# " Curriculum for the 21st Century Kuwait Education: the Forced Choice of Interdisciplinarity "

**Dr. Abdullah Bin-Oukla Al-Hashim**
**Faculty of Education – Kuwait University**

***Abstract:***

The global changes that have overwhelmed societies and economies in the world societies as well as the drastic information revolution brought about by the information and communication technology all led to similarly drastic changes in the field of education and school curriculum. A major issue raised by the revolution in information and ICT has got to do with integration and interdisciplinarity in the school curriculum. This paper, a speculative treatment of the subject, seeks to outline a definition of curriculum integration and the relationship between integrated curricula and interdisciplinarity in organizing learning materials for public education. The paper then outlines the rationale for integration, the philosophy and manner of integration of disciplines, with a redefinition of curriculum in the light of integration. An outline for pedagogical implications of integrated curriculum is presented.

**الملخص:**

إن التغيرات العالمية التي اعترت المجتمعات واقتصادياتها، وكذلك مجال تكنولوجيا المعلومات والاتصالات أدت إلي تغيرات مماثلة في شدتها على التعليم، ومناهجها الدراسية، ومن بين أهم الموضوعات التي طرحتها ثورة المعلومات والتفجر المعرفي في العصر الحالي قضية التكامل بين المناهج الدراسية، والبحث الحالي يقدم عرضا لمفهوم التكامل بين المناهج الدراسية وإستدخال الدراسات البينية، وكيفية تحقيق التكامل بين هذه الدراسات في المنهج المدرسي، ومبررات ذلك، وتعريف مفهوم المنهج في ضوء التكامل وأثر ذلك علي طرائق التدريس. وقد عرض البحث أخيرا لما يمكن أن تركز على تدريسه المناهج الرأسية في التعليم العام بمدارسنا وجامعاتنا.

## I. Introduction:

The very feature that highlights education for the 21st century is that it is in the process of being computerized and ICT-run. Barnes (1976) foresaw the situation of the impact of

the type of communication on education by noticing that: "As the form of (classroom) communication changes, so will the form of what is learnt" (p.14). In a few decades, the picture changed from a classroom-delivered education to an e-education where ...

> " there are many such e-mail systems of computer communication available offering access to databases of information, bulletin boards, chat lines and public domain software " (Mann and Crompton, 1996: 147) .

This development which is mainly due to the provisioning system of information as well as other epistemological changes called for ongoing development and reform of school curricula that has become an ongoing preoccupation for educational authorities in all countries.

According to Hallak (2000), two recent trends in this respect have contributed to bringing international attention to bear on curriculum matters:

1. The globalization of economies and societies raises a new challenge, requiring the adaptation of educational content to meet both national demand and international concerns, and
2. The diversification of actors, both national and international, involved in the delivery of education in particular with the growing use of information and communication technologies – ICTs, as illustrated by the significant share of non-formal education have resulted in the emergence of new concepts and norms for educational content, as indicated by such terms as the common core, universal values, basic life skills, etc.

Since these changes have come in action, a major concern of curriculum development is now shifting towards how the various subject areas can support general education for life-long learning. In this way, proposals for integrated curricula and interdisciplinarity emerged, given the possibilities of ICT as a medium of provisioning. But, as Daswani notes, "the major preoccupation is how to develop a balanced curriculum while avoiding aver load" (2000:20).

Current pedagogical practices and in-use organization of the curriculum ill suits the aim of the heralded era of e-education. The isolated academic subjects used to relay knowledge and experience in systematic instruction according to school subjects curricula does not suit the general education, which Elliott (1998) specified. According to Elliott, there should be an orientation to learning and to curriculum design where there is a focus on problem-solving skills and group co-operation with a particular emphasis on good citizenship. Hence, there rises the notion of interdisciplinarity. In accordance with the humanistic constructivist views interdisciplinary approach stimulates independent and active acquisition of learning experience. Interdisciplinary planning is determined by common purposes of different subject fields.

Interdisciplinary curriculum development is set of parallel approaches that include emphasis on core knowledge and skills, generative learning, identity development, and interdisciplinary opportunities. Such an approach holds promise for gifted students in that the level and pace of curriculum can be adapted to their needs, and the existing state standards call for the kind of focus that curriculum makers for gifted students have long advocated – higher-level thinking, interdisciplinary approaches, and an emphasis on student-centred learning. (VanTassel-Baska

& Wood, 2010) In this vein, icherl-Kafol & Denac (2010, p. 4696) explain ...

> "Interdisciplinary connections represent an integrated didactical approach, where knowledge, contents and learning skills are being connected horizontally and vertically. These connections are made on the basis of common purposes of different subject areas. They include the processes of a pupil's integrated insight into the learning reality through transfer of learning skills and knowledge. The common denominator or the thread connecting individual subjects, is the transfer of learning strategies, data, concepts, rules, thinking skills, emotions, viewpoints, communication, etc.

Modern understanding of interdisciplinary connections use different terms e.g. interdisciplinary, multidisciplinary, transdisciplinary, cross-disciplinary, metadisciplinary, informed disciplinary, synthetic interdisciplinary, pluri-disciplinary etc. to express how close the disciplines are connected (Nikitina, 2006).

Furthermore, the content-based aspect of interdisciplinary connections stems from establishing links between the learning content and the central topic of discussion, the main idea, subject, thematic set and similar. The planning of tuition takes place on the basis of a learning content curriculum (Palmer and Pettitt, 1993).

## II. Interdisciplinarity : the School Curriculum Redefined:

Interdisciplinarity does not stress discrepancies but linkages. In this context, Meeth (1978) notes that the emphasis is on deliberately identifying the relationship between disciplines; therefore, interdisciplinary curriculum design is a holistic approach, which nurtures a different perspective with focus on themes and problems of life experience.

There emerged some terms in the literature, all of which bear on the idea of integration and interdisciplinarity: these are crossdisciplinary studies, multidisciplinary studies, pluridisciplinary studies, and transdisciplinary studies. What follows is a brief description of the terms and the nuances out there as delineated by Meeth (1978) and Piaget (1972):

- Crossdisciplinary: Viewing one discipline from the perspective of another; for example, the physics of music and the history of math (Meeth 1978).
- Multidisciplinary: The juxtaposition of several disciplines focused on one problem with no direct attempt to integrate (Piaget 1972, Meeth 1978).
- Pluridisciplinary: The juxtaposition of disciplines assumed to be more or less related; e.g., math and physics, French and Latin (Piaget 1972).
- Transdisciplinary: Beyond the scope of the disciplines; that is, to start with a problem and bring to bear knowledge from the disciplines (Meeth 1978).

Given the chaotic nature of presenting the notion of interdisciplinarity in curriculum engineering and implementation, there developed more than one or two established terms all of which still bear on the notion of

integration (Russell & Zembylas, 2007): integrated curriculum, interdisciplinary teaching, thematic teaching, synergistic teaching.... and the list goes on. Interdisciplinary curriculum is defined in the Dictionary of Education as "a curriculum organization which cuts across subject-matter lines to focus upon comprehensive life problems or broad based areas of study that brings together the various segments of the curriculum into meaningful association" (Good 1973).

**In this fashion, an interdisciplinary curriculum includes:**

- A combination of subjects
- An emphasis on projects
- Sources that go beyond textbooks
- Relationships among concepts
- Thematic units as organizing principles
- Flexible schedules
- Flexible student groupings.

Wakefield, et al. (2003) indicated that the three dimensions of the framework of interdisciplinary curriculum development project must include the following components:

1. Context in which education takes place
2. Curriculum goals
3. Approach used.

This could be done by encouraging students to work together towards a common goal, adopting the principles of problem-based learning, and learning through multi-professional interaction (Wakefield, et al., 2003, p. 202).

When attempting to define integrated curriculum, it is also necessary to look at related terms. Several definitions are

offered here. However, these definitions vary from one teaching context to another although the nuances in the meaning are not significantly distinctive. A basic definition is offered by Humphreys, Post, and Ellis (1981):

> "An integrated study is one in which children broadly explore knowledge in various subjects related to certain aspects of their environment" (p. 11).

Therefore, links among the humanities, communication arts, natural sciences, mathematics, social studies, music, and art are thought both at the curricular level of planning and at the implementational level of provisioning. Therefore, skills and knowledge are developed and applied in more than one area of study. In keeping with this thematic definition, Shoemaker defines an integrated curriculum as

> "...education that is organized in such a way that it cuts across subject-matter lines, bringing together various aspects of the curriculum into meaningful association to focus upon broad areas of study. It views learning and teaching in a holistic way and reflects the real world, which is interactive. (1989, p. 5).

The similarity between this definition and those of integrated curriculum is clear. Jacobs defines interdisciplinary as "a knowledge view and curricular approach that consciously applies methodology and language from more than one discipline to examine a central theme, issue, problem, topic, or experience" (1989, p. 8). Therefore, an interdisciplinary curriculum can be defined as one that "combines several school subjects into one active project since that is how children

encounter subjects in the real world-combined in one activity."

Palmer (1991, p. 59) identifies several levels of integration as embodied in the following practices:

- Developing cross-curriculum sub-objectives within a given curriculum guide
- Developing model lessons that include cross-curricular activities and assessments
- Developing enrichment or enhancement activities with a cross-curricular focus including suggestions for cross-curricular "contacts" following each objective
- Developing assessment activities that are cross-curricular in nature
- Including sample planning wheels in all curriculum guides.

Thus, Palmer (1991) suggests that teachers and curriculum supervisors work together to identify common goals, objectives, skills, and themes. From these lists, the teachers work together to find appropriate connections to content areas.

In another context, Dressel defines integration curriculum by linking subject areas to the creation of new models for understanding the world:

In the integrative curriculum, the planned learning experiences not only provide the learners with a unified view of commonly held knowledge (by learning the models, systems, and structures of the culture) but also motivate and develop learners' power to perceive new relationships and thus to create new models, systems, and structures. (1958, pp. 3-25)

Broadly, curriculum integration embraces not only piecing together the school subjects (e.g., science and social studies) but also bringing together the curriculum elements (e.g., skills and content) to induce more effective intake of the curricular provisioning of these subjects integrated in relation to each other than separately.

While practically all educators agree that learners ought to acquire both skills needed to acquire knowledge and some knowledge itself, i.e., cognition and metacognition, there are substantial problems in organizing integrated curriculum at both the level of curriculum engineering and curriculum implementation, or planners and teachers.

Seminal theoretical discussions of integration as well as early field practice attempts support the view that integrated curriculum is an educational approach that prepares students for lifelong learning. There is a strong belief among those who support curriculum integration that schools must look at education as a process for developing abilities required by life in the twenty-first century, rather than discrete, departmentalized subject matter.

Integration reaches the apex when teaching "goes beyond the blurring of subject area lines to "a process of teaching whereby all the school subjects are related and taught in such a manner that they are almost inseparable" Bonds, Cox, and Gantt-Bonds (1993). This is what Bonds et al (ibid.) describe as "synergistic teaching".

According to Jacobs (1989) and Shoemaker (1989), these differentiations may move from two teachers teaching the same topic but in their own separate classes (e.g., both English and history teachers teaching about the same period of history), to

team design of thematic units, to interdisciplinary courses or thematic units, to a fully integrated curriculum. This process of synergistic teaching allows the student to quickly perceive the relationships between learning in all curriculum areas and its application throughout each of the school subjects and does more than integrate by presenting content and skills in the same basket.

## III. Support for an Interdisciplinary Curriculum:

Smith (2000) thinks of interdisciplinarity as a valuable strength in the curriculum of an undergraduate institution: "Interdisciplinarity in the curriculum is intrinsically valuable intellectually, and also because it encourages open-mindedness and flexibility, as well as problem-solving skills ... (which) are important defences of the social value of non-vocational curriculum" (p.2).

The philosophy of the curriculum engineer always bears on the final design. For instance, architects who design a project based on a site, materials, and the population to be served are incredibly ideal, but as they go on with the project, unexpected events crop up — a delay in materials, an immovable rock in the foundation—so the architect adapts the plan. Therefore, the more aware curriculum engineers are of the schooling system's philosophical beliefs, the more likely they and the practicing teachers are to make responsible instructional classroom design choices that reflect a cohesive and lasting quality in the educational experience. The following beliefs and assumptions (in Jacobs, 1989) can be sound philosophical foundations for interdisciplinary work:

- Students should have a range of curriculum experiences that reflects both a discipline-field and an interdisciplinary orientation.
- To avoid the potpourri problem, teachers should be active curriculum designers and determine the nature and degree of integration and the scope and sequence of study. The teacher's decisions will most directly affect students in the day-to-day running of the classroom. The teacher should be empowered to work as a designer, to shape and to edit the curriculum according to the students' needs.
- Curriculum making is a creative solution to a problem; hence, interdisciplinary curriculum should only be used when the problem reflects the need to overcome fragmentation, relevance, and the growth of knowledge.

Curriculum making should not be viewed as a covert activity. The interdisciplinary unit or course should be presented to all members of the school community. Few parents will have experienced integrated curriculum, and they will feel less suspicious if they are well informed.

Students should study epistemological issues. Regardless of the age of students, epistemological questions such as "What is knowledge?", "What do we know?", and "How can we present knowledge in the schools?" can and should be at the heart of our efforts. The preschool child deserves to know why the room is organized the way it is, why there are "choice times", and why there are set times for "group meetings." Relevance begins with the rationale for educational choices affecting the school life of the student.

Interdisciplinary curriculum experiences provide an opportunity for a more relevant, less fragmented, and

stimulating experience for students. When properly designed and when criteria for excellence are met, then students break with the traditional view of knowledge and begin to actively foster a range of perspectives that will serve them in the larger world.

Students can and, when possible, should be involved in the development of interdisciplinary units.

## IV. Interdisciplinarity: Curriculum, or Pedagogy:

Interdisciplinarity should not only be planned at the planned at the curricular level, but also pedagogically considered. In place of the current dominant curricular practice of the coverage and teaching of skills and information via discrete subject areas, it is recommended that the provisioning and teaching of subject areas be abandoned to the interest of an integrated interdisciplinary curriculum matched with a similar teamwork teaching approach. Valerie Bayliss (1999:10) explains that by applying this curricular-pedagogic approach, "we would be putting teachers back in control of the curriculum, as being there to help people learn rather than to teach in the traditional sense".

Moore (2000:172) in this context emphasizes the inseparability pedagogy and curriculum in the practical and curriculum in the practical rather than the theoretical would, and the difficulty of deciding when pedagogy is curriculum, and when curriculum is pedagogy.

Moor (ibid.) further explains the necessity to treat existing curriculum content in a particular pedagogic way (i.e.) problematizing existent content choice and related materials; for example, interrogating with students history and geography

as classiest, sexist and racist, or getting them to critique science and math's syllabi in terms of how they support some people's interests and purposes at the expense of others; (2) introduce current curricular provisioning system which are content-driven to ones concepts-based or experience-driven; and (3) alter curriculum inputs within an unchanging curricular model.

Earlier, Freir (1972) has argued for pedagogy that teachers can engage in inside the classroom and within imposed constraints that go beyond the recognition and valuation of multicultural students, cultural practices and experiences. That is to say, classroom practices (pedagogy) must be prioritized alongside curriculum so as to emphasize how children learn rather than what they learn.

Young (1998) further notes that it is the link that connects curriculum with pedagogy that mutters. This is, according to him, notion of "curriculum as practice, or how knowledge is produced in group work. According to Young, the connective integrated curriculum model does not start with subjects but with the broader motion of curriculum purposes and how these subjects can achieve those purposes.

Pedagogically, this connective model requires teachers to connect their subject teaching to the purposes of the overall school curriculum, and the way that other subjects contribute to the overall school curriculum. However, there should be caution as to differentiate between content-oriented integration and skill-oriented integration. This is what Ackerman and Perkins (1989) call curriculum (content) and meta-curriculum (skills). According to this distinction, integration between curriculum and meta-curriculum, several benefits are spawned:

By integrating the curriculum and a metacurriculum in the

manner suggested, the acquisition of vital learning skills would be enhanced, perhaps significantly, by reinforcement and refinement through a range of applications.

Students would be given a far more coherent set of learning experiences—they would know why they were being taught various "skills," and they would know better how to mobilize themselves to make sense of curriculum content.

Teachers from different departments would have a means of working together toward common goals without sacrificing their own subject matter concerns.

"Process" and "content" goals would be unified; they would not compete against one another (although there may always be some degree of tension between them.).

When planning interdisciplinary curriculum units, teachers should consider the following questions:

1. How valuable is the organizing central idea for students to think about and assimilate into their way of looking at the world? (big picture-rich).
2. How important to those subjects are the concepts that teachers have identified within mathematics and science? (content-rich)
3. To what degree might the students learn the concepts better than if they had been taught separately? (connections-rich).
4. To what degree does the curriculum contribute to broader outcomes--that is, the learner's overall approach to knowledge and his or her development as a person? (creative and critical thinking-rich)

5. How much time is available for curriculum development?
6. How much time is available for communication among teachers during common planning or teaching time, among grade levels, and between schools?
7. In what ways can scheduling support interdisciplinary learning?
8. What expertise exists within the district?
9. What materials are available?
10. What budget is available to support curriculum development, staffing, and materials acquisition?
11. How does the interdisciplinary curriculum reflect the philosophical orientation of the community, district, school, and majority of teachers?
12. How do teachers and administrators prefer to have curriculum organized? How compatible is that with the Problem Solving and Critical Thinking in Mathematics (PSCTM) model?
13. What support from key individuals or groups is needed? How will staff members respond to change and innovation? How will public relations be built and maintained?
14. How is the school board involved/informed about the curriculum process?
15. What personal concerns do you have about your involvement in interdisciplinary curriculum design and implementation?

As mentioned earlier, although the development of integrated learning experiences is important, teachers often find it difficult to plan such experiences for our students. While a current emphasis on a `whole language' orientation in the

elementary curriculum assists us as we help students understand relationships among reading, writing, and oral language, most middle and secondary school curricula retain a non-integrated approach to subject matter instruction. Textbooks and teachers' guides rarely emphasize relationships between the subject area of major concentration and other disciplines. As a result, teachers have neither the information nor the time needed to realistically include interdisciplinary experiences in curricular planning. While we cannot always change the existing middle and high school curricular materials rapidly or directly, we can employ a planning process which will allow us to periodically incorporate cross-disciplinary ideas and activities into our repertoire of instructional strategies.

## V. Interdisciplinarity for Planning Teaching:

From the very inception, knowledge disciplines are unitary. But the decision to specialize in teaching knowledge disciplines in isolation dates back to Aristotle who believed that knowledge should be divided into three main fields: the productive disciplines the theoretical disciplines and the theoretical disciplines (Jacobs, 1989). Hirst (1964) upholds the pedagogy of the discipline field on the assumption that each field is a form knowledge with distinctive characteristics thereby revealing unique concepts and propositions. And the advantage of a discipline field curriculum and pedagogy is that disciplines permit educators to develop in learners the mastery to relate relevant concepts and develop patterns of reasoning. As well, to Bruner (1975), the disciplines are essential for knowledge acquisition. No matter how rational these assumptions may be, they run counter to the unitary nature of knowledge. Take for example the relationship between science

and mathematics: the boundaries are flimsy. For instance, the boundaries between biology and biotechnology, computer science and electronics physics and most technological disciplines are artificial and outdated (Ilan,2001:111).

Teaching science and technology according to the interdisciplinary approach would stress the interconnections and reciprocities between the sciences, mathematics and technology. According to an interdisciplinary science curriculum approach, learners will also be exposed to both scientific and technological content in the social context in the social context of science. As Ilan (2000:111) observes:

> "These connections are expressed both at the level of the application of principles as well as that of defining human-social needs and problem solving with the aim of improving the quality of life".

In this way, the challenges for our Kuwaiti curriculum developers in this era of e-education are to mete out innovated approaches utilising interdisciplinarity for integrating the science and the social sciences in order organise learning and teaching into meaningful context. Many units become a sampling of knowledge from each discipline. If the subject is Modern Kuwait, there will be a bit of history about Kuwait, a bit of literature, a bit of the arts, and so forth. Unlike the disciplines that have an inherent scope and sequence used by curriculum planners, there is no general structure in interdisciplinary work. Curriculum developers themselves must design a content scope and sequence for any interdisciplinary unit or course.

The guidelines below can help teachers as well as curriculum developers in designing interdisciplinary lessons

that meets the needs of the current era of information and communications technologies:

1. Setting educational goal statements that indicate the principle(s) or concept(s) currently in use and has (have) public bearing to be understood at the completion of the lesson.

   A key question is : what are the primary pieces of information or concepts that you want students to understand? Often, interdisciplinary lessons do not concentrate on the mastery of specific skills. By their very nature, these lessons usually focus on the application of skills and knowledge to novel situations. For this reason, goals of interdisciplinary lessons will usually involve helping students understand how the skills and knowledge they possess can be combined to accomplish a task, discover a solution, or explain a situation.

2. Selecting the primary content base to initiate instruction. Often, the content base will be determined by the text. There are times, however, when your goal necessitates the use of other, ancillary materials. In either case, determine the primary vehicle which will drive the instruction (e.g., a work of art or literature, a scientific or mathematical principle, an event or era in history, etc.)

3. Identifying events, discoveries, and writings within other disciplines that relate to the primary content base in a meaningful way. Through talking with colleagues and brainstorming on one's own, one can consider information in other disciplines that seem to relate to the primary

content. At this point, it may be helpful to look at the table of contents in the textbooks the teachers will be using.

4. Determining the key points of intersection between the disciplines which correspond to the established terminal goal of instruction. As teachers investigate each cross-discipline idea in more depth, they can keep their terminal goal well in mind. Some ideas will probably need to be discarded, either because they are too complex, or because they do not fully address the goal. Other ideas may be so compelling and enlightening that teachers may want to revise the terminal goal to reflect new insights they have gained.

5. Formulating instructional objectives. Again, it should be noted that most interdisciplinary lessons would not focus on the mastery of specific skills. Nevertheless, it is important for the teachers to determine what they expect their students to be able to do when they have completed the lesson. As in other instructional planning, objectives serve as the springboard for the development of the instructional strategies and activities the teachers would use.

6. Identifying the necessary prerequisite knowledge that students must possess in each discipline area teachers might address. Interdisciplinary instruction can fall apart if students lack knowledge of key principles or concepts within each discipline. Thus, they have to carefully consider the prerequisite skills students must have before they can successfully accomplish the objectives that they have set forth. Sometimes, missing skills or pieces of information can be taught rather quickly. However, when this is not the case, it will be necessary to revise the interdisciplinary content.

7. Formulating instructional strategies that would compel students to use their knowledge in one discipline to better understand and appreciate another. Students are not used to activating their knowledge in one discipline while studying another. For this reason, it is important for teachers in teamwork to develop activities, which require this transfer in a purposeful way. Depending upon the content and timeframe of instruction, teachers may want to use conceptual mapping, in-class debates, group projects, and/or a variety of discovery techniques to accomplish your goal. The critical component of interdisciplinary lessons, as in most instruction, is active and invested participation.

A majority of universities and other lower educational institutions now provide at least one interdisciplinary course as part of their required education. Educational journals and conferences routinely feature integrative pedagogy that addresses problems connected to students' experience while drawing them into the larger community and critiquing as well as engaging its culture.

Science can be used as a great integrative bowl for other disciplines. The questions addressed by science and the answers obtained represent only a fragment of the human enterprise, but it is a fragment that has transformed the world and our ways of thinking about it. To clarify the manner in which this fragment fits into the human endeavour our first concerns should be with the motives and methods of science as an open system of inquiry.

Because science is represented, at least in part, in all other areas of the curriculum, most of which have adapted to the unique nature of the problems they have evolved to solve, these

concerns are interdisciplinary and their pursuit is likely to engender a fruitful mutual understanding of humanistic and scientific approaches as well as nurturing talent so informed. Interdisciplinarity must seek to provide

- key elements of scientific thinking and their representation in diverse disciplines as well as
- forces which guide the rejection or acceptance of ideas or methods in specific disciplines, and
- ideas or methods, particularly those of science, are transferred between specific cultural and intellectual environments to serve specific needs.

These may be accomplished by curricular innovations involving carefully designed interdisciplinary pilot courses to review both the theoretical and practical aspects of such interdisciplinarity.

## VI. Conclusion:

Once given the opportunity, our students explore interconnections among the subject areas they are studying.

This has many advantages. Interdisciplinary instruction adds meaning and relevancy to learning as students discover fascinating and compelling relationships between disciplines. New perspectives are developed which help students construct a more integrated web of knowledge. Not only does this powerful knowledge structure facilitate the assimilation of new information, it also increases students' understanding of and appreciation for the wealth of information and ideas they already possess.

Therefore, interdisciplinarity is required because real world problems cross-disciplinary boundaries. Curriculum

interconnections induce us to look functionally for the benefits; therefore, even if the curriculum is not integrated or coordinated, when teachers communicate students benefit for coordinating curriculum and making connections is relatively easy.

With practice, project based curricula do not require more teacher preparation or work. Add to this that coordination and integration are possible when each teacher can see the learning objectives of other teachers. Students need direction to learn background and acquire skills before plunging headlong into creating their product. When students were given time to gather and analyze relevant information during the first few weeks, projects flowed more smoothly.

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