the principal described the curriculum, texts and workbooks as perfect, especially for elementary classes. Students have a better understanding of the conceptual underpinnings of subject matter because the picture selected to illustrate them are more consistent with ideas and information being presented. But there are differences depending upon the subject matter being covered. Finds curriculum across all levels of achievement help improve achievement so the struggling students become more like the average students, the average students become more like the above average or gifted – and the gifted become exemplary. English articles and text present more realistic content that can be related to students' daily lives.

Another principal from a school located in a comparatively poorer district remarked that in the new curriculum, textbooks and workbooks, the material is the same as before though the methodology for course delivery has changed. But the consolidation of schools into a two shift operation has reduced the amount of class time available to the students and their teachers. There really is not enough time. Teachers are overwhelmed with work. They can't really cover the curriculum and achieve outcomes with so little time. In a school where the average class size is 45 students and even higher, the ERfKe initiative is regarded as well developed but teachers cannot improve – the teaching load is heavy and tough to manage with 26 classes and a 35 minute class period. The teachers are overwhelmed they cannot implement the standard, curriculum, assessment and that were planned for by ERfKE. The teachers are very frustrated and depressed – it is tough to manage classes like physics and chemistry or social studies when they are teaching 24-26 classes per week. In addition there are no breaks and no time for planning and class preparation.

A principal of a girls school commented that as for the curriculum (including texts, workbooks), there is some confusion due to a gap between theory and what can be successfully implemented or practiced. It's a good start – but anticipated student outcomes outpace teacher development and training activity. Teachers need more time, development and training.

At one private school visited, the curriculum was described a basically good by the principal there. The emphasis on technology is good. But this still needs work. It demands a lot of change in a limited amount of time. The assessments also require a lot of work. A lot of weight is given to performance based assessment but these assessments still require improvement and teachers need more training and more time for this.

In contrast, at the other private school visited, teachers maintained that the ERfKE curriculum is not coherent and well planned. It is written for lower level students and not designed to promote deep thinking. In Math, the standards elicit a reduced set of skills from the student – particularly ICT activity - which impacts negatively on the student. The principal remarked that although

many teachers are favorably disposed toward the new curriculum, far fewer approve of the new assessment tools despite training received. In addition, the worksheets are not always accurate.

Another principal at a school for boys claimed that the teachers had no role in preparing the curriculum. There is a real gap between the Ministry of Education and the field. MOE needs to make a concerted effort to get feedback from the field. He argued that the curriculum is built by subject matter experts who are unfamiliar with student characteristics so the curriculum may not fit the needs of students attending schools. "The curriculum is too advanced for the student level here. There us a lack of rapport between the educational community and the teachers and principals in the field. The assessment strategies don't work well because the students don't study – traditional paper and pencil measures work better. Teachers don't want to change – they still want to teach the way they were taught though they might put on a show for outsiders. The assessments (competency based performance measures) work well for below average students whose grades improve through these methods – though their knowledge does not. To overcome these difficulties, it is imperative to listen to the teachers. In math the new strategies are wonderful. In the beginning when these were introduced, the supervisors lacked the necessary vision to help the teachers accept and properly implement these ideas. The rubric and checklist are great but it is hard to implement these in classes of any level where the teacher to student ratio is so high. It's the same for science. "

Logistics required to satisfy curricular demands may compromise ongoing efforts to meet the needs of struggling students, according to one of the principals from a girls' school. "Although the curriculum is very good it still requires revision because it is too long, too complex. Numerous outcomes are specified requiring a great deal of information to be assimilated by teachers. Unfortunately teachers are already extremely overwhelmed. Our teachers try to provide additional classes to cover curricular requirements - the instructional day is extended (e.g. extra science classes may be offered to meet required outcomes). In addition, extra time has to be given to students requiring remediation. For example: Newton's laws entails provision of 5 activities to achieve all required outcomes - this becomes a huge task to achieve outcomes and to schedule all requisite activity especially in view of the high student to teacher ratio."
This school has on average about 40 students per class. In computing, 2-3 students share a computer. Grades 6-12. There are 750 students. They choose one of three tracks: Science, Literature, Information Technology. About 12 (out of 40) are high achievers (90% or higher), 20 are good achievers (80-90%), 13 are adequate or borderline (70-80) and 5 are at risk (below 50%). Immigration poses a considerable challenge that creates a textbook shortage, shortage of seats

At another one of the private schools visited one of the administrators informed us that this highly data (assessment) driven school is very responsive to the needs of its struggling students. Assessment results are quickly analyzed. The passing grade is higher than typically required in government schools (60 instead of 50). Students who score low are readily identified and they are given remediation promptly. Students are then reassessed. Most (80%) of the students improve subsequent to remediation. In general, struggling students and students with learning disabilities attend regular classes – though students with learning disabilities are provided push in (specialized assistance in a regular class) as well as pull-out (specialized assistance outside the regular class).

This type of activity was not characteristic of any of the public schools although some – especially at the girls schools – efforts were made to provide remediation for struggling students. In the public school context were classes are frequently overcrowded teachers would have to

come in extra early or stay late to work with struggling students. At one school for boys, about 20% of the students are struggling. The school starts at the eighth grade – historically some students come to the school unprepared in science or math. These struggling students may receive support by getting extra time or classes before the school day starts – depending upon the disposition of the teacher. "Some of the students behave badly. This is an issue. The school administration exerts some pressures on these students so they drop out. On the other hand, even tough any student who is absent more tan 30 days cannot pass, some students who are victims of socio-economic circumstances beyond their control can't always make it to school – and the administration closes its eyes in some cases like this. In addition, by law, three boys in a class must fail. still some students who are woefully behind academically do get by because grades may be curved so these students get by."

Teachers

In contrast, at another boys' school where one of the teachers did describe scaffolding strategy with his struggling students but generally struggling students at that school participated in peer learning groups to obtain the assistance they needed.[2] Essentially, "Struggling students are put in peer learning groups in our overcrowded classes. They get tutorial support. It's ok. The peer learning groups go over what the student knows and build on their knowledge."

Notably, male students who had previously attended classes with female teachers also described them as more willing to work with them until they attained subject matter mastery than their male teachers.

When teachers at one of the boys' schools were asked about their perceptions of the curriculum and the new assessment tools, they indicated that the curriculum is seen as very comprehensive covering numerous concepts in depth. As a result, sometimes there are gaps in student's understanding. The student centered approach requires students to make greater efforts to master the material but often the students are not up to this because of fatigue or lack of motivation. Students need more time to understand and require more work to attain mastery over the material. Students seek more help from their teachers but it is not always possible to follow through. The new curriculum works well for gifted students to become better but the average and below average student may get worse.

The curriculum encourages more critical or higher order thinking in students. Students focus more on thinking than recall of information. The curriculum is likely to change again, there is always change, but now there is also some stability in direction.

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[2] Scaffolding refers to the construction of a learning foundation to increase student knowledge. For example, first, a teacher might models a comprehension strategy, next, students move into flexible small groups where they, together with the teacher, practice using the strategy and finally, students are provided opportunities to use the strategy independently on their own.

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As for the Assessment Tools, these were described as great by these teachers. According to the principal, students are assuming 30% of the education and teachers 70%. There is no difference as a function of achievement level – everyone benefits. Students interact in the classroom more. Even below average students participate and interact more. But parents still believe in the paper and pencil measures and resist the performance based assessments. And students don't review and study at home for performance based assessments

Often teachers' impression of the curriculum and assessment are colored by their discipline of practice. For example at one boys' Discovery School, where the average class size is comparatively small (22 to25), the English teacher is satisfied with the curriculum, texts and workbooks for English. The math teacher described the math curriculum as excellent because of its emphasis on computing. Opportunities to practice life skills in subjects like science were considered advantageous. In addition, the new assessment tools represent a significant improvement over the past because more attention is directed on the student. These teachers approve of the assessment tools and regularly use them finding the performance based assessments as good as paper and pencil measures. They also agreed that the assessment tools are useful across all levels of student: gifted, average and below average. But even at this school where the teachers were favorably disposed toward the new assessments, these teachers observed that for the 1st performance based grading period, students don't study, prepare or review for these assessments until the 2ndgrading period which relies more on paper and pencil measures. Although they expressed a need for additional training they have no complaints.

In one Discovery School for girls the consensus of teachers agreed that the guidelines, texts, and test were helpful even excellent – though the learning outcomes are too numerous, too long, too intensive – too complex at least in science. For nutrition, the learning outcomes are underdeveloped. Assessment in nutrition is easier because of its reliance on old standards. Students even brought their own tools. Also, there are fewer students in this program. These teachers felt the introduction of assessment tools in a knowledge economy context is promising and potentially useful.

In English the new assessment tools work well for English language. For English classes in this high performing Discovery School for girls they use Interactive English Online. This a self-learning program / software is very useful aside from minor obstacles associated with connectivity interruptions or headset problems. These obstacles are relatively minor and typically easily resolved. The software also has some technical problems but overall, works well. Still the challenge is the variety of students or individual differences. This was difficult in the beginning – but later, it got better. Performance Assessment has some benefits for students who are insecure, shy – it boosts there confidence. The teacher described success using a performance based assessment where scenarios were set up to simulate an English TV program addressing health. This was videotaped. The project got its impetus from CADRE.

For math the new curriculum is regarded as very good. In terms of the curriculum and texts and workbooks, these are generally good. But, the standards and strategies have been described as overwhelming, requiring a lot of teacher preparation, especially for performance based assessments. Math, calculation is facilitated through ICT which is good although students with lower ability still do not recall information as well, but the technology is motivating them. They are more interested and engaged and interact with the teacher more.

For Arabic, performance based assessments are actually easier to design and administer than paper and pencil tests, because it is easier to observe learning in this context. In Arabic, in the beginning after obtaining ICDL training there was a lot of use of PowerPoint pictures and

multimedia. Later after Word Links, more skills were developed. Students started asking for special assignments. Through EduWave it is possible to post marks and grades and follow-up on grades. Students clamor for feedback. But the performance based assessments are tricky – teachers still don't know how to mark them. Still, although the new approach emphasizing listening, reading, comprehension, writing and speaking is valuable, it does require continuous development. The assessment tools, rubrics, checklists were considered helpful.

Many teachers from a variety of schools noted that the assessment tools work especially well for comparatively weak students. They build confidence. The science teacher at the same school felt that the check list works much better for below average students than gifted counterparts. The teachers also agreed that the curriculum worked for them and for all levels of students (e.g. above average, average and below average).

According to another principal from another high performing girls Discovery school, the assessment tools and strategies were once again considered most effective for weaker students. These tools get around test anxiety issues and are generally responsible for raising student grades. Performance based assessments did encourage students to speak more and appeared to build student confidence. Still weaker students needed a lot more activities. But the teachers from this school strongly maintained that there was not enough traditional paper and pencil testing. Students needed more experience with this modality of testing when they were preparing to go to universities. They also needed more exams and exam preparation to study. As it was, too many students leave everything until the end of the year.

At one of the private schools visited, the principal remarked that although faculty are favorably disposed toward the new curriculum, far fewer approve of the new assessment tools despite the training received. The worksheets are not always accurate.

In terms of the private school perspective, the new curriculum was received with mixed reviews. There is definitely a teacher training gap. Although the teachers have attained mastery over the content they deliver, they do need more work in their delivery if they are to conform to the new delivery methodologies. Difficulties are encountered. For example, when teachers are directed to special materials on websites for English speakers whose content has not yet been translated into Arabic – this is only language some students know. Alternatively, some English speaking students understand these websites better than their teachers. The teachers have not unilaterally embraced the new curriculum which they feel is overly advanced. They still need more time to fully digest this content. A Math teacher from the same school noted "I don't think the ICT provides any value added insight – the students just input data – they just learn data entry but nothing deeper."

In terms of assessment tools, the English teacher described assessment tools as very good for English language learning, while the math teacher maintained that the checklist strategy is not good and that more emphasis should be given to the paper and pencil tests. The consensus of three private school teachers interviewed was that maybe there should be two paper and pencil tests and just one performance based test (and not the reverse) because the paper and pencil tests provide a clearer picture of the students skills and knowledge.

In addition, teachers maintained that some of the information in the tests is old or incorrect. The outcomes are too long, too intensive. The content of the curriculum needs revision. The books are attractive on the outside – but not as good on the inside. Optimally, it'd be better if the technological activity would occur at home, not in the classroom. The text is critical and the computer cannot replace the text.

The overall consensus of the group was that use of the computer/technological applications results in an abandonment of deeper higher order skills that only makes the student more dependent on the computer. Books are ok – but the technology is leaving teachers behind. Technological developments are leaving the teacher who is unable to keep pace behind. Teachers are having a hard tine keeping up with the demands of the new curriculum.

At the girls' school with a dual shift, the teachers trust both the performance based assessments and the paper and pencil measures. Some teachers still feel that the paper and pencil measures are more reliable. But performance base assessment helps students who have test anxiety. A lot depends on the subject matter content. For math the paper and pencil test appears to be more reliable. Performance based works with science, geography but not math. The Arabic teacher described the curriculum and assessment tools as good but time consuming for teachers who frequently take work home. There is just too much to do and not enough time in the class day.

Though the assessment tools can be used to distinguish between gifted, average, and struggling students, these tools are minimally useful for differentiation. The picture they provide is not very accurate but conveys some idea of student status. These tools do help students improve their grades. But time is the problem. The tests do reflect an increase in knowledge – and don't just inflate grades. However, there is still a need to decrease the number of papers that have to be compiled with these new assessment tools. In some (if not most) schools, the student report is compiled subject by subject.

The daily copy book also takes up a lot of time. There is not enough time to develop meaningful criteria and go over everything. Teachers feel they must write about everything. As a result, they have to take work home, and they have a lot to do at home. Perhaps it would help if some of this activity could be computerized.

Overall, below average students from a girls Discovery school that has embraced the ERfKE initiative in instructional practice are getting better marks because of the new assessment tools. There are lots of assessment tools for the teacher to use that are appropriate to student age and level – but these require more teacher preparation more experience. The performance based assessments are not very good for diagnostic purposes or identifying student level with any accuracy. With self or peer assessment it is difficult to determine the student's aptitude. ICT focuses on computing – but not learning per se.

For Science, in particular Chemistry, it really takes time to learn how to develop good assessments. The teacher must develop criteria for each grade and level (e.g. gifted or above average, average or grade level, struggling or below grade level) and teachers lack the time and experience to develop such criteria. In addition, the large number of students (35-50) in a class does not permit all students with equivalent opportunities for participation. Criteria like "cooperates with others is not always meaningful." It is better to infuse this task with subject matter criteria and not just methodological criteria. In addition, different supervisors value different things. This further compounds these problems.

Performance based assessment does not work well since many students have technology skills which compensates for their lack of subject matter knowledge. Since the performance based assessments are offered in the first grading report, students rely on their prior knowledge and don't study. Students are not particularly motivated to keep studying so they are likely to forget material learned during this period. It is also very hard to assess student skills for so many different classes which are offered to students in different grades. Also they may be tested at a time when they are not at their best – for example if they are tired at the time of testing.

The abundance of exercises in the curriculum was considered especially helpful to struggling students. None the less, with 40 students in the average class it is a challenge to provide quality education. To some extent, it is possible to overcome this challenge through small group work. This enables students to help each other.

Teachers at one Boys Discovery school felt curricular development could be enhanced with more input from teachers and students. These teachers maintained that there is a need to consult students and teachers as well as principals in curricular preparation. The performance based assessments were described as confusing to students who did not prepare seriously enough for them. Results obtained gave the teachers some idea of student competency but they were not really very accurate. The consensus of this group agreed that it would be better to have two paper and pencil tests than two performance based assessments. Students lack confidence in their work with computers. The assessment tools do seem to work for all levels of students (above average, average and below average). This group of teachers found the assessment tools to be very time consuming and felt there needed to be more and better training regarding their use.

For one boys' school, the assessment tools had only recently been introduced and implemented (October 2007), and this teacher had very little experience using them although there is time set aside for planning and sharing with other teachers.

At one of the private schools visited, teachers maintained that the ERfKE curriculum is not coherent and well planned. It is written for lower level students and not designed to promote deep thinking.

An English teacher from this school described assessment tools as very good for English language learning, while a math teacher maintained that the checklist strategy is not good for math In Math, the standards elicit a reduced set of skills from the student – particularly ICT activity - which impacts negatively on the student. More emphasis should be given to the paper and pencil tests. The performance based evaluation is problematic.

The consensus of the three teachers interviewed was that maybe there should be 2 paper and pencil tests and just one performance based test because the paper and pencil tests provide a clearer picture of the students skills and knowledge. In addition, these teachers maintained that some of the information in the tests is old or incorrect. The outcomes are too long, too intensive. The content of the curriculum needs revision. The books are attractive on the outside – but not as good on the inside. Optimally, it'd be better if the technological activity would occur at home, not in the classroom. The text is critical and the computer cannot replace the text.

Students

According to a group of boys attending a Discovery school for Boys, the text books were good, especially in math, physics and science - but the history text was not appreciated as much by these boys.

Assessments reflected true learning and mostly reflected recall of information presented or read. It was the same for Chemistry, Arabic, History or Physics. The same questions were asked across different levels.

Performance based assessments were not always objective – a lot depended on ones' relationship to the teacher. And teacher turnover was another problem. One student recalled having three different teachers in a row for the same course, and remarked "How can they assess students?" Moreover, only one student recalled a teacher ever using the checklist. There were no well defined criteria, rubrics. Most of the students preferred paper and pencil tests.

The students were also asked about their teachers. They described their teachers as unable to control the class, unprepared or weak in preparation. The students who had previously attended classes with female teachers also described them as more willing to work with them until they attained subject matter mastery than their male teachers. When asked who helps them learn the most, most of these students responded that it was their family.

Summary

Results obtained generally corroborate results obtained in other similar studies designed to address the implementation of the ERfKE curriculum.[3] In a survey of teachers', school principals and parents' perception of the new curricula and textbooks, principals and teachers appeared to be favorably disposed toward the new curricula which they perceived as helping students to participate and compete in a knowledge-based economy. More specifically, teachers most frequently identified learning computer skills, using knowledge in life and developing critical thinking skills as activities that prepare students for participation in the knowledge economy. Factors like communication, team-work, taking initiative, planning and creativity were mentioned less frequently.

Teachers identified use of authentic assessment, using ICT resources and skills, developing teaching thinking skills and differentiation or adapting instruction to individual differences as skills they felt they needed to acquire to effectively teach the new curriculum. Indeed in addition to the lack of school resources, tools and facilities, and inclusion of an abundance of topics, the use of new instructional and assessment methods and adapting instruction to individual differences were identified as barriers to effective implementation. Teachers tended to seek help from colleagues, district supervisors and websites rather than their own principals.

In this study, teachers were also favorably disposed toward the ERfKE curricula in principle. Preparing students for a knowledge economy was generally regarded as a laudable goal. However, the number and complexity of learning outcomes was frequently alluded to as unnecessarily cumbersome. Teachers also repeatedly alluded to overcrowded classrooms and time constraints that made it difficult to adequately assess students with the new assessment tools. Both principals and teachers often expressed a need for more training in assessment.

Although teacher satisfaction with the curricula varied as a function of subject matter, there did appear to be some consensus that the new curricula and associated assessment tools were appropriate to all levels of students (e.g. gifted, average and struggling students). Performance based assessments were frequently described as improving or elevating the grades of struggling or below average students. Similarly, the emphasis on technology was also described as especially engaging to these students who were otherwise often disengaged.

[3] A Survey Study of Teachers', School Principals' and Parents' Perceptions of New Curricula and Textbooks.

As for principals, this study also corroborates the generally favorable disposition toward the new curriculum on the part of principals. However school principals interviewed in this study and surveyed in other studies consistently express the need for additional professional development for their teachers in both instruction and assessment. Unlike other studies, principals interviewed in this study expressed the need for additional resources, and facilities to offset overcrowding, problems with connectivity and the need to improve the professional status of their teachers. The need for additional facilities was most pressing for the principals and teachers of the double shift school. There, additional computers or more professional development for teachers were not considered as especially effective or necessary means of improving instruction as long as classes were overcrowded and shortened (to 35 minutes) because of the double shift. In addition, some principals expressed the need to better organize professional development and support from supervisors.

b. Professional development of Ministry of Education(MOE) personnel

Background
The ERfKE goals for professional development describe:

1. Implementing the role of teacher as the "facilitator" and "guide" for learning from a role of teacher as "provider" of information;
2. Recognizing the "professional" nature of teachers through an effective ranking and rewards system as compared to a civil service view of human resource management;
3. Investing in quality continuous professional development of education staff (teachers and leaders) rather than accepting pre-service training as sufficient to meet the needs of learners

Background
The recognition that changing teaching practices in schools and classrooms is considerably more complex and challenging than is typically understood or planned for is critical in this context of sweeping educational reform: "Teachers and principals are at the heart of the change process and their active participation critical to initiative success Sustained partnership involvement is critical to the long-term success of initiatives. It must be carefully managed and should not be taken for granted. Monitoring and evaluation and considerations of scale-up and sustainability are essential to the long-term success of initiatives and have yet to be given the attention required (Cassidy, 2007)."

Increasingly, Jordanian teachers confront the new challenge of becoming a learning guide instead of being a director of instruction (Bengtsson, 2002). But although the desire to move away from a teacher -centered mode of instruction to a student-centered approach is paramount, the diving force of instruction remains the teacher, not the technology.

MoE has provided professional development activities pertaining to the ERfKE initiative overall, on instruction and assessment and training to teachers. In addition, there are a number of professional development activities designed to support Information and Communications Technology (ICT) training for Jordanian teachers.

The International Computer Driving License® (or ICDL) is the International qualification that enables people to demonstrate their competence in computer skills. ICDL provides a performance benchmark for all employers seeking employees with the skills to operate everyday computer applications. ICDL can ensure a consistent and desired level of IT

knowledge is achieved throughout the organization. Increasingly, many private and public organizations worldwide require employees have an International Computer Driving License.

Any employees with the ICDL credential is expected to understand basic IT concepts relating to the physical makeup of a personal computer, and concepts such as data storage and memory. These employees should be able to use computers, computing operating systems and manage files. They should also be able to create and format a word-processing document, develop, format and use a spreadsheet; using basic formulas and functions to perform standard mathematical and logical operations. They may also be expected to design simple databases using a standard database package and retrieve information from a standard database. They should also be able to create, format and preparing presentations, using graphics and charts and various slide show effects. In addition, they should be able to use a Web browser application and available search engine tools to accomplish Web search task. And finally, they can be expected to know how to use Email software to send, receive and organize messages. None of these competencies guarantee that a teacher who has the IDCL credential will be able to successfully integrate ICT into instructional or core learning activities. As a result, other ICT professional development activities are made available to teachers.

To date, 33,000 Jordanian teachers – 60 percent of public school teachers – have been trained through the Intel Teach Essentials program, reaching approximately 700,000 students throughout Jordan. The program was designed to help teachers overcome some of the major challenges to successful integration of ICT into teaching including:

- The lack of curriculum to help teachers effectively integrate technology into classroom instruction
- The need to shift from traditional methods of instruction to more student-centered and outcome-driven approaches
- The imperative to help teachers implement new educational strategies that allow for more student-centered approaches and technology integration

Another modality of training that is used for teachers is World Links training. World Links is a global learning network that links thousands of teachers worldwide via the Internet for collaborative projects designed to integrate technology into learning. The training program for this network is designed to help teachers and students learn to use information and communication technologies to improve teaching and learning. Evaluation of the program suggests that it has successfully:

- Encouraged teachers' group work
- Enhanced innovative thinking
- Enhanced self-confidence
- Increased teachers' use of ICT in their personal lives
- Increased teachers' use of ICT in research
- Created a capability of designing tele-collaborative learning projects
- Promoted ICT integration into coursework
- Promoted encouragement of students to use ICT
- Encouraged students to look for extra knowledge resources
- Changed the role of teacher from dictator to facilitator

However a number of barriers to successful ICT integration into course work were also identified and included:

- Insufficient numbers of computers at the school
- Lack of necessary software
- Poor internet service or connectivity
- Difficulty integrating ICT use into education

Although the implementation of a national curriculum is the priority of professional development (sustainability) the organization and structure of its contents depend on the countries' overall context. For example, the European Computer Driving License (ECDL) has now been introduced in 22 European countries. In Hong Kong and Taipei, the focus is on technical skill development in the use of multimedia in teaching and learning. In Eastern Europe, it is on basic technical skills. But the realization that the ICT literacy alone is insufficient has mandated supplementary professional activity like the introduction of training for the pedagogical use of ICT (Danish ICT Pedagogical Driving License). Finland put teacher training as a part of the Information Society Strategy and focused on the new pedagogy to foster collaborative teaching and learning, networking, and team work (Al-Nahar, Chang, and Koda, 2007).
Jordanian officials appear to be on the threshold of a similar realization about the significance of the ICDL credential.

In addition, teachers indicated that their academic load needed to be reduced to improve training outcomes. In addition, many teachers indicated that they lost interest in the training because it extended over so many months and they had limited access to computer labs and the internet. Over half reported that their command of the English language was limited and this impaired the usefulness of the training for them.

In the early stages of ERfKE implementation there were challenges and there was resistance to the proposed changes. MoE provided training helped to get teachers more involved. Now, many teachers as well as students like to work with technology. This has resulted in a much better understanding of the initiative

Results of Principal and Teacher Interview
Most of the teachers interviewed across all schools visited have their ICDL, and most of the principals interviewed indicated that most of their teachers had this credential or were working toward it. At one of the private schools visited, the principal expressed the sentiment that this should suffice. But other principals are more skeptical.

At the school with the most impressive classroom walkthrough, all the teachers have their International Computing Drivers License, and there were two teachers Word Links trainings. Sixteen teachers have had Word Links training and three were trained in Intel. The principal encouraged a cooperative effort with JEI to provide an integrated science course for higher levels (9-10) for a whole year. The 2nd Word Links festival was held under the auspices of the Queen last February when gifts – awards in ICT were distributed. In addition, teachers regularly meet once a month to discuss major problems, issues relating to curriculum and assessment or to develop blueprints comprehensive action plans for at risk students or plans to support the gifted.

According to one principal of a boys Discovery school the training provided to teachers is good but not excellent. It could be substantially improved. The teachers are not satisfied with the training or convinced to use it either. Teachers interviewed from this school, had not taken

ICDL or Intel. The training received was described as insufficient and the need for more training was expressed. But the teacher who expressed these sentiments was unable to articulate what kind of training was wanted or needed. The teacher was asked to elaborate further about his need for training but could only say he wanted more workshops. He felt the internet connections were too slow, available math software was insufficient providing more access to the old curriculum than the new.

As previously discussed the ERfKE mandate transcends simple attainment of computer literacy for its teachers. Teachers are envisioned as sophisticated consumers of technology and contributors to its creative application. Additional training in ICT pedagogy is often requested. At many schools, teachers have been able to share their knowledge and help each other.

This atmosphere prevailed at one girls' Discovery schools, where computer access is widespread at all levels. Students as well as teachers demonstrate new skills and strategies for using computers. Every month or even as often as every week the teachers have one hour of planning time to help each other.

A principal from another small affluent girls' Discovery school described how many of her teachers have also received Intel training or World links training in addition to ICDL. Some have even received special training in authoring. Other forms of training (e.g. Crocodile were also mentioned). The principal also observed that the teachers from this high performance school try to do their best – and sometimes the training has proven useful. As a result, students exhibit ICT mastery – for example they have built a school website.

Even at the dual shift girl's school located in a comparatively impoverished section of East Amman, all teachers have their ICDL – almost all have Intel – one teacher took three Intel courses. As another principal of a girls' Discovery School noted, "it is the teacher, the teacher who constitutes the core of any educational endeavor" and therefore professional development for teachers is essential. Teachers from this school indicated that they had training on computing and computing software. At this time, they felt it would be more useful to obtain laptops so they could better prepare their lessons at home. Scheduling time for training required changing timetables to be able to accommodate the schedule for training.

Another principal noted when describing the curriculum, there is some confusion due to a gap between theory and what can be successfully implemented or practiced. "ERfKE I is a good start to needed Educational Reform, but anticipated student outcomes outpace teacher development and training activity. Teachers need more time, development and training to be able to implement the curriculum and concomitant assessment tools successfully.

> Field supervisors don't do much about training. Implementation of training is not efficient or organized - instead it is confused. There is no organization, no coordination. Professional development programs or activities are initiated and then abruptly cut off. There is no scientific foundation for the training that is offered. No cost benefits analysis for ICDL or Intel or Word Links. There is no follow-up from the administration."

While the vast majority of teachers have received ICDL, Intel, World link or some other form of training at girls Discovery schools, comparatively fewer teachers at the boys schools visited had received such training.

In terms of ICT, a boys Discovery school where most students have computer access at home and many own their own laptop, most teachers have ICDL and Intel (1 and 2) or Word Links. The

choice is at the discretion of the MoE. At one of the boys schools teachers were pleased with the ICT training they received – particularly from the Canadians (New Brunswick) and the British Council. But the lack of computers posed the most significant challenge to successful ERfKE implementation. The teachers agreed that it would be great to go to the US to get more technology training. ICDL was regarded as a must-have. Still, there was a real gap in teaching effectively with technology especially for lower grades.

At the another boys' discovery school where the school is a pilot school for new compute programs, all teachers have their ICDL, and with this are managing to implement ERfKE. Most teachers have Intel or World-Links training. More training in Intel or World Links is needed.

Summary

In the public schools visited, most of the teachers have received requisite training (ICDL) for computing literacy. Still, most principals and teachers, with the possible exception of private schools visited, expressed a need for additional professional development. The need for training appears greatest in assessment and in ICT. Although administrative staff, teachers and students are computer literate teachers still need to learn more about how to effectively teach with computers and internet tools.

Recently in the JEI Overall Impact Assessment Workshop (April 30, 2008) recommendations were advanced to provide more learning opportunities for principals, teachers and supervisors. More specifically, this entailed supporting development of:

- a wide variety of high quality professional development programs for principals and teachers
- more robust professional development offerings for teachers about ICT integration and new, student centered strategies for teaching and learning
- informal opportunities for teachers and school principals to learn and share strategies
- a professional development programs for school leadership and for MoE supervisors

a. Provision of required resources to support effective learning

Recently in the JEI Overall Impact Assessment Workshop (April 30, 2008) recommendations were advanced to continue support for thoughtful innovation and distribution of e-content and infrastructure. More specifically, this entailed:

- Providing additional CT resources to the Discovery Schools
- Developing simple sustainable solutions to critical infrastructure problems
- Continue piloting new technology platforms and tools
- Formalize the process of improving e-content and ICT innovation in public schools in grades 1-12, using the Discovery schools as a test bed for future improvement and innovation
- Share e-content developed by teachers and students
- Create strategies to support off line use of technology
- Leverage infrastructure investments to create community outreach and after school activities to provide students and the community more access to technology.
- Create opportunities for students to acquire technological knowledge and experience in schools y establishing student tech support programs

ICT designed and used to develop specific skills (e.g., problem solving) shows some effect on acquisition of technological and critical thinking skills but this is still very limited. Teachers' use and knowledge of ICT in teaching indicates some positive effect on achievement of learning outcomes.

Results from Principal and Teacher Interviews
Even with more opportunities for professional development, schools are constrained by a lack of resources. Teachers repeatedly described a need for more computing resources for their students and themselves. More specifically, the need for additional laptops and data show was repeatedly reiterated.

Aside from the private schools, there were only two public schools where students did not share a computer with at least two other students. The lack of computers posed the most significant challenge to successful ERfKE implementation at one boys' school. At another, where the school is a pilot school for new compute programs, there is a pressing need for more training, more laptops and data show software programs are also needed.

The lack of resources and time to optimize effective use of ICT was also evident at quite a few schools.. Many of the classes were overcrowded. In classes whereas Q & A was organized around a laptop that was manned by a teacher or even a student, many students simply did not have the opportunity to respond to the Q&A though their upright, raised hands flaying in the air indicated a very strong desire to be heard . It is quite possible that teachers, at very crowded schools, have been loath to turn over the class to students because they were anxious that the material might not be covered as well.

As one science teacher noted – it was not possible for every student in his class to view slides on a conventional microscope given class size – if the students had to take turns viewing slides it could easily take the entire class to see one slide. In this context, laptop presentation optimizes exposure of course content. This is especially critical for schools where the school population has only limited access to computers at home. In school after school, teachers and principals .alike

bemoaned the paucity of laptops. JEI currently proposes to reduce the number of laptops using EFL technology that will be allocated to Discovery schools.[4]

Currently, teachers are provided with a laptop computer and a data show projector that they carry from classroom to classroom to use with e-Learning content. This teacher-centered approach invariably limits the amount of interaction that students have with the computer technology and e-Learning content. ESP proposes to test and evaluate the use of alternative display technologies that may include the use of standard TVs fixed in different locations that can be connect to the teacher's laptop to create an audio-visual classroom.

Similarly, while computer labs are now the primary venue for student access computer, having very few labs per school limits the time each student spends with the computer. To increase access and time with the computer, ESP is proposing to install up to 6 computers in 12 classrooms in each school. These classroom computers would have connectivity with the teacher's laptop. The teacher would be able to control what is displayed on the monitors of the classroom computers and therefore manage the instructional process. At the same time, the teacher would be able to release control so that clusters of students at each of the computers would be able to engage in group learning activities.

[4] Jordan Education Initiative JEI Annual Report 2007

School Infrastructure

Background

By the end if 2008, it is anticipated that 190 new school buildings will be completed under ERfKE. This will come in addition to some 650 computer labs and 350 science labs in already existing schools. It is also anticipated that Jordan's 1.6 million public school students and their 70,000 teachers will shortly be able to move into 40 brand-new school buildings.

New school design aiming at enhanced efficiency projects a student enrollment of an average student enrollment of 720 and up to enrollment of 1200 students. Previously, 70% of MOE schools enrolled less than 400 students. If this sample of schools visited is at all representative, the enrollment profile has changed dramatically over the last five years. Most of the schools enrolled over 400 students and only two had enrollments that were less than 400. Overcrowded classes of 30-50 students constituted a concern for most of the principals and teachers interviewed. This condition also exerts a profound impact on student access to computers - especially in poorer Districts were comparatively few students had access to computers - especially computers with internet access – at home.

Under ERfKE, schools have been networked and connected. Jordan also initiated construction of a national broadband 9fiber Optic) network aimed at connecting the nation's 3000 schools. The student-computer ratio is improving. Many initiatives have been introduced and are ongoing including networking, curriculum development and teacher training. These activities combined promise to transform teaching and learning to create the knowledge society and economy. Yet, much remains unclear in the implementation of ICT infrastructure and professional development in this developing country's educational system though the early lessons suggest that the investment in ICT in education alone will not improve learning outcomes. The research on ICT in education suggests mixed results on achievement of overall learning outcomes. For example, analyses of International tests suggest that provision of computers alone has no effect on learning (e.g., TIMSS, PISA, Becta).

Although this is a very limited sample of schools, observations of these schools suggests that substantial progress has been made in improving the information technology infrastructure of schools since the baseline study was conducted in 2005. At that time only one in a hundred students had access to computers. Access to computing has substantially increased, though this is still comparatively limited – especially in the poorer districts where fewer students have access to computers and the internet at home. Table --- shows the number of computer labs, estimated number of computers and the number of students in attendance for the schools visited. It also shows the number of science and any additional labs available to students at that school.

According to the Jordan National Census for the year 2004, released on October 1st of the same year, Jordan had a population of 5,100,981.[5] The census also estimated that there were another 190,000 who were not counted (for being out of the country at the time the census was taken, or did not turn in their forms). It was also estimated that most of those who did not turn in their forms were immigrants from neighboring countries, or non Arabic-speaking foreigners.

During the years 2004-2007, Jordan saw a rapid increase in its population due to the heavy immigration of Iraqis. An independent census carried in 2007, estimated that there are 700,000

[5] The next census is scheduled to take place in 2014.

Iraqis residing in Jordan. As a result, most estimates put the population of Jordan slightly over 6,000,000 as of the year 2007.[6] The latest estimates indicate between 700,000 and 1.7 million Iraqis living in Jordan; mainly in Amman, the capital. This resulted in an increase of Iraqi students in Jordanian schools. In 2007 Jordan allowed all Iraqi refugees, regardless of immigration status, to attend free state-operated schools in Jordan. Khalid Touqan, the Minister of Education at the time, stated that Iraqis will be integrated into the Jordanian school system.[7]

The Jordan Education Initiative (JEI) anticipates over 2000 new computer labs will be needed by the 2008-2009 school year though it is considered unlikely that anywhere near this number of computer labs can be constructed and equipped to keep pace with the increasing enrollment and scaling up of e-content pedagogy. The MoE still lacks the capacity to manage, support or sustain ICT infrastructure. Essentially the security, management, technical support and long range planning infrastructure is not yet in place.

Most computer labs are reconfigured classrooms of about 50 m^2 with about 20 workstations per lab. Desktop computers in Discovery school labs are supposed to be relatively new and well maintained though in at least one boys Discovery school there were about 20 non-functional PCs occupying one of the two (all Discovery Schools have two computer labs) computer labs for that school. It took about a week to repair malfunctioned PCs, if the PC was transported to an appropriate repair facility.

Schools are supposed to have at least 512 kb connectivity through ADSL lines and broadband connections and are connected under the National Broadband Network. Classrooms used for e-content have wireless access points and projectors – yet issues (typically slow speed) with internet connectivity were described by several schools.

Schools have access to e-content through the EduWave e-learning platform. EduWave software includes:

- Learning Management Systems (LMS)
- Content Management System (CMS)
- Instructional Management System (IMS)
- Educational Management System (EMS)
- Decision Support System (DSS) Enterprise Research Planning (ERP) features

The EduWave system also includes authoring and individual student assessment tools. In addition, the system also includes collaborative tools including discussion forums and audio-visual conferencing. But these EduWave tools reportedly are under-utilized. [8] The portal is also somewhat restrictive, limiting the size of media files which in turn limits the use of video and related applications such as video conferencing. Teachers are also able to develop their own materials and lesson plans using internet or other resources.

Observations

Environment

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[6] Doors closing on fleeing Iraqis The New Iraqi Diaspora, Hii Dunia, January 2007

[7] *Iraqis flooding Jordan get free schooling. (October 11, 2007), CNN World.com*

[8] Education Development Center, Inc with RTI International, (April 22, 2008) Evaluation of the Jordan Education Initiative, Syntheseis Report .

The private schools were in the best condition. Aside from the private schools, there were only two schools that were decorated, and only one that displayed student work, rubrics and information relating to academic subjects. Many of the buildings were older, and signs of wear and tear were evident, though none of the buildings visited appeared to be structurally unsound. Several schools appeared to make a concerted effort to clean-up for their visitors. Staff was in the process of washing floors upon arrival of the team.

Lab/Classroom Facilities

At the private schools visited, there are separate lab facilities for girls and boys. In addition, the government requires private high schools to provide three science (Biology, physics and chemistry) labs for students in grades 9-12. There were three additional science labs (Biology, Physics and Chemistry) for boys and 3 for girls (also Biology, physics and chemistry). In addition, there are also 6 computer labs: Kindergartners had their own computer lab, the boys and girls in grades 1-3 and 4-12 had two computer labs each. Each lab was equipped with 18-25 computers. Essentially the student computer ratio is 1:1. Almost all students have home access and routinely access EduWave or the Web. However, despite the available ICT resources, faculty appear to resist ICT applications. One faculty person was quite adamant that computers can never replace the text.

The public schools targeted for observation rarely approximated the 1:1 computer to student ratio enjoyed by private schools. In this limited sample there was only one public school - a boys' discovery school - that enjoyed this ratio. This school, located in a very affluent section of the capital, has established a reputation for excellence. The two computer labs contain 22 computers each. In addition to a science lab, a vocational and art lab are also housed at this facility. On average there are between 26-27 students in a class, although the teacher student ratio for some classes (e.g. Biology) is substantially higher (37). There are also 6 laptops and Data Shows mostly for English classes. As a Discovery school provided maintenance is good. The school also features wireless connections. In addition, most students who attend this school have computer access at home and many own their own laptop. The ERfKE emphasis on computers fits in with the principal's vision for the school. Students are encouraged to use Internet. The principal wholeheartedly endorses the problem-solving approach and the use of learning centers. All students are encouraged to succeed, though upperclassmen have become much more self-motivated, and really require minimal encouragement. Still this school fell in the mid or average PISA score category.

In contrast, even among public schools located in the most affluent sections of Amman where most of the students have access to computers at home, as many as 3-4 students may have to share a computer. In more affluent districts, most of the students have access to computers at home.

Some of these schools also faced obstacles like overcrowding and problematic connectivity. Typically, public schools are required by law to have two computer labs and a science lab. Some schools may also have a vocational lab or even an art lab. More students in upper classes share a computer than in lower grades. In addition, students in some specialty classes may be more likely to share a computer with more partners.

As previously mentioned, a number of boys Discovery schools experience problematic access to internet or computers. For example, at one boys' discovery school where there are four computer labs and a total of 67 computers for about 700 students, the Asymmetric Digital Subscriber Line (ADSL) is problematic.[9] The school had lost its internet connectivity for the last two weeks at the time of the visit (May 21) due to road construction. Until this year, there was no internet connectivity. As a result the school could not use EduWave. Last year EduWave was required for administrative use, as well as for Science, Physics and Arabic – but not this year. Six laptops are reserved for English and Math use. About 20% - maybe less – of the students have access to a computer at home: out of an average of about 30 students, maybe 5 would have access at home. In keeping with JEI, if there is a breakdown the system will be serviced. Grade 9 activities have priority.

At another boys' school, where there are 2 computer labs, one is inoperative because the 20 computers it houses are either broken or require upgrades to function properly. A malfunctioning computer can be fixed by a week if it is transported to the appropriate facility. Essentially, there are only 20 PCs for the 1020 students who attend this school. Only 20-25% of the students have access to a computer from home, and the parents of those who do frequently object to internet use. This constitutes a significant problem. According to the principal of this school "Using computers is not a choice but a mandate…. It is too complicated to use this model – and not necessary."

Teachers from this school described the ERfKE emphasis on computing as beneficial because it provided special impetus to struggling students who were not normally motivated to excel academically. However, the lack of computers posed the most significant challenge for teachers at this school. In addition, teachers felt there was a real gap in teaching effectively with technology especially for lower grades.
This school was associated with comparatively low PISA scores.

Another boys' Discovery school located in the 4th District of Amman (a comparatively poor district in East Amman) is an internet hub controlling the internet activity for 40-50 schools in District 4. Nonetheless, the school is also a pilot school for new computer programs. The principal is very active in the fourth district and would like his school to be number one in the 4th district. The school participates in a variety of activities in the 4th district. He would also like to build a 4th computer lab.

Better equipment and software is needed. There also needs to be more and better professional development for teachers. The fourth district is economically impoverished. Seventy percent of the students at this school are below average. Sometimes there are 5 students to a computer – in classes which often include as many as 40 students if not more. This is especially problematic because less than 5% of these students have access to a computer at home. Also parents complain that when the students go to internet café to use internet, it gets expensive costing 1 JD/hour.

[9] A new technology that allows more data to be sent over existing copper telephone lines (POTS). ADSL supports data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate). ADSL requires a special ADSL modem.

At a comparatively high performing boys discovery school where there are three computer labs (with about 15 computers apiece) as well as the required science lab, there are about 26students in a class in grade 12, 22 in grades 4-5. However, sometimes classes are combined so there may be as many as 45-55 students in a class at this school. Fortunately, About 70% of the students have access to computers at home at this school which obtained Pisa scores in the mid-level range.

Girls' schools are not without their own problems but these are largely due to overcrowding. At one fairly affluent girls Discovery school most students do have computer and internet access at home as well although at this school there are two computer labs with about 18 PCs each for over a thousand students. The school also houses a science lab and a vocational lab. The school also maintains a specialized facility for about 18 special education students and a nursery for the children staff.

As many as 45-50 students can occupy a class, though the ratio is lower for higher grades. The biggest obstacle to success in this school is the number of students. The principal hopes to reduce the number of students and is looking to export students to other schools. Despite its large number, this school was unique in its emphasis on the environment. The principal is dedicated to improving the school environment and making the school a second home to her students. To this end the school was very clean, well maintained, air-conditioned and well decorated. The halls were replete with posters describing Jordan, the King and various academic subjects. The principal has also taken necessary steps to ensure that the water is filtered and clean. In contrast, the walls of most of the other schools were bare, devoid of decoration.

The science lab was full of student work. Elsewhere there were rubrics to help guide students and frame expectations. This was rarely in evidence elsewhere. At one of the private schools, there was a room containing science fair projects which was also impressive – but this room was not readily accessible to any passer by.

As many as 3-4 students share a computer at one girls' Discovery school even though it is located in a comparatively affluent area of town. However, only 10 of 412 students do not have computer access at home. This school maintains two computer labs with about 18 computers in each, and one science lab. The science teacher at this did allude to the lack of ICT for her 9th and 10th graders. This school scored high on the PISA test.

Some schools overcame substantial obstacles to attain their ranking. Located in poorer districts, many students do not have home access to computers or the Internet. While some of these facilities were allocated more computing labs (three instead of two), classes in these schools are still often overcrowded.

Thus, one of the mid-level scoring PISA schools was a girls' two stage/shift school is located in East Amman – a poorer section of town. About a thousand girls attend each shift – the first, which starts at 7 AM is for grades 7-10; the second which starts at noon is for grades 1-6. Each shift has about 47 teachers. Because it is a shift school, classes last 35 minutes. This school was reorganized and its infra-structure expanded to accommodate ICT demands. The first computer lab was built in 2000. There are now three computer labs with a total of 50 computers. In addition there are 8 laptops for the Arabic faculty – and 6 for the math teachers. There are 7 data shows.

Because this is a Discovery School, good maintenance is provided by JEI. Only between 3-5 (out of 45) girls have home access to a computer – though a lot use the library for free internet access. There was little consensus from teachers on how sufficient this was.

Another girls' Discovery school has fully embraced the ERfKE initiative despite infrastructure constraints and students' lack of computer access at home. With two computer labs housing about 16 computers each and about 3-4 students per computer, students from this school scored comparatively low on the PISA test (although this school did approximate Level 2 on PISA). Still the school seemed to be maximizing its limited resources. This school experiences good connectivity through its fiber connection and the maintenance provided to the school was also described as being very good. Recently (February 2008), this school hosted a World Links festival that was attended by the Queen. In addition, the school has received many awards in ICT. The school is also participating in an ICT pilot study involving Harvard University. In addition, the school is involved in a cooperative endeavor with JEI pertaining to ICT integrated science instruction.

Summary

As previously described, research on the relationship between ICT in education and achievement has produced mixed results. For example, analyses of International tests suggest that provision of computers alone has no effect on learning (e.g., TIMSS, PISA, Becta). ICT designed and used to develop specific skills (e.g., problem solving) shows some effect on acquisition of technological and critical thinking skills but this is still very limited. Teachers' use and knowledge of ICT in teaching indicates some positive effect on achievement of learning outcomes.

It is very important to consider the broader context schools must operate in. Some of the schools that enjoy advantages because they are located in an affluent section of town, have students that have access to computers at home, have a low student to computer ratio still do not always obtain high scores. Similarly, schools that are overcrowded, in comparatively poor sections of town where only a paucity of student have access to computers at home may, all things considered, do fairly well on the achievement test – albeit not necessarily as well as counterparts that enjoy more advantages on the playing field.

There is still a pressing need for integrating ICT in other subjects. Improvement in learning outcomes is contingent upon the balance between ICT hardware and other factors. It is imperative that ongoing monitoring and evaluating continue to effect progress so necessary corrections to plans can be made.

Differences between boys and girls school in ICT maintenance were apparent. Many of the schools for girls were overcrowded, but the PCs were well maintained and problems with connectivity were not as salient as they were in schools for boys. Even though some schools had more computer labs, overcrowding was evident. This is especially problematic for schools located in poorer districts where students do not have access to computers or the internet at home.

Aside from the private schools, there were only two schools that were decorated, and only one that displayed student work, rubrics and information relating to academic subjects. Many of the buildings were older, and signs of wear and tear were evident, though none of the buildings visited appeared to be structurally unsound.

Classroom Observations

Background

Optimally, in concert with the ERfKE vision, classroom activity should incorporate ICT use to further enhance active, learner-centered instruction. However, But Jordanian evaluation research on Discovery School teachers, describes ICT as still mostly used to support teacher centered pedagogy. Often teachers rely on ICT solely for planning activity. Although teachers have begun to experiment with ICT use with students – most still do not assign ICT activities to students with great frequency. Ideally, in keeping with a Constructivist approach to learning, teachers should support and assist students who are allowed to explore, experiment, and discover on their own. According instead of memorizing information, students are expected to work with and use information, alone or with peers. Unfortunately, teachers still resist the fundamental assumption that learning is most meaningful to students when they are actively engaged in creating, understanding and connecting to knowledge (McCombs and Whistler, 1997).

Formal and informal observations of classroom activities suggest that most teachers perceive ICT as a tool to support student memorization and practice. About 80% of the observed computer lab sessions were based on a lecture delivered by a teacher on their laptop. Typically this entailed presentation of PowerPoint lecture notes projected on a screen or whiteboard or used e-content used in a similar way – and the teacher was often the only person using a computer.

In most of the classes observed in this study students were seated at computers which were often shared. But, it was not uncommon to observe students passively observing e-content or PowerPoint notes projected on a screen. Only sometimes were presentations presented by students who actively engaged classmates in discussion or in a structured Q & A. More often than not, active student engagement took the form of teachers having students responding to a Q&A come up to the laptop, whiteboard or board and respond to e-content organized in or around assessment like activity (e.g. selection of the correct multiple choice option on EduWave).

Essentially, there was a continuum of classes along a student-centered – teacher centered continuum. In some of the classes student engagement was continually elicited by the teacher while in others, the students were more actively engaged in directing their own learning and the learning of their peers.

For example, at one girls Discovery school, that most closely appeared to realize the ERfKE vision; students explored, discussed and debated the material in groups – and the lesson was created by students (with assistance or guidance from the teacher as needed). Another class observed at the same school involved small student groups actively engaged in exercises, creative role playing scenarios or games designed by the teacher to promote active understanding and expression of English.

Another girls Discovery school approximated this pattern, with students presenting biological information that was projected on a screen at the front of the class and also on the monitors of desktops where small groups or pairs of students could observe the content of the student presentation. Again, the students, especially those presenting, were enthusiastic and eager to engage classmates who were generally attentive.

Other classes at other schools also involved classes where students were actively engaged in problem solving. At quite a few schools students worked on Excel to compute statistical outputs (e.g. means, median and mode). The teacher would assist individual or student pairs working at a computer. Even when classes were organized so students observed content prepared by the teacher on their computer screens, they were, especially at schools for girls, fully engaged in the teacher directed Q and A.

Such engagement was generally more subdued at schools for boys. While none of the students in the classrooms were disruptive, sometimes students appeared more restless, focused on other content displayed on their computers or otherwise distracted. This was more likely to be observed at the Discovery schools for boys.

A modified rendition of the Classroom Walkthrough tool developed by Teachscape was used to organize observations on classrooms visited during the course of this study.[10] This tool is used by school leaders (e.g. principals, subject matter coordinators) to obtain a clear objective picture of what is happening in the classroom and to help establish standards for practice, guide professional learning and support reflective practice. The walkthrough tool addresses curricular emphases, instruction, learners, the classroom environment and differentiation to address diverse learning needs.

In terms of the curriculum the Walkthrough addresses learning objectives, whether these are evident to students and whether or not these are on target for grade level standards. In terms of instruction, the classroom walkthrough addresses instructional practices. These include:

- **Coaching:** The teacher acts as a guide or facilitator to help students work on a task.
- **Discussion:** An exchange between the teacher and student(s) or between groups of students, in which questions, ideas and concepts are considered, debated and possibly answered. This type of open forum can also be used for brain-storming and problem-solving. It is often NOT teacher-centered.
- **Hands on Experience:** Students complete a- hands-on-experience such as a project, lab activity or activity using content specific manipulatives. Students may also be trying to solve real world problems.
- **Learning Centers:** Stations enabling small groups of students to explore ideas and provide opportunities for extra practice and or provide enrichment activity. One classroom may have multiple learning centers providing different activities and opportunities for students.
- **Lecture:** A formal usually structured presentation on a particular topic. This is often, though not always, given by the classroom teacher.
- **Modeling:** Showing and making visible verbally, the invisible processes or steps for completing a process, task or project. This is usually done by the teacher, though it can be done by students as well.
- **Presentations:** The conveying of ideas to an audience that may be delivered by a teacher or a student. This is typically more informal than a lecture. Direct instruction is included as a form of presentation.
- **Providing directions / instructions:** The teacher provides directions or instructions to a student so they may complete a task.
- **Providing opportunities for practice:** Students working in small groups or independently, practice a specific skill. Practice may be guided by the teacher when students work independently. This could include completing worksheets, lists or similar types of problems.

[10] See http:/www.teachscapec.com

- **Teacher-directed Q & A (Question and answer):** The teacher leads a series of questions and answers that generally does NOT lead to broader student –to- student discussion.

Next, the Walkthrough addresses group format defined as either whole group, small group, pairs, individuals or any combination of these. The walkthrough also facilitates identification of research-based instructional strategies (Marzano, Pickering and Pollack, 2001)[11]:

- **Identifying similarities and differences:** The ability to break a concept into its similar and dissimilar characteristics. This enables students to understand complex problems by analyzing them in a simple way; or by comparing new knowledge with prior knowledge.
- **Summarizing and note taking:** Requires students to analyze a subject to expose what is essential, and then put it in their own words. Entails substituting, deleting while keeping some idea of the basic structure of information presented.
- **Reinforcing effort and providing recognition:** Reward students for achievement. Symbolic rewards are better than tangible rewards.
- **Homework and practice:** Assign practice homework. Provide opportunities to "shape" a practiced skill to make it their own. Students need to practice a skill 24 times to attain mastery.
- **Nonlinguistic representation:** Represent knowledge in forms other than words. Available research indicates this not only stimulates but increases brain activity.
- **Cooperative learning:** This occurs when four or less group members articulate the purpose of cooperative work, resolve disputes, and work cooperatively.
- **Setting objectives and providing feedback: This entails e**ncouraging students to personalize the lesson. Rubrics are provided to help students measure their own growth and get feedback from teachers and peers. Essentially, students personalize learning goals and use rubrics to self-evaluate their own or work of others.
- **Generating and testing hypotheses:** Deduction – use general rule to make prediction.
- **Cues, questions and advance organizers:** These students use what they already know to advance further learning. This tool also enables observers to look at learners to see what students are doing, what materials they are using, the cognitive level they are working on and the level of engagement for the class.

The instructional strategies listed above have been associated with improvements in academic performance. The order of these strategies listed above is also associated with greater effect sizes (See Appendix B).

Next, the walkthrough described student actions including: Listening, Reading, Speaking, Writing, and Working with hands on materials, Observing demonstration (e.g. Live, PowerPoint, other), and/or Math (e.g. calculations, analysis).

Subsequently, the tool deals with instructional materials including: Computer software, Content specific manipulative, Hand-held technology, Lab / activity sheet, ,Overhead board / flip chart, Student created materials, Real world objects, Worksheets, Published print chart, Video, Web Sites, Oral interchange and/or Textbook(s).

[11] Marzano, R.J., Pickering, D.L. and Pollack, J.E., (2001), Classroom Instruction that works: Research-based strategies for increasing student achievement.

Then the walkthrough addresses the level of student work. This entails focus on: Recalling information (knowledge), Understanding information (comprehension), Using information in a new way (Application), Breaking down information into parts (Analysis), Putting information together in new ways (Synthesis), and Making judgments and justifying positions (Evaluation).

In addition, this instrument addresses various level or degrees of student engagement. In this context it is important to distinguish between authentic engagement pertaining to the engagement of students in a task, activity or work that is meaningful and has immediate value to the student. Strategic compliance relates to activity that has little or no inherent value to the student who engages in this activity because he/she associates it with an extrinsic reward like a good grade. Ritual compliance describes student engagement as a consequence of the students desire to avoid negative deleterious consequences. "Retreatism" describes student disengagement that is not disruptive while rebellion describes students' active refusal to work (Schlechty, 2004)..

The walkthrough tool addresses the classroom environment focusing attention on processes and procedures that support student learning, the availability of resources for student use, the extent to which the classroom arrangement supports learning goals, and the presence (absence) of displayed work providing models of quality. Classroom environment generally encompasses routines and procedures, available materials, student work, rubrics, exemplars that support the learning objective. (see Appendix B).

Finally, this instrument addresses differentiation describing whether or not diverse learning needs are addressed and supports are in place to help students meet their individual learning needs (Tomlison, 2000). In this context, the observer looks for evidence that the teacher is responding to the different learning needs in the classroom. It takes about 7 minutes to conduct a brief classroom walkthrough. A classroom walk though should take no more than 4-7 minutes. Ideally data is either collected manually and then submitted to a Web site to generate reports or collected via PDA or Smart Phone. An additional item was added to the list to address technology used – this item was derived from research by Coppala.

Observed Walkthroughs

Observations of classes have been organized in terms in terms of a continuum of student centered Constructivist instruction to a more traditional teacher centered instruction. In the first three classes learning was student driven even though the teacher, indirectly, may have set the stage for students to do this. The next series of classes describe classes where students are active participants in their own learning, followed by classes where students are actively engaged, though the teacher is actively directing the activity. The last classes described are those where students appear increasingly disengaged either because of technical problems (e.g. Poor connectivity) or the teacher's lack of skill in orchestrating classroom activity so students assume an active role in the learning process.

Student Directed Classes

1. Accordingly, the school that best realized the mission and vision of the ERfKE initiative was a girls' Discovery in the 4th District of Amman that has accumulated many awards for excellent (including a visit from the queen). In this class students assumed the role of presenter(s). The students acted out a scenario about financing a car loan. They developed their own materials to illustrate activities associated with this task and to illustrate conceptual practices relevant to this activity. They also presided over a Q and A session and responded to student queries for clarification. At the end they also passed out prizes and puzzles (questions to solve) in balloons.

The teacher also distributed some of these balloons to the class but her role appeared to be supportive of the presenting students who directed the class..

This 10th grade class was studying finance. The objectives of the class visited was to learn about financing a loan, securing a loan – act out financing a loan to buy a car. The scenario was provided by the teacher – the students had to research and develop their roles and dialogue.

The student developed lesson was designed to guide classmates through interaction- thematic lessons constructed on the desire and passion for learning through interaction and role play. The problem-solving exhibited here were drawn from real life situations requiring problem-solving in a very dynamic interactive context. Critical thinking and higher order skills were evident. The application of critical thinking and judgment skills were dramatically evident. Advanced learning outcomes and strategies for future career development were also apparent. The presentations were creative, exciting and entertaining – students were highly motivated to learn and teach. The presenting students were confident and energized. There was also some evidence that academically challenged as well as academically gifted students were able to derive benefits from this class. One of the most dynamic and confident presenters had obtained a score of only 70.

It was apparent that the teacher who was taking a backseat to her students was very knowledgeable about her students' aptitudes – she knew her students very well and was able to quietly provide support as needed. After the presentation, students engaged in a competition to solve problems related to this topic on the board. This was followed by a series of very brief presentations by students on internet links they had chosen to explore for the class.

The learning objective was very evident to the students. In terms of instructional practices, the approach students used combined practices of coaching, discussion, hands on experience, learning centers, modeling, presentations and student-directed Q & A (Question and answer). This very dynamic class involved a variety of group formats including: whole group, small groups, pairs and individuals. Initially, the student presenters addressed the whole group but activities had been prepared for small groups or pairs of students, and both presenters and the teacher were able to assist individuals as needed.

The second part of the class entailed very brief individual presentations on internet content.

Research-based instructional strategies included identifying similarities and differences and summarization strategies which were used by students as well as teacher who was supporting the student directed instruction but still maintained an active role by providing small groups, student pairs and individuals with assistance as needed. In addition, student presenters incorporated strategies of reinforcing effort/ recognition which again was used by students as well as the teacher when rewards were passed out. The distribution of balloons with puzzles or questions inside seemed to be a very creative way to apply strategies of reinforcing effort/ recognition, getting objective feedback with cues / questions / advance organizers. Cooperative learning was also evident as classmates worked together in learning centers to solve problems that were assigned to them by the presenting students.

Student actions included for the classmates who were not actively presenting included listening, speaking, writing, working with hands on materials, observing the live demonstration that was accompanied by a data show presentation, and to a lesser extent reading of materials prepared by student presenters.

Instructional materials included:

- Computer software – Excel
- Overhead board
- Oral Interactive activity
    - Role playing scenario
    - Q&A
    - Discussion between small groups' and pairs
- Student created materials
- Web Sites

The level of student work could be described by:

- Recalling information (knowledge),
- Understanding information (comprehension),
- Using information in a new way (Application),
- Breaking down information into parts (Analysis)
- Putting information together in new ways (Synthesis)
- Making judgments and justifying positions (Evaluation)

Thus, the depth of knowledge associated with student work ranged from basic to complex cognitive processing.

Both presenting students and other student participants were highly and authentically engaged. In terms of the classroom environment, materials were available, routines and procedures were evident, and students fully interacted with the class.

Since it was a student centered class, there was little evidence that the teacher was responsive to the different needs of students in the class, though the teacher did assist the presenters and appeared to be available to respond to student questions. Because it was a student centered class and since there were no technological breakdowns the teachers did not have the occasion to demonstrate her technical expertise. The students directing the class were able to fully engage their peers though their skill in student differentiation. The students did demonstrate some technological expertise.

This class entailed a sophisticated blend of instructional practices and research based instructional strategies. Students were able to demonstrate a multifaceted interplay of knowledge, comprehension, application, analysis and evaluation relating to real life situations. Both presenters and observers had the opportunity to bring together knowledge of subject matter, skill, critical thinking and appreciation of realities that determine how knowledge and skill must be applied.. The students were all fully and authentically engaged. It was easy to envision presenters in the real life situations that they played out in their scenarios. Students were professional and polished in their enactment of processing a car loan.

The class was enjoyable to watch and class participants seemed to be having a great time as well. It was very interesting to see how the elements of classroom instruction evolved in such a highly creative and dynamic manner.

There were 20 computers for 36 students in this class. Almost all were shared. The content of presenting students was available to others through the computer. While much - if not most- of the material presented through technology could have been presented some other way, students were actively using the technology and often used it as a problem-solving tool. They were energized by the technology and very enthusiastic. Definitely a Constructivist approach to teaching and learning was evident. Not surprisingly, the school has received numerous awards and even recognition from the queen.

2. A second class at this school was also observed at the insistence of the English teachers whose students had heard about the visit and were anxious to show off. The teacher had the students go through a series of exercises – interactive games with some role playing. .In the first game/exercise students gather in a circle to throw a basketball to each other – whoever catches the ball has to come up with an English word or phrase describing an association to the "smart house." (e.g. computer, cell phone, radio, TV). Later, students brook out into small groups to act out their scenarios of a "smart" house including family robot….

The lessons developed by this teacher were designed to maximize interaction and learning through interaction and role play. The problem-solving exhibited here was both dynamic and interactive. Critical thinking, creativity and higher order skills were evident. The presentations were creative and entertaining – students were highly motivated to learn. The students were confident and energized. The teacher was directive but the activity was predominantly student centered**.**

The students were very eager to perform for us and extremely disappointed that we were unable to see all the small group presentations. Students were very engaged and enthusiastic about their learning.

The learning objective(s) is evident to the students and the learning objective was on target for the 7th grade level student. **T**he most appropriate strand/ standard / benchmark was communication. Instructional Practices entailed: learning centers, role play and presentations, as well as the providing opportunities for practice. Both whole and small group formats were used.

Research-based instructional strategies included:

- Identifying Similarities and Differences/ Summarizing
- Reinforcing effort/ recognition by the teacher for students.
- Practice cooperative learning
- Getting objective feedback

Student Actions included listening and speaking in English. None of the standard instructional materials listed on the Teachscape instrument were applicable to the instruction observed. The level of student work entailed:

- Recalling information (knowledge),
- Understanding information (comprehension),
- Using information in a new way (Application),
- Breaking down information into parts (Analysis
- Putting information together in new ways (Synthesis)

- Making judgments and justifying positions (Evaluation)

Thus, the depth of knowledge students were engaged in ranged from the full gamut of basic to complex cognitive processing.

As previously mentioned the students were both highly and authentically engaged. As for instructional environment: there were no materials available in the classroom, no models or examples of quality student work posted, no student work on display, no routines and procedures were available except those printed in the workbook/text , and scoring rubrics were not prominently displayed or evident. There were some props – a curtain in the front of the room that students used in their role playing scenarios.

Since the class was so student-centered, it was difficult to see evidence that the teacher is responding to the different learning needs in the classroom, and since no technology was used, it was no possible to determine the teachers' level of technological expertise.

3. At one of the more affluent, high performing academically girls' school, the class targeted for observation was a Biology class. During this class, the District supervisor was in attendance to give the teacher feedback. Typically, the supervisor provides feedback to this teacher every two to three weeks.

The teacher previously prepared work sheets for the students to be sure students were properly addressing relevant learning outcomes. Teachers at this school typically facilitate computer work even in this student-centered context. Students formally described and discussed biological slides that were presented via the computer - these slides were excerpted from the Internet. Typically, students search the internet, visiting subject-matter websites to find these slides which are reproduced using LDC projectors to a screen at the front of the room and on every computer in the room. Some of the slides were also in the text. Questions posed by the teacher and presenting students are designed to elicit higher order thinking on the part of students observing the presentation. As the students present the other student observers comment. Students also made use of rating/observation cards – specialized evaluation forms which were designed by the teacher based on the model adapted by the ministry

The learning objective appeared to be evident to the students who were observing the class as well as the students who were presenting to the class. Observers appeared eager to respond to both the teacher and presenting students. Similarly, learning objectives appeared to be on target for grade level student

Relevant strands/ standards / benchmarks included: The Nature of Matter – DNA/RNA, and Processes of life. Instructional Practices included coaching, discussion, presentations and student-directed Q & A (Question and answer). There was also some minimal teacher-directed Q & A.

In terms of group format, the student presenters directed their presentation to the whole group, although students sharing the computer did interact with each other, and the teacher did move about the room as well. In terms of research-based instructional strategies, the teacher, presenting students and students observing the presentation were all involved in identifying similarities and differences and in getting objective feedback. Presenting students also exhibited summarizing strategies.

Student actions included: listening, speaking, and observing demonstration (e.g. Live, PowerPoint, other). Instructional materials included overhead board / flip chart, worksheets, and worksheets.

As for the level of student work, activity included recall of information (knowledge), understanding information (comprehension), breaking down information into parts (analysis), and possibly putting information together in new ways (synthesis) and making judgments and justifying positions (evaluation). Thus, the depth of knowledge students were engaged in ranged from basic to complex cognitive processing. The students appeared highly engaged in their learning activities..

The classroom environment was comparatively impoverished although materials were available to students in the classroom – most appeared to be using some sort of text or workbook, But there were no models or examples of quality student work posted, no student work on display, no routines and procedures were available except those printed in the workbook/text and scoring rubrics were not prominently displayed or evident. This was especially notable, since this was the school that had the best instructional environment. Although halls were covered by examples of student work and informative excerpts covering the wall, this particular room was relatively bare.

Because this was a student-centered class, it only possible for the teacher to show minimal evidence of differentiation (responsiveness to the different learning needs in the classroom) – she did assist the presenters and she did respond to some questions from students in the rest of the class. Similarly, it was not really possible for the teacher to exhibit her technological expertise. The level of technological activity could be described as Constructivist, innovative & engaging**.**

4. In another girls average performing Discovery school a 9th grade Math class was observed that entailed the computation of averages using EXCEL. This activity was observed in a in a computer lab where desktop computers were arrayed in a conventional classroom format – all PCs faced the front of the classroom, though the teachers mainly stayed in the back of the room assisting students as needed. The teacher also directed a Q&A session, the girls would calculate the means of various distributions and attempt to respond to her other questions and inquiries relating to this topic. Girls were paired – sometimes in groups of three to one computer. There were a few unmanned workstations that appeared functional but were just not used.

The class was clearly responsive to the curriculum with students that had texts and worksheets to use in this class. The learning objectives appeared to on target for this grade level. Data Analysis and Probability characterize the focus of this math class. The class was characterized by oral interchange between students in small groups and occasionally with the teacher, and the open textbooks that were referred to from time to time.

In terms of the level of student work, activity included recall of information (knowledge), understanding information (comprehension), and using information in a new way (application), breaking down information into parts (Analysis), and possibly putting information together in new ways (synthesis).

Instructional practices included coaching, discussion, hands on experience, providing directions / instructions, providing opportunities for practice as well as teacher-directed Q&A. The group format was pairs – and the occasional small group of three students.

Research based instructional strategies in evidence included the teacher 's reinforcing / recognition efforts as well as her provision of objective feedback, and use of cues / questions / advance organizers, while students exhibited practice, non-linguistic representations, Cooperative learning, getting objective feedback.

As for focus on the learner, student actions included: working with hands on materials and of course math (e.g. calculations, analysis). The class also seemed well-managed. Instructional materials included: Excel computer software, Lab / activity sheet or Worksheets, Oral activity both among student pairs or trios and with the teacher, and possibly the Textbook. Student work entailed: recalling information (knowledge), Understanding information (comprehension), using information in a new way (application), breaking down information into parts (analysis), and possibly putting information together in new ways (synthesis).

In terms of levels of class engagement, students were highly engaged and most students appeared authentically engaged and very enthusiastic and the class was also well managed.

In terms of the classroom environment, some materials were available to students in the classroom – most appeared to be using some sort of text or workbook, But there were no models or examples of quality student work posted, no student work on display, no routines and procedures were available except those printed in the workbook/text, and scoring rubrics were not prominently displayed or evident.

The teacher appeared to be very responsive to the students going up to work stations to answer specific questions that the students were asking of her**.** The teacher's technological expertise was evident, she clearly knew how Excel worked and appeared to be able to answer all her students questions.

To some extent the class could be characterized by Coppola's Technological imperative category where computer use driven by technology instead of curriculum. This was basically a lesson in using Excel, though the students were very engaged and inquisitive. Since they were using workbooks it is likely that the class did relate to material that was in the curriculum for these students

5. At a Private School in Amman, the class observed at this school was a 6th grade girl's class in Arabic grammar. Students responded to the teacher's Q& A. Students often would stand up after being called on and respond – if they were correct they would have the opportunity to go up to the board and write out a response to the question and additional follow-up questions on the board (in Arabic). The teacher made a concerted effort to provide students with positive – very enthusiastic – feedback. The class was a very dynamic fast paced class, where students were straining their raised hands to arrest the teacher's attention so they could receive her praise. The students in this class were extremely competitive. Students were eager to respond and when a classmate who was called upon hesitated in responding or failed to obtain the correct answer there were many volunteers ready and willing to supply the correct answer. There were no computers in this classroom.

The learning objective appeared evident to the students and also appeared to be on target for the student grade level. None of the language arts strands/ standards / benchmarks listed appeared appropriate descriptors for this class which addressed verbs and derivatives in Arabic Language. The class was characterized by oral interchange though students did have texts or workbooks to refer to. Instructional Practices included coaching, discussion, modeling, and teacher directed Q

& A. The group format was whole group although a great deal of attention focused on individual responses to the teacher's Q&A.

Research-based instructional strategies for both the teacher and the student included similarities and differences/ summarization, reinforced or recognized effort and provision of objective feedback. The teacher was both very enthusiastic and diligent in reinforcing correct student responses. The students also engaged in a lot of summarizing or note-taking behavior as well. Student actions included listening, reading, speaking and writing in their notebooks and on the board after successfully called on. In terms of instructional materials, most of the class revolved around oral communications or interchanges between teacher and students.

As for the level of student work, activity included recall of information (knowledge), understanding information (comprehension), breaking down information into parts (analysis) and making judgments and justifying positions (evaluation). All students were authentically and very enthusiastically engaged. The class also seemed very well managed. Because the teacher consistently reinforced and clarified student responses different learning needs in the classroom were met. Since technology was not used in this class, it was not possible to gage the teacher's expertise in using technology from observation, though the teacher did, during interview sessions appear knowledgeable about technology.. Although the class was teacher directed, students were fully engaged, active and highly responsive.

The teacher did an excellent job and the students appeared to be learning. Although it would be difficult to quantify the amount of learning that actually occurred, it very well could have exceed the amount of learning that occurred in the last two classes described however, the class most definitely was not student centered or student directed. The amount of student to student interaction was minimal. The class revolved around the teacher though students were fully engaged in the learning process. Nonetheless, it was relatively easy to see why the students from this school had done so well on the PISA.

6. At the dual shift girls' school, ninth graders attending this class were learning about handling the plural case in Arabic. There were 32 students in this classroom. Although there were computers in the classroom, all of them were covered-up. The students, seated in a U-shaped configuration, were watching the laptop projection of an EduWave module designed to address or illustrate examples of the Arabic plural. The teacher directed the Q & A activity to the whole group or class of students attending the class. Students who answered the teachers' questions correctly would come up to the teachers desktop to respond to pre-developed multiple choice test items. The teacher would then elaborate upon student responses.

Seven students also had workbooks that they referred to.

Learning objective appeared to be evident to the students who were eager to respond. The teacher appeared to try to give the students an opportunity to respond, though it seemed inevitable that some of the students would not be called on because there were simply too many to be called on in the time allocated for the class.

In terms of research-based instructional strategies, both teacher and student were involved in identifying similarities and differences. The teacher reinforced students learning efforts through recognition of correct responses. The students received objective feedback on their responses.

Student actions took the form of listening to the teacher, observing the EduWave Assessment and speaking when called upon by the teacher. In terms of instructional materials, computer software, the LCD, the EduWave website, possibly answer sheets and worksheets, as well as the oral back and forth dialogue were used to engage students. The level of work entailed recalling information, understanding information and possibly breaking down information into parts (analysis). The teacher elaborates upon student response with her notes on a whiteboard.

It was not readily apparent whether or not the teacher was able to respond to different learning needs of her students. There were so many students straining to be called upon. The teacher appeared to be responding to the different learning needs in the classroom. In this classroom context, still students" use" of computers *per se* entailed little or no instructional value. Still most students did appear to be authentically engaged.

In terms of the classroom environment, except for the 7 students who had a text or workbook, no materials were available to students in the classroom, and there were no models or examples of quality student work posted, no student work on display, no routines and procedures were available except those printed in the workbook/text, and scoring rubrics were not prominently displayed or evident.

Although a computer was used in instruction, its use actually had little or no instructional value. The same information could be delivered through a series of overhead slides. Although the students were actively engaged in the class, it was still predominantly teacher directed. Given the overcrowding, and the shortened time period , it may not have been possible to do otherwise – still the class does not appear to exemplify the ERfKE vision or mission, though it was well delivered under very difficult circumstances.

7. In contrast, 5th grade boys attending a math class in another private school were comparatively more subdued. The class was organized as a traditional classroom with the desks of the boys facing the front of the room and the board that the teacher used to illustrate math – geometrical - concepts. The teacher drew figures on the board to illustrate different types of obtuse, acute or right angles. As he drew he explained concepts and wrote them on the board. The boys moved around quite a lot. Most, but not all were attentive. Some of the boys chatted a little, packed up their things in preparation for departure and turned around to stare at the visitors. Still there was a lot of response to the teachers' Q & A. Even some of the boys seated off to the side, seemingly distracted still participated. One of the boys who got up to hang up a jacket, later also voluntarily and successfully responded to the teacher. There was a lot of fidgeting, still, it seemed that the boys were paying attention. Some of the boys seemed quite eager to be called upon, though they did not exhibit quite as much fervor as female counterparts previously described. Overall, the boys were comparatively more restrained. Some were non-participants. Others seemed to move around and fidget more – though they did participate successfully.

It was difficult to determine the extent to which the learning objective was evident to the students. Their success in responding to the teacher's Q&A suggested that the learning objective was probably on target for the student grade level.

The Geometry and Spatial and the Sense Number sense, concepts, and operations characterized the strands/ standards / benchmarks associated with this class. The class was also characterized by oral interchange and instructional practices consisting primarily of teacher directed Q & A. The group format was whole group.

Research-based instructional strategies for both the teacher and the student included similarities and differences, and reinforced or recognized effort. There was also some limited evidence for cooperative learning, getting objective feedback and , questions. Student actions included listening, speaking and some math calculations. Aside from the oral interchange and board used to illustrate mathematical or geometric concepts no other instructional materials were evident.

As for the level of student work, activity included recall of information (knowledge), understanding information (comprehension), breaking down information into parts (analysis) and making judgments and justifying positions (evaluation). Some students were very engaged, others minimally engaged. Students were generally compliant, ritually engaged. It was not possible to assess the extent of differentiated instruction. Since technology was not used in this class, it was not possible to gage the teacher's expertise in using technology. These were fairly young students and their distractedness" may have been a function of their age.

8. At another high scoring boys school located in a comparatively affluent section, two classes were observed. In the second class observed at this academically high performing school, thirty students were learning to apply technology (Excel) to calculate the average and median of a randomly generated distribution. Four computer workstations were unused. The team was told that some of the students come to the school unprepared to do simple calculations. The team was also informed that only about five of the students had internet access at home.

The lab was organized with desktops facing three walls but not the white/board. The students' attention was on desktops and on the teacher using the whiteboard. The teacher also moved around from desktop to desktop to assist students. There was plenty of room in the center of the class. The teacher and assistants provided individual assistance and support. Many, but by no means all, of the students had workbooks designed to accompany this class presentation. Students calculated the average from a range of numbers. The formulas were discussed and pointed out on the whiteboard and in workbooks to the students.

The learning objective appeared evident to the students and seemed to be on target for their grade level Data Analysis and Probability was the most appropriate strand/ / standard / benchmark listed. As for instructional practice, the teacher engaged in coaching, providing opportunities for practice and teacher-directed Q & A. The group format was whole group and individual. Identifying Similarities and Differences, Summarization, Practice, Non-linguistic representations, getting objective feedback, cues / questions / advance organizers – were the most salient research-based instructional strategies in evidence. Listening, Working with hands on materials and Math (e.g. calculations, analysis) were the most significant student actions observed. Computer software (Excel), and Lab / activity sheets, published print charts or Worksheets as well as the oral input from the teacher and text were the most important instructional materials.

The level of student work could best be characterized as using information in a new way (application) and putting information together in new ways (synthesis). In terms of class engagement, the class appeared to be well managed and students seemed to be willingly compliant, ritually engaged. As for the classroom environment focus, materials were available in the classroom – but not with every student. The teacher did attempt to accommodate different student needs as they went to each work station to provide assistance as needed. The teacher's technological expertise was also evident from the adjustments made to non-functioning workstations.

As for Coppola's characterization of the level of technology, the technological**: c**omputer use driven by technology instead of curriculum; appeared to characterize the activity observed the

best. Students seemed to be participating in this activity solely to learn the technology for the technology's sake – there seemed to be no inherent advantage to learning this activity except to obtain exposure to the technology per se.

9. At this boy's secondary level discovery school. A class was observed where 7th grade boys were learning how to compute the average using Excel. The learning objective seemed evident to the students and on target for their grade level. The strand/ standard benchmark concerned Data Analysis and Probability.

Hands on experience, lecture and teacher-directed Q & A constituted the observable classroom instructional practices.. Instruction was directed toward the whole group. The teacher used a combination of research base instruction strategies, including identifying similarities and differences, summarizing, and reinforcing effort/ recognition. The students received objective feedback. Essentially, the class was teacher centered.

Student actions included listening, speaking, Observing what the teacher wrote on the board, as well as math calculations using EXCEL Instructional materials included: EXCEL computer software and the board. Student work entailed breaking down information into parts (analysis), and putting information together in new ways (synthesis). However students were not particularly engaged by the class activity. The level of technological activity appeared to be cosmetic. Students could have learned this material observing a slide show.

There are twenty functioning computer and another twenty malfunction or outdated computers in a room that is never used at this school. The lack of computers posed the most significant challenge for the teachers at this school. The team was informed that malfunctioning computers were repaired within a week if they are transported to a repair facility.

10. A high scoring boy's school that was described previously (see 8 above) there were 35 desktops set up in a conventional classroom manner – all facing the board in the class. There was a mirror in the back of the room. Most of the screens were dark when we entered the classroom. The final exam that was going to be administered was <u>not</u> part of the tri-semester series of ERfKE exams. This was not one of the MoE practical online exams but a school based online test administered to 8th, 9th and 10th graders. The room had been setup for an 8th grade Arabic class that incorporated enrichment content from EduWave. More specifically, the focus of this class was based on Arabic enrichment modules from EduWave that focused on grammar.

Unfortunately, there seemed to be a lot of connectivity problems – the access to internet was very slow. The visiting team was informed that for some reason, the ADSL for Arabic is especially slow – it is much faster for English and math. Lots of students appeared to be waiting because they were not connected to internet, or because they lost their connection. Perhaps given the fact that this was design to prepare students for an exam, there was not very much interaction at all. The presentation was very didactic. The teacher discussed information from EduWave that was displayed on a screen at the front of the classroom. Students, one by one, came the desktop used to display the information. The teacher asked a question, made a comment or embellished upon content in response to students who came up one by one to the computer at the front of the room as the rest of the class listened. There was some Q & A, some limited one on one focus as students took their turn at computer. Each student reacted to displayed content the teacher evaluated their response advancing corrections as needed.

It was not possible to determine, on the basis of observation alone, whether or not the learning objective was evident to the students or on target for their grade level. Relevant

strands/standards/benchmarks included: reading process, communication and specific grammar issues. As for instructional practice, the teacher appeared to be engaged in coaching, presentation of EduWave content and teacher-directed Q & A (Question and answer). In terms of group format, the teacher focused on individual students and on the group as a whole.

In terms of research-based instructional strategies, the teacher identified similarities and differences/ summarization, reinforced or recognized effort and provided objective feedback to individual students. As one might expect from students taking an exam, students identified similarities and differences and summarized content. They also appeared to be receiving objective feedback from the teacher. Student actions entailed reading, speaking, writing and observing the Data Show demonstration of Arabic on EduWave.

Instructional materials included overhead screen used to project EduWave web site content. As for the level of student work, activity included recall of information (knowledge), understanding information (comprehension) and making judgments and justifying positions (Evaluation). The students were minimally engaged except when it was their turn to respond.. There was little if any evidence that the teacher responded to the different learning needs in the classroom and it was not possible to determine the teacher's technical level of expertise. Although students used computers for this online exam, the advantages over conventional paper and pencil test measure were not evident. This also did not appear to qualify as a performance based test either. Rather, this exam seemed to be an electronic version of a paper and pencil test administered individually. Even as a test-review session, this class would have to be considered problematic since it afforded minimal opportunities for students to interact and discuss course content.

11. Another class that was observed focused on probability at a school for boys. The teacher was trying to access the last topic on a list of mathematical topics. This module pertained to probability. A series of pictures were displayed using an LDC projector. The teacher set everything up on one computer using Data Show to save time due to poor connectivity. As the class progressed, the class content appeared on more and more computers. One or two boys sat at a computer though there were some students who were somewhat removed from the computer. The display appeared on only some computers – it seemed difficult to establish access on the computers so different content appeared on different screens. Gradually over time the targeted content appeared on more computers but there where some computers that never accessed the targeted content. The class had to respond to the teachers questions about the graphical/pictorial displays. Although students did respond to the questions, attention was no uniformly focused on the lesson. Some students were looking at other content while the teacher and assistant were trying to set up access. The boys chatted among themselves. While the chatter was not particularly disruptive, the attention of many students did not appear to be consistently focused on the lesson per se. The materials presented appeared to be akin to enrichment modules.

Ten of the 30 or so students in the room had home access. There appeared to be about 30 computers. The computers were arrayed in a traditional classroom manner all facing the board. The class may have been thrown together at the last minute. Apparently, no computer classes were offered at all this academic year due to poor connectivity.

Learning objective appeared evident to the students, the lesson focused on Data Analysis and Probability.

Instructional practices used took the form of a Data show with teacher directed Q&A session. A whole group format was used. Student actions included listening, speaking, writing (some

limited writing on the board after successfully answering a question to elaborate upon a correct response to the teacher) as well as observing demonstration (e.g. Live, PowerPoint, other)

Instructional Materials included a Data Show presentation of EduWave content.

The level of student work concerned understanding information (comprehension), and the levels of class engagement could best be described as approximating Dysfunctional – some compliant, moderately engaged – no really disruptive students – but then again the students were aware that they were being observed.

As for the classroom environment**,** it seemed like the room was not in active use that much: there were no materials were available in the classroom, no models or examples of quality student work posted, no student work on display, no routines and procedures were available except those printed in the workbook/text, and scoring rubrics were not prominently displayed or evident.

The teacher was very preoccupied with setting up the computers to correspond to the Data Show and only minimally could respond to the different learning needs in the classroom. However, the teachers' technological expertise was evident as they attempted to resolve all the technical difficulties with connectivity, Data Show and individual PCs.

The level of technological activity could best be described as little or no instructional value because of the disorganization and disarray of the class.

Another girls Discovery school was visited though it was not possible to observe a class there due to time constraints. Similarly, there was a power outage at another boys discovery school and at another boys discovery school students were out studying for their final exams (May 27).

Summary

Ironically, the school which has embraced the mission and vision of ERfKE and has come the closest to realizing best practices envisioned by its architects is a comparatively poor school with limited computing resources and a comparatively high student to computer and high student to teacher ratio. Students there have limited or no access to computing resources at home. Not surprisingly, the next best school in this regard, is a much more affluent school, although that school is also overcrowded now. Other schools visited may be well on their way, but still have some distance to travel.

Private schools that have much better computing resources simply have not made the shift to become student–centered or student–directed school culture. Boys' schools generally lag behind girls' schools in both technological and pedagogical application. Teachers at these institutions appear unable or unwilling to relinquish control to their students.

Female students appear consistently more engaged in their classes. Moreover, more of the classes in girls schools used a greater variety of group formats, including the small group or pairing as well as the whole group or individual.

If technology is used as part of instruction, it must be in good working order. This was somewhat less often the case at boys' schools. But even when the technology was in good working order, it was rarely used to promote the critical thinking of student groups or teams. More often than not

teachers and administrative staff viewed the sharing of a computer as an impediment or problem to be worked around. There is some evidence that this can be used to advantage.

Conclusions

Although technology is readily available at the private schools, it does not constitute the instructional delivery preference of choice. At two academically high performing girls Discovery schools, the ICT student centered instructional approach consonant with the vision of ERfKE is evident but this was not the case at the many of the schools for boys where the use of ICT appears more incidental and supplementary to a teacher centered mode of instruction.

The dual shift school for girls did remarkably well for a school that is so constrained by overcrowding, shortened class periods, a lack of ready access to computers and the internet at home, and the comparatively low socio economic background of most of the students in that area. It is a tribute to the dedication of its hard working teachers that the school enjoys the success that it was able to demonstrate in light of these very difficult circumstances. Although, successful implementation of the ERfKE initiative seems unlikely given these constraints, success achieved by another girls' discovery school in the area provides some measure of hope.

Notably, the school which has embraced the mission and vision of ERfKE and has come the closest to realizing best practices envisioned by the architects of this initiative is a poor school. Students lack ready access to computers and the internet at home. Its classrooms are also overcrowded. Its walls are comparatively barren. Although PISA scores were lackluster, considering the broader context of this school, this is not altogether surprising. The principal at this school, like almost all of the other schools as well, has not been in residence there very long. The school has in many other ways established a reputation for excellence.

Small project driven groups like those observed at the girls' discovery school that so completely embraced the ERfKE spirit show how groups can be used to their advantage. Although it was not possible to replicate the same degree of creativity and innovation, the same Constructivist approach was evident at a more affluent girls' discovery school–and possibly because students there did have access to computers at home, those students may have been able to do achieve more. But in general, even when the technology was in good working order, it was rarely used to promote the critical thinking of student groups or teams. More often than not teachers and administrative staff viewed the sharing of a computer as an impediment or problem to be worked around.

The unanticipated and unprecedented growth of student enrollments due to the influx of about one million refugees from Iraq, has put an enormous strain on the Jordanian educational system. Classes are often overcrowded, and despite the procurement of technological resources, students often have limited access to the required technology. Teachers still lack experience, training and understanding regarding new teaching methodology that incorporates technology and also lack of experience, training and understanding regarding new modalities of assessment. Not surprisingly, there is a lot of frustration among teachers who can barely keep pace with the imperative to master technology, develop expertise in new emergent pedagogies but still remain underappreciated and underpaid.

Hopefully, this can be changed in phase II.

Some Recommendations for Change

Although the educational school system has made huge advances in providing technological access, the implementation of technology in the classroom is - more often than not - cosmetic. Occasionally, the introduction of technology for technologies sake was also evident (i.e. learning

how to use EXCEL to generate statistics or mathematical functions without enhancing genuine understanding of these statistics or functions).

Technological tools have been developed to promote instruction. This constituted the focus of attention for major projects like MIT's project Athena. The older Interactive Videodisk technology developed instructional materials that more optimally integrated subject-matter integration. For example, students learning Spanish could participate in a re-enactment of the adventures of Don Quixote as they honed in on their Spanish and literary skills and knowledge. Similarly, students learning French could assist an eighty year old woman search through French / Parisian newspapers for an apartment. Many of these tools have been successfully ported to the internet, and new applications like these are continuously being developed. Computer Adaptive technologies are also available to address authentic performance assessment. Some of these applications are readily available on internet and warrant serious consideration in the promotion of the ERfKE initiative.

In Jordan as in the United States although the emphasis of pedagogy is radically different, the teaching profession warrants renewed "professionalism." Especially in Jordan where teachers play a major role as models of knowledge economy workers, it is imperative that the profession warrants transformation. If teachers are to succeed in reshaping Jordan's educational systems and developing successful cohorts of knowledge workers, the profession cannot continue to enjoy second class status. Accordingly, teachers cannot continue to be overworked, underappreciated and underpaid. At the very least, the burgeoning workload cannot sustain duplicative activity that deflects teachers from their primary instructional role. Additional professional development is warranted to help teachers meaningfully incorporate technology in instruction. Teachers also need more help with authentic performance assessment in subjects like math and science. Creative solutions for coping with overcrowded classrooms and limited technological resources need to be addressed.

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