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A Social-Cultural View of Information Technology Integration in School Contexts

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The time is ripe for information technology (IT) to make major contributions to improve learning in education settings. The increasing understanding of learning environments, intelligent systems, agent technologies, and other related educational platforms coupled with increasing power and declining cost of personal computing enable us to now have a better perspective on how technology should be used in the context of pedagogical and organizational design.

As processes and work become increasingly complex, technologies can assume the more mundane functions and free us for tasks that are more complex and fuzzy. Additionally, as society becomes more global, collaboration across boundaries through networks becomes increasingly necessary. More interaction and collaboration efforts are needed with other institutions, organizations, and societies. In order to harness technology fully to enhance educational processes in a learning environment, teachers will have to integrate IT into their curriculum.

The purpose of this article is to discuss the social-cultural issues and problems inherent in IT integration, particularly in school contexts. It proposes a social-cultural framework for IT integration for practitioners and school leaders to consider as they experiment with existing and emerging technologies. New directions in IT as applied to learning and IT enriched environments can be seen from the following perspectives:

1. **Simulation, visualization, and modeling.**
   Learners can benefit from simulations in order to understand complex phenomena or those that otherwise cannot be observed directly because of problems of time and scale—ranging from microscopic to astronomic. Simulations and visualizations should generally be content-specific, e.g., in the sciences.

2. **Cognitive tools.**
   Technology can facilitate the construction of knowledge using epistemic structures and tools.

3. **E-learning environments.**
   There is an important need for researchers and practitioners to spearhead the pedagogical directions for e-learning that support learning beyond the classroom.

4. **Assessment tools.**
   Formative assessments and multiple assessment modes are gaining currency and these can be facilitated through technology.

5. **Wireless and mobile computing.**
   The widespread advancement of wireless and mobile technologies is making headway into learning and educational domains. Learning through the use of devices such as Palms and Pocket-PCs is gaining momentum.

6. **Tools for learning communities.**
   Recent research literature has emphasized the social nature of learning, stressing the processes and social structures undergirding knowledge construction.

7. **Tools for project work and authentic tasks.**
   We increasingly recognize that tasks given for learning should be authentic and challenging and that we need to work at developing tools to support authenticity.

The above directions or perspectives in IT development come in tandem with newer constructivist paradigms in learning and instruction. The assumptions of constructivist learning involves meaning-making and the social construction of knowledge (Duffy & Cunningham, 1996). The constructivist assumptions about learning and meaning-interpretation are influenced by cultural underpinnings. In other words, how one interprets meanings are based largely on one's cultural context and situation.

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A Social-Cultural View to IT Integration

In recent years, the focus of IT integration in educational technology has been grounded on theoretical underpinnings, such as situated cognition, distributed cognition, activity theory, and other dimensions relating to social-cultural perspectives (Bruner, 1996; Wertsch, 1998). Fundamentally, these notions stress the tight inter-relations between the individual mind and social others and the environment or authentic context(s) (Hung, 1999). Culture is basically the implicit and explicit social and cultural dimensions of values and core beliefs that a school practises and adheres to. Simply understood, it is the way we live our lives in the schools. A school's culture...
is a critical factor in the success or failure of IT integration into the curriculum. According to social-cultural psychology (Wertsch, 1998), culture deeply influences personal behaviors. The cultural contexts include both the physical and created practices of varying communities where activity is mediated by cultural artifacts or tools.

In many attempts at integrating IT into the curriculum, insufficient considerations are made at the social-cultural levels. In this article, we propose four dimensions for IT integration which are inter-related and would impact efforts in IT integration: school structures, classroom dynamics, teacher beliefs, and student behaviors.

The first dimension—school structures—considers the school’s culture, workflow processes which are in place, the design of the curriculum structure, reward systems, and the kinds of overarching beliefs and values held by school leadership. Structures could also include physical infrastructures and designed set-ups of school buildings and classrooms.

The classroom dynamics dimension includes the pedagogies practiced and implemented during curriculum and non-curriculum time organized by the school. For example, if a school were to be rooted in its beliefs in traditional models of learning, then the pedagogies practiced would be translated as didactic-instructive strategies of delivery. This process also depicts the kinds of applications and tools used to support classroom dynamics.

The third dimension is concerned with the individual teacher beliefs which strongly influence classroom behavior and the propensity to change classroom behavior. If the design of school structures and reward systems influences the behavior and beliefs of teachers, then a traditional systemic structure would influence teachers to value teaching as the transmission of information. These beliefs are reinforced by students being rewarded with good grades as they take paper and pencil tests.

The fourth dimension involves student behaviors as manifested in the classroom, with teachers as either disseminators of information or as facilitators of knowledge construction. If teachers believe that constructivist methods are ultimately better for their learners in terms of overall achievement, then they will practice the appropriate strategies which foster meaning-making; and, over time, students will manifest the appropriate behaviors in the classrooms.

Figure 1 depicts our understanding when analyzing IT integration in schools. All four dimensions of the framework must be inter-related and lead to the consistent outcomes desired by the school.

It should be noted that consistent changes in all dimensions of the framework are necessary over time in order to see IT infused in the school. Incremental changes in any one of the dimensions may yield minimal change; whereas consistent changes at multiple dimensions of the school—from school structure to student behavior—would yield maximal change. See Table 1 for a detailed comparison between traditional (instructivist) and non-traditional (constructivist) approaches in relation to the four dimensions of ICT integration.
Table 1. Dimensions of IT integration in relation to traditional and constructivist approaches.

<table>
<thead>
<tr>
<th>Dimensions of IT Integration</th>
<th>Traditional Didactic Approaches</th>
<th>New Constructivist Approaches</th>
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| School Structures           | • Design of curriculum time is in chunks or time-slots where knowledge transmission is facilitated.  
• Curriculum is based on content lists and some processes.  
• Content is decontextualized and in abstracted forms.  
• Focus is on organization and provision of equipment and resources.  
• Assessment is in terms of products.  
• Summative assessment is crucial.  
• High student to teacher ratio. | • Project work is emphasized.  
• Curriculum is process oriented.  
• Focus is on learning outcomes and student choice.  
• Teachers are supported in their design of learning experiences with just-in-time skills provision.  
• Focus is upon student generated knowledge and research skills.  
• Formative assessment is emphasized.  
• Low student to teacher ratio. |
| Classroom Dynamics and Pedagogies Through Tools | • Instructional methods are focused on information delivery and memorization.  
• Most popular pedagogies are drill and practice or Learning Management Systems.  
• Centralized design of resources.  
• Tools are used to deliver content.  
• Hardware and software focus.  
• Content is designed for display on particular technologies. | • Focus on rethinking the strategies and curriculum to integrate in authentic and technology enhanced learning systems.  
• Pedagogy is used to support thinking and task processing.  
• Focus is on construction of personally meaningful artifacts.  
• Distributed instructional design.  
• Tools support collaboration and construction of knowledge, e.g., cognitive tools and aids for visualization.  
• Focus on mobility, communication software, Internet linkages, and shared communities of interests.  
• Technology could be ubiquitous.  
• Tools can be focused on personal need and support.  
• Environments support learning communities. |
| Teacher Beliefs              | • Teacher beliefs that learning is about acquiring knowledge and information.  
• Knowing is about telling other what we know. | • Teacher beliefs that learning is meaning-making.  
• Knowledge is about constructing accounts of phenomena in as accurate a fashion as possible based on a community’s criteria of valuing knowledge. |
| Student Behaviors           | • Talking in class is bad and requires discipline.  
• Individual behaviors are best for learning.  
• Repetition of what the teacher says best reflects one’s understanding. | • Productive conversations are central to knowledge constructions.  
• Social collaborations and multiple perspectives are useful to understanding and learning. |
New Wine in Old Bottles

The dimensions of school structure, classroom dynamics, teacher beliefs, and student behaviors constitute a proposed framework for analyzing a school's IT integration. The classifications can be reworded into terms such as management structure, operations, supervisor styles, and worker behaviors within an organizational context. These dimensions reflect the systemic social-cultural structures and cognitive aspects of persons within a school or other organization. The various dimensions are dynamic and constantly interacting and, over time, will achieve dynamic equilibrium.

Change is only possible when we leverage changing processes in all dimensions of the school system. Change begins with a clear goal or outcome. What are the goals of introducing IT into the school? How do these support the achievement of the larger goals of the entire school structure? School leaders have to define the relative goals of new technologies in the context of the school’s larger goals.

The four dimensions as reflected by our framework are processes within the school. Processes refer to the workflow of the organization in fulfilling its goals. An effective and efficient process is necessary for an organization because it makes the work for employees (i.e., teachers and school administrators) easy and value is delivered to the customers (i.e., students) in the most direct way. It is very important to consider the processes involved in IT integration. People resist when the processes are so messy and tedious that their lives are made more difficult in learning through a virtual medium. School leaders have to examine either how IT would fit into current processes in the school or what processes would require re-engineering in an enriched environment. The key question to ask is whether the processes associated with using IT are streamlined so that teachers and students find it easy to operate and learn in an IT enriched environment.

Sometimes, despite the claims of technology to improve efficiency, processes such as getting the laboratory and equipment ready make life even more difficult for teachers and students. This sounds like a small issue, but it is precisely such small and sometimes overlooked issues that get people frustrated. Moreover, if the teacher is just using the Web to upload and download notes that the students can easily read from a book in a matter of a few minutes, the teacher may have just made the learning process less efficient and effective for the students.

Another important consideration is the infrastructures or enablers (see Figure 1) that are set in place. Teachers and students cannot perform effectively and efficiently unless they have good tools to work with. For example, a chef will be totally frustrated if he has to prepare an important meal, and all his knives are blunt and he or she does not have the right kind of stoves and pans. Hence, in implementing IT tools, school leaders have to ask: are the working enablers, e.g., IT systems, network speed, infrastructure and bandwidth, PCs for the teachers, and IT support in the school efficient and effective? Other enablers include reward structures, communication channels, interest groups, and other such catalysts which continue to sustain interest and keep up the momentum of IT integration.

Opposed to enablers are contradictions. When any dimension of the framework (Figure 1) is inconsistent, contradictions result. In other words, if classroom dynamics or any other dimension does not align itself to the other processes, for example, reformed school-structures, the goals would not be achieved (see Figure 2).

Contradictions are misalignments to the system which are bottlenecks at any of the four dimensions of the school. School leaders need to know where contradictions would most likely result and efforts need to be put in place to resolve them.

In simple terms, teachers often adopt new practices and pedagogies but often experience frustrations. For example, learners or individuals do not possess the mindset or beliefs for constructing knowledge and that the school-structure of classroom or curriculum time allocations do not match the kinds of constructivist activities needed to facilitate the process of learning. In other words, if teachers are working with “new wine” (constructivist methods) in “old bottles” (traditional systemic structures), frustrations will abound. New wine is best suited for new wine bottles.

In most instances, unchanged school processes are usually the root cause of many IT integration problems. From a Vygotskian perspective (Bruner, 1996), social structures influence individual thinking and behaviors. Beliefs are implicitly developed as a result of social practices. Current developments in IT integration commonly over-emphasize the technology with the assumption that school structures and individual beliefs co-relate with the pedagogical assumptions of IT tools. Systemic, curriculum, and management changes should be put in place and questions asked so that new practices can be adopted.

According to systems thinking (Senge, 1990), the performance of the entire organization as a system depends on how the parts fit in, not just on how they perform separately. If the factors do not gel, we may have a recipe for disaster rather than success. So, in IT integration, are the goals, processes, and enablers seamlessly and coherently in place? In other words, are the four dimensions of our proposed framework coherent?

To summarize, Figure 3 reflects the processes which are relevant from a systems’ point of view.
The proposed social-cultural framework of IT integration views the school as a relatively closed system unto itself. In a real classroom, however, practitioners and school leaders would face the additional challenges that arise from the views of key stakeholders such as parents and funding agencies impacting on the proposed dimensions. In our framework, we have assumed that there is an alignment between the school outcomes and those desired by key stakeholders. The social-cultural dimensions have been confined to the school, whereas in reality factors include societal and other cultural impacts.
Conclusion
In order to facilitate recent developments in IT towards constructivist orientations, a rethinking of IT integration along the four dimensions of integration is needed. These four levels of IT integration need to be consistent. We hope that this article is able to give sense to many frustrations of IT usage in schools and in other learning situations. We also hope that we provided ideas on how to leverage the four dimensions of IT integration and point the way to making changes in order to integrate IT into the schools.

References

IT Integration in the Schools: Some Suggested Readings
Meanings are context dependent and interpreted based on situational contexts, and thus learning (through technology) should capitalize on real-world, authentic problems.

Epistemic structures such as lists, tables, games, forms, and matrices can assist learners in cognition by helping them to think in certain perspectives and organized ways.

The authors term meaningful learning as active, constructive, intentional, authentic, and cooperative. The technologies for meaningful learning are referred to as ‘mindtools.’

IT-enhanced environments can help a learner to learn by doing, receive feedback, and continually refine their understanding and build new knowledge. The NRC compares the use of IT to that of training wheels, and points out that with the assistance that technologies provide, learners can do more complex activities and engage in more advanced thinking and problem solving. IT can also create new opportunities for curriculum and instruction by bringing real-world problems into the classroom.

IT is seen as a support whereby learners apply information to: (a) solve real-life problems; (b) explore issues using approaches that have both been collaboratively negotiated with their teacher; and (c) engaging in team and collaborative work guided by their teachers, who become facilitators.

The emphasis of IT integration is not just on the acquisition of knowledge in specific subjects but on helping learners to acquire creativity, curiosity, and enterprise. These are skills and traits that have also been identified as being core skills and dispositions for the 21st century.

IT can be used: (a) for simulation, visualization, and modeling; (b) as cognitive tools; (c) as assessment tools; (d) in wireless computing; (e) for facilitating learning communities; and (f) for project work.