



Designing Interdisciplinary, Integrated Curricula

A PRACTICAL
MANUAL

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Welcome!

We're excited that you are incorporating curriculum integration into your school and are using this manual to support the process. We designed this guide for teachers who are new to curriculum integration, and those who want to enhance their current practice. Presented here is a roadmap for committed teams of teachers to work together in planning, developing, and implementing a multidisciplinary, career-focused, integrated high school curriculum. We hope this manual will help you be successful.

Designing Integrated Curricula: What and Why?

Engagement is one of the most important keys to student academic success. Every teacher knows that even the right foundation skills are not enough to ensure that learning will occur. Students need to be curious about new material, focused on what they are learning, and of course, they need to be present in class. Why do so many students lack this high level of engagement? Today's high school students are demanding relevance and they aren't getting it. Too often, by the time they reach high school, students have concluded that school has little connection to their current lives and even less to offer in preparing them for the future.

Many teachers have experienced, first hand, the disaffection of high school students who have turned away from learning because they don't connect with school. Survey data make a strong case for the importance of relevance for students. In a 2006 survey of more than 3,000 at-risk, early high school students in California, more than 80 percent revealed that they would study more and work harder in school if they saw the relevance of their classes to their future education and careers (Peter D. Hart Research Associates 2006).

Applied learning theory can help us understand how to reverse this situation. According to researchers, students are more motivated to learn when they need to acquire knowledge [to accomplish something they care about], when they are curious [about an interesting and challenging problem], and when the material relates to their own lives (Svinicki 2002). As teachers, we can create this kind of motivation by linking rigorous academic content to students' personal lives and the community issues they care about.

One of the most powerful strategies teachers can use to make learning relevant is to place academics within the context of issues and problems from the world of work. Across the country, teachers, school admin-

istrators, and parents have seen students change their attitudes about school when they are solving exciting problems and working on projects that link their academic and technical courses to an authentic, career-related theme.

Contextual instruction has proven to be the most powerful aspect of our small high school. Students believe in their lessons when every assignment adds meaning and creates understanding in all of their classes. I can speak for our school; we have truly made a difference in our students' hope for success—they feel empowered to dig deep and ask questions, and they are enthusiastic about sharing their research with the world.

Matt Perry, Principal
Arthur A. Benjamin Health Professions High School
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Curriculum Integration Requires a New Instructional Approach

Curriculum integration is taking hold in a wide variety of high school settings. In new small high schools, career academies, and even large, traditional high schools, teachers are integrating academic and technical instruction by focusing on career-related themes. They are working across the usual boundaries of academic and technical fields to make course material more engaging, encourage once reluctant learners to enroll and succeed in higher-level academic courses, and give students a running start at planning for college and future careers.

Integrating courses around career-related themes and making those themes relevant to teenagers—while also addressing state-mandated academic and technical content—requires a new model for designing instruction. This new model asks teachers to work across the entire curriculum from science, to social studies, to language arts, and also to include mathematics, foreign languages, physical education, and career and technical education courses.

Designing Integrated Curricula: What and Why?

What does this new multidisciplinary curriculum look like? It looks like the real, thorny, and exciting problem solving that engages professionals in their everyday work lives. It brings authenticity to students' schoolwork, homework, and work-based learning situations. For example, in their mathematics and health sciences classes, Arthur A. Benjamin Health Professions High School students, in Sacramento, California, learn about the calculations that insurance underwriters conduct, while they ponder a highly relevant question: how do high-risk lifestyle decisions and behaviors affect access to and premiums for medical insurance? While the students address this important question, their Spanish class provides a venue for studying differences in mortality rates and causes of death in many Spanish-speaking countries and across ethnic groups in the United States. Spanish becomes an important tool for researching and understanding national and cultural differences in rates of illness and injury and causes of death.

In another example, students in several states examine the connections among genetics, diet, and exercise to explore the rising rate of obesity. Instead of solving the usual math problems, algebra students in New York, Texas, and Utah apply their knowledge of algebraic equations in calculating their body mass index. They also debate the link between fast food consumption and the rise in obesity in their English, biology, Spanish, and health science courses. These subjects take on new relevance when students see that they are tools for addressing an important, real-life issue.

This practical manual shows you how to create an exciting and challenging high school curriculum that uses this instructional approach.

The Goals of Multidisciplinary Integrated Curriculum

Delivering a multidisciplinary integrated curriculum is a strategy that addresses many of our national, state, and local objectives around high school improvement. This approach is designed to reach high school students at all academic achievement levels, to facilitate learning for students with diverse learning styles, and to close the achievement gaps across groups of students. Teachers, principals, and school district administrators who support this approach indicate that they have used it to:

- Shift classroom instruction from passive to active, thereby engaging more students in the learning process. Students become the center of the learning experience by collaborating in real-life career-focused projects and problems that connect to their current interests and future pursuits.
- Help students develop effective education and career planning skills. By participating in professional work and engaging with employees who address exciting and challenging problems in their jobs, students recognize the need to perform well in high school, understand the educational pathways leading to a variety of rewarding careers, and pursue postsecondary education or training to achieve personal career goals.
- Reach out to the diverse group of students who arrive in class with widely different backgrounds and levels of academic preparation. Students who participate in integrated curricula are able to express their own interests, demonstrate their unique skills, and master high-level academic and technical material by applying a variety of learning styles.
- Provide students with knowledge of a wide variety of career-related fields by creating research opportunities and career connections with professionals in many jobs within a career area.
- Build community support for improving high schools through partnerships with industry, postsecondary education, and local community representatives. By engaging the key industry, education, and community-based stakeholders in their areas, these educators are creating support for schools and proactive education improvement policies, and providing future employment opportunities for their students.

The Building Blocks: Multidisciplinary Integrated Curriculum Units

Teachers are the key to success in creating a multidisciplinary integrated curriculum, but they can't do it alone. Effective curriculum integration requires an infrastructure that is different from the usual high school. Major pieces of this infrastructure include engaged and supportive administrators, class schedules that facilitate teacher collaboration, investments in finding and working with industry and postsecondary partners out-

Designing Integrated Curricula: What and Why?

side the high school and the district, sustained teacher enthusiasm and commitment, and a foundation of good integrated curriculum material.¹ Success also requires a clear road map. This practical manual or planning guide offers teachers that road map.

Rest easy—designing a multidisciplinary integrated curriculum does not require creating an entirely new set of academic courses. This manual presents a strategy for teams of teachers to enhance academic and technical instruction by introducing *multidisciplinary curriculum units* into existing courses.

These integrated curriculum units are relatively large, multidisciplinary projects that bring together

academic and technical subject material around a common career- or industry-related issue or theme. Through immersion in an important problem faced by industry professionals, students experience their studies as more coherent and see how they connect with the real world. An effective integrated unit improves instruction because it helps teachers address important academic and technical standards in a new way. It follows from students' needs and interests, provides real world relevance and application, and prepares students for success in college and career.

Creating a successful interdisciplinary integrated curriculum starts with this short list of foundational principles.



- Academic and Technical Rigor—Projects are designed to address key learning standards identified by the school or district.
- Authenticity—Projects use a real world context (e.g., community and workplace problems) and address issues that matter to the students.
- Applied Learning—Projects engage students in solving problems calling for competencies expected in high-performance work organizations (e.g., teamwork, problem-solving, communication, etc.).
- Active Exploration—Projects extend beyond the classroom by connecting to internships, field-based investigations, and community explorations.
- Adult Connections—Projects connect students with adult mentors and coaches from the wider community.
- Assessment Practices—Projects involve students in regular, performance-based exhibitions and assessments of their work; evaluation criteria reflect personal, school, and real-world standards of performance.

¹ For a more detailed discussion of the key infrastructure components necessary to build this kind of learning environment, go to the National Consortium on Health Science and Technology Education website <http://www.nchste.org>.

Designing Integrated Curricula: What and Why?

Why Invest the Time to Create and Use Integrated Curriculum Units?

For both teachers and students, incorporating integrated, career-themed curriculum units into a high school program offers a variety of potential benefits. Lipson, Valencia, Wixson, and Peters (1993) examined the research on integrated curriculum and student learning and described the following links between integrated curricula and positive student outcomes (cited in Lake 1994):

- Integrated curriculum helps students apply skills.
- An integrated knowledge base leads to faster retrieval of information.
- Multiple perspectives lead to a more integrated knowledge base.
- Integrated curriculum encourages depth and breadth in learning.
- Integrated curriculum promotes positive attitudes in students.

In addition to these direct positive effects for students, there are also several benefits for teachers who collaborate to create integrated curriculum units and lessons. Designing and delivering a multidisciplinary integrated curriculum

- helps teachers engage in and establish a culture of professional dialogue about student work;
- offers a way to address key academic and technical standards through applications that are more interesting and engaging to students;
- provides fertile ground for high-quality student projects and presentations that encourage students to develop both academic and technical skills;
- establishes a meaningful vehicle for making connections across academic disciplines;
- fosters professional growth by encouraging teachers to go beyond the boundaries of their academic and technical fields; and
- brings coherence to the curriculum by providing a thematic focus for a school program, a small learning community, or a classroom.

Our work with students also suggests that engaging in projects and investigating authentic problems from the world of work across several of their courses

- helps them make connections across academic disciplines;
- demonstrates the need to apply learning from several disciplines to solve real-world problems;
- introduces students to a wide range of career options and opportunities;
- connects students and their work to the larger community; and
- provides a better answer to the age-old question, “why do I have to learn this?” than, “because you need it to graduate or to go to college.”

What Does It Take to Build a Successful Interdisciplinary Integrated Unit?

Creating a multidisciplinary integrated curriculum requires a true partnership. School leaders, teachers, students, and industry and postsecondary partners all play key roles in the curriculum design process. What exactly is needed from all of these partners?

From the school:

- A common intellectual mission and commitment to high achievement for all students
- Agreement to implement a common curricular focus that will cut across disciplines
- A flexible schedule that allows integrated, multidisciplinary project work and involvement with the world beyond the school
- Common planning time allotted for teachers to formulate and facilitate the components of an integrated unit
- A funding model that supports the extra time and energy spent on developing and implementing the integrated units

Designing Integrated Curricula: What and Why?

From the teachers:

- Commitment and dedication to the common mission and focus
- Cooperation and teamwork among faculty and participating staff
- Shared responsibility in developing and implementing all aspects of the integrated units
- Agreement on core learning goals
- Agreement to build learning goals for the integrated curriculum unit by aligning with existing academic and technical content standards
- Risk-taking and flexibility
- Focus on deeper structures and understandings of their discipline
- Encouragement of student ownership

From the students:

- Commitment and dedication to the common mission and focus
- Cooperation and teamwork with other students, faculty, and participating staff
- Shared responsibility in the entire process of the integrated unit, including active participation in the Culminating Event

- Willingness to pursue a deeper understanding of the material and its connections across disciplines
- Willingness to synthesize complex concepts into a cohesive whole and to engage with community and industry partners in the learning and assessment processes

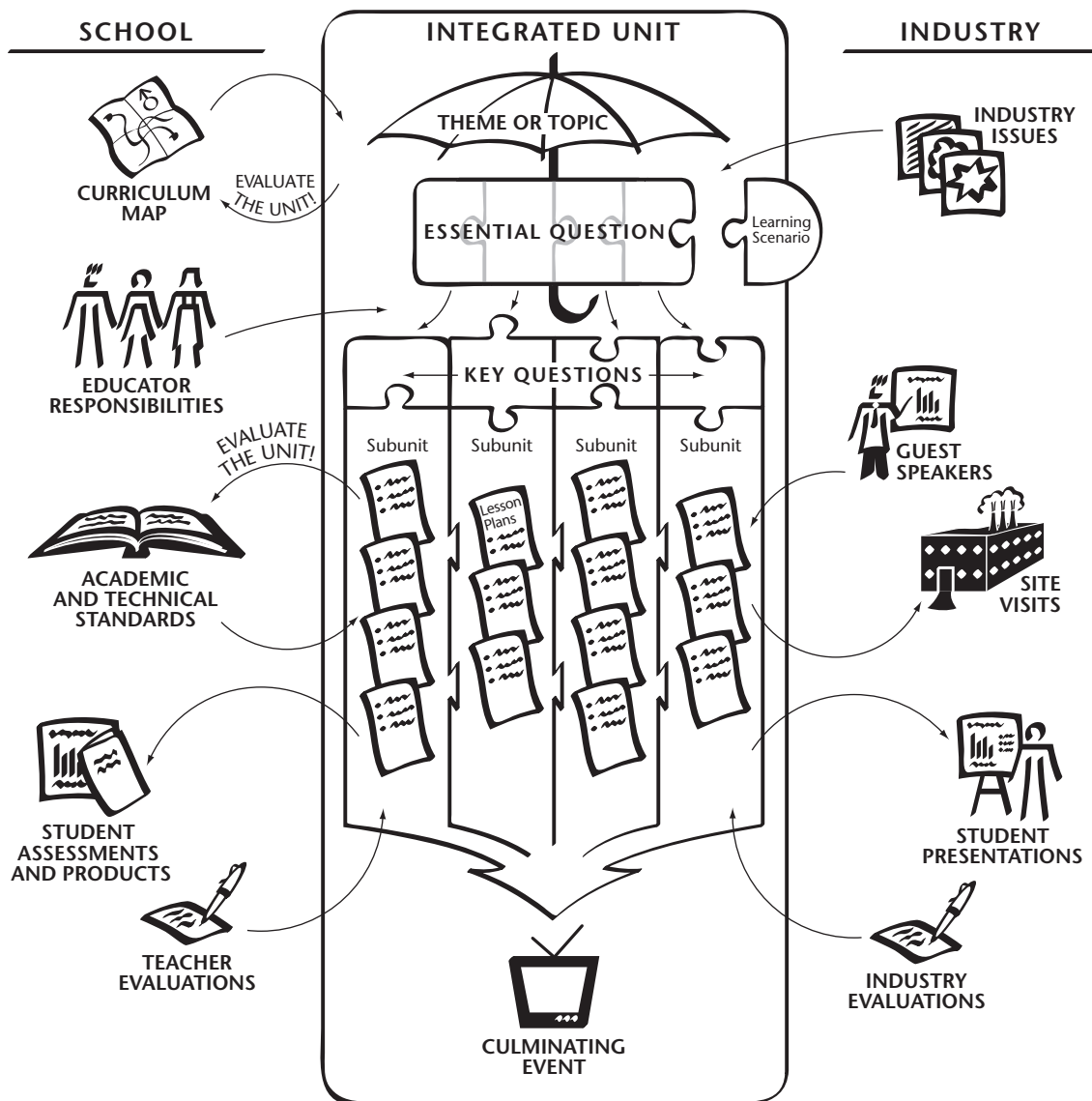
From industry and postsecondary partners:

- Commitment and dedication to the common mission and focus
- Volunteering as guest speakers for topics that relate to the thematic unit
- Enthusiasm about supporting students in their research and project work
- Investing in the students by assessing their ongoing work, offering feedback, and evaluating their culminating projects
- Offering feedback to teachers on curriculum development and related activities
- Offering feedback to students regarding accuracy and relevance of material presented in their projects
- Volunteering facilities as venues for showcasing the students' work outside of class

Designing Integrated Curricula: How?

In the remainder of this manual, we offer details on the major steps that teachers at 11 high schools across the United States have followed to design and deliver multidisciplinary integrated curriculum units. At a number of the high schools, teacher teams have tailored some of the steps to meet their unique needs, but all of them have followed the broad outlines of this model.

THE INTEGRATED CURRICULUM MODEL



Identify Themes through Curriculum Mapping

STEP 1

One of the major goals of the interdisciplinary integrated curriculum is to give students an opportunity to connect the content covered in various academic subjects to authentic applications in the world of work. Even highly technical and difficult material can be much more engaging when students see it in the context of an interesting, real-world problem that arouses their curiosity. Therefore, the first step in developing an integrated curriculum unit is to look at the important topics in the existing curriculum to see where connections can be made across academic disciplines and focused into an interesting and relevant career-related theme. This process begins with curriculum mapping.

- Using a chart similar to the one shown here, each teacher should map out the existing Scope and Sequence of topics covered in his or her course.
- In a group meeting and beginning with the health sciences teacher, each member of the instructional team should present a brief overview of his or her scope and sequence to the rest of the team. Having the health sciences teacher kick off this discussion helps the academic teachers start

thinking about career-themed applications that may be relevant to the major topics and concepts that they cover. For example, references to cigarette smoking (described as part of the Health Sciences Course Unit on the respiratory system) may lead an English teacher to think about an expository or persuasive writing assignment or help a social studies teacher to visualize a lesson on the role of tobacco and other commodities in economic development.

- This is also a time for academic teachers to identify concepts in their disciplines that are very important but difficult for students to grasp and address them through an integrated curriculum unit. Teachers can use the unit to reinforce learning by having students explore these important and challenging concepts through multiple applications in a variety of contexts. *Remember, the idea is to make connections across existing content, not to add additional content.*
- As a team, brainstorm the various connections that can be made across the academic subjects, linking them to the career and technical class.

Subject Area	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Health Science I	Integumentary System	Skeletal/Muscular System	Cardiovascular System	Respiratory System	Nervous System	Endocrine/Reproductive System	Immune System	Public Health/Insurance		
Biology	Introduction	Biochemistry	Cell Biology	Photosynthesis and Cellular Respiration	Genetics	Evolution	Ecology	Diversity		
Algebra I	Real Numbers	Solving and Graphing Linear Equations	Writing Linear Equations	Solving and Graphing Linear Inequalities	Systems of Equations	Exponents and Exponential Functions	Quadratic Equations and Functions	Polynomials and Factoring		
English Language Arts	Grammar	Technical Writing	Research Project	Literature Themes in Short Stories	Persuasive Essay	Literature Themes in Novels	Analytical Essay	Oral Presentations		
Spanish	Family and Friends	School	Food and Fun	The House	Shopping	Traveling	Experiences	Communication		
Physical Education	Fitness Fundamentals	Safety Features	Diet	Cardiovascular Fitness	Flexibility Training	Strength Training	Team Sports	Designing an Exercise Program		

Decide on the Topic of the Integrated Unit

STEP 2

Once the team is familiar with the content covered in each class, brainstorm to arrive at the major topic for the integrated curriculum unit. Select a topic that (1) reflects the career focus of the program; (2) supports the major learning goals of the school and the participating teachers; (3) can be addressed through multiple disciplinary lenses; and (4) advances instruction related to key disciplinary content standards. The topic should be drawn from real-world issues associated with professional work in the career/industry sector.

A good topic will have the following characteristics:

- Is relevant to students' lives and interests
- Reflects important contemporary or historical issues in a broad career area
- Is general enough to include all major academic disciplines
- Cuts across all disciplines and may be addressed from a variety of disciplinary perspectives
- Lends itself to student investigation and research
- Links to community issues and needs

The following are examples of broad topics that teams of teachers have used for multidisciplinary integrated curriculum units in health science and biomedical programs of study:

- Bioethics
- Communicable Diseases
- Complementary and Alternative Medicine
- Forensics
- Global Health Issues: HIV/AIDS
- Healthcare Careers
- Health Insurance
- Nutrition and Health
- Smoking
- Workplace Injuries

Brainstorm subtopics that “unpack” the general topic. These subtopics will later become the subunits that make up the overall integrated curriculum unit. These subtopics often arise from the specific connec-

tions of two or three academic subjects to the larger theme. For example, a curriculum unit on nutrition and health might include the following subtopics and academic disciplines:

- Effects of diet on individuals' health—Biology and mathematics
- Impact of general nutrition on public health—Biology and Social Studies
- Influence of culture on perceptions of good nutrition and health—Social Studies, English, and World Languages
- Changes in food technology and their influence on food production and consumption—Biology and English

Creating opportunities for students to demonstrate what they have learned and receive feedback about their progress is an ongoing activity throughout development of the integrated curriculum unit. Exactly what do you want students to learn? Before your team moves farther in the curriculum development process, this is a good point to start creating a list of possible learning outcomes, using the questions below as a guide. It is also the first opportunity for teachers to start identifying important disciplinary standards in their courses that can be addressed by teaching the integrated curriculum unit.

After settling on the final topic for the integrated curriculum unit, discuss the following questions in a team meeting:

- What do you want students to understand?
- What do you want students to be able to do?
- What resources have students accessed to complete their work?
- What interdisciplinary connections have students made?
- What connections have students made with the community?
- How have students demonstrated their learning?

Craft the Essential Question

STEP 3

The next step is to develop the Essential (or Driving) Question for the integrated curriculum unit. Be sure to consider the learning outcomes and the key academic and technical standards your team identified as you craft your Essential Question.

An Essential Question is the fundamental query that directs and drives the search for understanding across all of the participating subject areas. Everything in the integrated curriculum unit is studied with the goal of understanding and answering the Essential Question. Since the Essential Question is central to the design of the unit, it is important to consider the characteristics of a good Essential Question.

- The question reflects a problem that engages students in learning because it is interesting and relevant. Students want to figure out an answer.
- It relates to an open-ended problem with multiple solutions (no “yes” or “no” answer).
- There is no single correct answer or course of action. Students may arrive at a variety of different answers. And, they may not all agree about the best answer.
- The question is often controversial. The controversy heightens student interest and causes learners to raise their own questions.
- The question challenges students to solve real-world problems. The nature of the problem cre-

ates a natural bridge to professional work and industry and postsecondary partners.

- The complexity of the problem requires collaboration and thinking beyond recall. Students need to work in teams and build on each other’s skills and experiences.
- The question applies to more than one discipline, and full understanding requires learning in more than one discipline.²

The following are examples of Essential Questions that high school students are addressing through integrated curriculum units in health sciences and biomedical programs of study:

- How can we balance personal freedoms and society’s need to provide accessible, affordable health-care?
- How can workplace injuries be reduced and who is responsible for implementing these reductions?
- What role should government play in regulating biomedical research?
- How can medical science prevent worldwide disease epidemics in the future?
- Who should decide who gets medical care?
- What is the best way to reduce cigarette smoking? Should smoking be criminalized?

² This material on Essential or Driving Questions expands on material presented in Markham, Larmer, and Ravitz (2003), and Problem-based Learning (2001).

Identify Topical or Key Questions

STEP 4

Essential questions are designed to be “big” questions. They are the kinds of issues that drive professional work, public policy, scientific research, and often legislation. Answering the Essential Question requires students to address a variety of smaller, more targeted questions. We call these Topical or Key Questions. They are subject-specific questions that relate disciplinary content and standards to the Essential Question and connect to the overall theme.

- Topical or Key Questions are derived from the Essential Question, but are subject specific.
- Answering the entire set of Key Questions should provide the information necessary to answer the larger Essential Question.
- Key Questions focus attention on an issue that is authentic to a specific academic or technical discipline or a couple of disciplines.
- A Key Question may apply to more than one discipline, or it may be specific to a single discipline.
- Key Questions provide the vehicle for addressing specific curriculum content standards.
- Each Key Question is typically addressed by one or two lessons within the larger integrated curriculum unit.

Presented below are examples of Key Questions that relate to a specific health care theme and a particular Essential Question.

Topic: Health Insurance

Unit Title: Risky Business

Essential Question: How can we balance personal freedoms and society’s need to provide accessible, affordable healthcare?

Key Questions that are discipline specific:

- How do we pay for health insurance? (Health Science)
- Why is healthcare so expensive and where does the money go? (Health Science and Economics)
- What roles do governments play in promoting national health? (U.S. History, World History, and Government)
- How do mortality and illness rates vary in different parts of the world? (World Languages)
- How do genetics account for individual differences in various personal characteristics and health outcomes? (Biology and Health Science)
- What factors are used—and how—to arrive at the health insurance premiums individuals pay? (Algebra and Economics)
- What role might a fitness program play in helping individuals reduce their insurance premiums? (Physical Education and Health Science)

Identify Topical or Key Questions

STEP 4

Theme: Workplace Injuries

Unit Title: Safety First

Essential Question: How can workplace injuries be reduced, and who should be responsible for efforts to reduce workplace injuries?

Key Questions that are discipline specific:

- What body systems are most affected in workplace injuries? (Health Science and Biology)
- Are high school students susceptible to injuries at school? Which ones occur most often, and how can they be prevented? (Health Science and Physical Education)
- How can we demonstrate the cost effectiveness of an injury prevention program to the owner of a local business or the principal of a school? (Algebra and Economics)
- What is the history of workplace safety laws, and how do these laws differ in various countries? (U.S., World History, and World Languages)
- How can we communicate to diverse audiences the dangers, available treatments, and ways to prevent specific workplace injuries that are prevalent in a particular industry or occupation? (English Language Arts)

Now that your team has identified an Essential Question and appropriate Key Questions for each participating subject area, revisit the learning outcomes that you identified in Step 2. Evaluate whether or not students will be able to achieve and demonstrate these outcomes by investigating the Essential and Key Questions. If not, revise the questions accordingly.

After identifying the Essential Question and the subject-specific Key Questions, as a team you may want to brainstorm activities that link two or more academic subjects for true cross-curricular lessons (e.g., students in chemistry and geometry learn that one way to describe molecular bonding involves the angles of molecular formations).

Assign Responsibilities

STEP 5

Since one purpose of the integrated curriculum unit is to show students the interconnections among subjects, i.e., how one subject builds on and supports another, it is essential that teachers work collaboratively so that each may refer to related work that occurs in other subject area classes. Selecting a Team Leader for each integrated curriculum unit helps to ensure that important coordination tasks are performed. Identifying the roles and responsibilities of every team member at the start of the process helps to ensure harmony and success.

The Team Leader

- Monitors the team's progress in developing and implementing the integrated unit.
- Leads the Culminating Event for the curriculum unit.
- Serves as the liaison among faculty members as questions arise or issues need to be discussed.
- Communicates deadlines and instructions for producing the curriculum materials.
- Works with the Integrated Curriculum Coordinator to deliver instruction, establish deadlines

based on curriculum mapping, and communicate this information to the rest of the faculty.

- Works with the Work-Based Learning Coordinator to contact industry partners to serve as guest speakers or on the assessment panel for the Culminating Event.
- Schedules integrated-unit meetings and evaluates the progress of the integrated unit.
- Prepares the forms and rubrics for evaluating student work.

All Team Members

- Attend meetings set by the Team Leader in collaboration with the Integrated Curriculum Coordinator.
- Complete their assigned work in a timely manner.
- Complete the curriculum-mapping component related to their subject to ensure instruction is sequenced in a meaningful progression.
- Complete the necessary templates and lesson plans for submission.

Revisit and Revise the Curriculum Map

STEP 6

Now that the team has decided on the content that will be covered in the integrated unit, it is useful to reorganize the curriculum sequence where possible to bring these topics closer together within the year.

- Review the curriculum map constructed in Step 1.
- Highlight the topics covered for each subject area. Example 1 below shows topics that might be covered in an integrated curriculum unit on risky behaviors and health insurance.
- Discuss whether any topics must occur early or late in the unit (e.g., some lessons will only make sense if they precede or follow other lessons.)
- As a team, decide where the various curricular sequences can be reordered to support the flow of instruction of the integrated unit without disrupting the logical sequence of the subject matter. In Example 2 below, Health Science, English Language Arts, and Physical Education have reordered part of the curricular sequence to support the timeline of the integrated unit.
- Mathematics classes are typically the least able to reorder their sequence, so it may be best to begin this process by discussing their topics. However, remember that topics can be reviewed later in the year after the original instruction. In the example above, the Algebra teacher can revisit linear equations a second time and tie the lesson back to the health insurance theme.

Example 1. Highlighted topics covered for each subject area

Subject Area	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Health Science I	Integumentary System	Skeletal/Muscular System	Cardiovascular System	Respiratory System	Nervous System	Endocrine/Reproductive System	Immune System	Public Health/Insurance		
Biology	Introduction	Biochemistry	Cell Biology	Photosynthesis and Cellular Respiration	Genetics	Evolution	Ecology	Diversity		
Algebra I	Real Numbers	Solving and Graphing Linear Equations	Writing Linear Equations	Solving and Graphing Linear Inequalities	Systems of Equations	Exponents and Exponential Functions	Quadratic Equations and Functions	Polynomials and Factoring		
English Language Arts	Grammar	Technical Writing	Research Project	Literature Themes in Short Stories	Persuasive Essay	Literature Themes in Novels	Analytical Essay	Oral Presentations		
Spanish	Family and Friends	School	Food and Fun	The House	Shopping	Traveling	Experiences	Communication		
Physical Education	Fitness Fundamentals	Safety Features	Diet	Cardiovascular Fitness	Flexibility Training	Strength Training	Team Sports	Designing an Exercise Program		

Example 2. Reordered topics for Health Science, English Language Arts, and Physical Education

Subject Area	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Health Science I	Integumentary System	Skeletal/Muscular System	Cardiovascular System	Respiratory System	Public Health/Insurance	Nervous System	Endocrine/Reproductive System	Immune System		
Biology	Introduction	Biochemistry	Cell Biology	Photosynthesis and Cellular Respiration	Genetics	Evolution	Ecology	Diversity		
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Spanish	Family and Friends	School	Food and Fun	The House	Shopping	Traveling	Experiences	Communication		
Physical Education	Fitness Fundamentals	Safety Features	Diet	Cardiovascular Fitness	Flexibility Training	Strength Training	Designing an Exercise Program	Team Sports		

Set the Learning Scenario

STEP 7

The learning scenario is the “hook” that will engage students in the problem. Through the scenario the students can see a real-life application of the academic and technical knowledge and skills they will be mastering and applying to answer the Essential Question.

Learning Scenario Examples

Essential Question

How can we balance personal freedoms and society's need to provide accessible, affordable healthcare?

Learning Scenario—

Risky Behaviors and Insurance

The Ski Club's annual trip to Lake Tahoe is just around the corner. In a triumph of planning and lucky timing, the club managed to schedule the trip on the very same weekend that Squaw Valley was offering a packaged workshop on extreme aerials by a member of the United States Olympic Ski Team. The members of the club were ecstatic. Enthusiasm had reached a fever pitch when, two days before the trip, the principal announced that participating in the aerials workshop was forbidden. Despite student protests, Mr. Perry explained that the district office had informed him that the school's field trip liability insurance could not cover such a high-risk activity. If anything happened, the district's insurance premiums would rise. The district's budget was already stretched to the limit and they could not afford additional insurance. It might be possible to pass the insurance costs on to individual students, but the trip is already very expensive and not everyone can afford it. The club has been fund-raising for weeks to cover all the costs and coming up with more money at this late date seems unrealistic. The club president thinks

the district is exaggerating the risk. A district official has agreed to meet with representatives of the club to discuss the situation. What should be done? What arguments can the club present that will convince a skittish district? What is the relationship between risky behaviors and the cost of liability insurance?

Essential Question

How can work-related injuries be reduced, and who should be responsible for efforts to reduce workplace injuries?

Learning Scenario—

Workplace Injuries: Who's at Fault?

A construction worker falls off scaffolding while building our new high school and sprains his ankle. How could this have been prevented, and who is responsible for the unfortunate event?

Essential Question

What roles should various government and other agencies play in regulating performance-enhancing drugs? Should amateur and/or professional athletes be banned from using performance-enhancing drugs?

Learning Scenario—

Lessons From a Zero-Tolerance Drug Policy

Our high school has a zero-tolerance policy against the use of non-prescribed steroids and other performance-enhancing drugs. One of the student clubs on campus wants to invite a well-known professional athlete to campus as a motivational speaker, but the administration does not support this invitation because the athlete has allegedly used performance-enhancing drugs. How should the student group proceed? What arguments can be made for and against the invitation?

Establish Student Assessments

STEP 8

Integrated curriculum units offer teachers many opportunities to move beyond traditional paper and pencil tests. Teacher teams can design engaging and challenging performance-based formative and summative student assessments that are well matched to authentic teaching strategies. To create these assessments, it is valuable to work backwards. Begin with the summative Culminating Event and then design the formative student work products that demonstrate student learning and help them prepare for the Culminating Event.

Summative Evaluation: The Culminating Event

The Culminating Event is the place where students summarize and present their conclusions about the Essential Question, synthesizing their learning and research across all of the participating disciplines. At the Culminating Event teachers, community representatives, and industry partners also can assess and evaluate student learning in relation to many of the discipline-specific content standards that were the basis for the Key Questions. This summative evaluation is an ideal opportunity for students to display their higher-order thinking skills, problem-solving abilities, effective teamwork, written and oral communication skills, and the ability to integrate and apply knowledge gained across several academic and technical disciplines.

The following are some considerations that have helped teachers design effective and memorable Culminating Events:

- Encourage students to link their presentations to a real-world setting, ideally in the workplace; the setting will further reinforce career development goals identified for the curriculum unit.
- Involve the community and industry partners; participation at the Culminating Event will reinforce community and industry support for innovative high school improvement strategies and career-themed education.
- Allow students to present in groups or individually, depending on their strengths and learning

styles; use these alternatives as a way for students at all achievement levels to participate.

- Ask students to reflect on what they have learned and share their observations; explicitly tie results of these meta-cognitive activities back to the academic and technical content standards that were used to design the curriculum unit.

There are many different formats that are appropriate for the Culminating Event in a multidisciplinary integrated curriculum unit. The first time students engage in one of these comprehensive Culminating Events, teachers usually assign this major activity to the class. Subsequently, students who have previously participated in a Culminating Event can choose among several event formats or even design their own, thereby increasing their ownership of the learning process.

The following are several possible formats for a Culminating Event:

- Create and deliver a PowerPoint presentation.
- Hold a Science Fair with students presenting tri-folds and visual displays.
- Invite parents to view presentations (PowerPoint or tri-folds) at a Back-to-School night.
- Demonstrate a lesson or activity to industry partners, a community group, or a municipal agency.
- Develop a practical manual addressing the topic of the unit and proposing a resolution or plan of action.
- Create a website focused on answering the Essential Question.
- Hold a debate on the Essential Question.
- Develop policies and procedures that deal with the topic of the unit.

These kinds of Culminating Events require considerable student preparation and practice and teacher preparation and collaboration. Consequently, it is essential to establish and communicate deadlines well in advance for key classroom activities leading up to

the Culminating Event. This will allow students sufficient time to synthesize their research, prepare materials, and get ready for the presentation.

Formative Evaluation: Student Work Products for Feedback and Assessment

Integrated curriculum units also lend themselves to a variety of performance-based and standard formative assessments. Teachers can use these assessments to give students ongoing performance feedback and also avoid having too much of a semester's final grade rest on a single Culminating Event. This is particularly important as many of the Culminating Event formats rely on group activities and presentations and may include limited opportunities to assess and provide feedback to individual students.

The following are several examples of work products that help groups of students prepare for the Culminating Event and offer opportunities for formative feedback to individuals and groups.

- A written project outline, work plan, and schedule, or a classroom presentation on the team's project objectives and work plan
- A selection of readings (with an annotated bibliography) that individuals or teams recommend for outside reviewers who will later evaluate the Culminating Event
- A scoring rubric for outside evaluators to use in grading the team's Culminating Event
- A research paper on one of the Key Questions addressed in a specific discipline
- A set of drawings, designs, graphic representations, or a photographic portfolio related to the Essential Question or one of the Key Questions

Samples of Integrated Units Showing Formative and Summative Assessments (Student Work Products and Culminating Events)

The following are two examples of assessments for integrated units currently in place in high schools and a third hypothetical example.

Theme: Health Insurance

Unit Title: Risky Business

Essential Question: How can we balance personal freedoms and society's need to provide accessible, affordable healthcare?

Learning Scenario: School ski trip

Discipline-Related Formative Assessment Assignments:

- Art and English—Create business cards and brochures for an insurance company.
- English—Read excerpts from *Shattered Air* by Robert Madgic (about a tragedy at Yosemite National Park's Half Dome) and debate risky behaviors.
- Algebra—Calculate entries for actuarial tables and mortality rates for leading causes of death.
- History and English—Explore the history of medical insurance and write an expository essay on the issue of universal health insurance.
- Geography and English—Research and write about the geographical distribution of genetically linked diseases.
- Science—Chart biological pedigrees.
- Information Technology—Use appropriate computer software to prepare written reports, brochures, statistical tables, and presentations.
- World Languages and English—Research foreign insurance and medical information and write up results in both English and another language.
- Health Science and English—Research medical insurance and risky behaviors and write up research results.
- Physical Education—Create a Wellness Program/Prevention Plan for an insurance company.

Culminating Event: Small groups of students form their own insurance company. They prepare Science Fair tri-fold presentations where they present their insurance companies' programs and policies, including decisions about ensuring individuals who engage in risky behaviors. Community healthcare professionals use a rubric designed with student input to grade the student presentations.

Establish Student Assessments

STEP 8

Theme: Cultural Differences in Health Care **Unit Title: Second Opinion**

Essential Question: How can we ensure the safety and effectiveness of complimentary and alternative medical practices?

Learning Scenario: Excerpt from *The Spirit Catches You and You Fall Down*, Anne Fadiman's book contrasting Hmong and Western medicine's interpretations and responses to epilepsy

Discipline-Related Formative Assessment Assignments:

- Art, English, and Health Science—Design the lesson plan format and content for a lesson on cultural competency.
- English—Read an excerpt from *The Spirit Catches You and You Fall Down*; complete an expository writing assignment.
- Mathematics and Chemistry—Measure the bond angles of molecular compounds created in chemistry class.
- History—Write the script for an “elevator pitch” to a physician about why he or she should be culturally sensitive to patients from different countries.
- Geography and English—Research and write an expository essay about alternative healing practices, including their distribution and spread around the world.
- Chemistry—Create a model of the molecular structures of medicines and research the differences in drugs.
- Computers—Provide web-based research support for all classes participating in the curriculum unit.
- World Language—Research and write about healing practices in Spanish-speaking countries.
- Health Science and English—Study and write an essay about cultural difference in healing practices.
- Physical Education and English—Research and write about cultural differences in levels and attitudes about physical activity.

Culminating Event: Students present a culturally competent lesson plan to representatives from various state agencies and professional organizations. These individuals use a scoring rubric designed with student input to assess the lesson plan.

Theme: The Environment and Health **Unit Title: Save the Planet; Save Yourself**

Essential Question: How can we preserve the environment and enhance quality of life for future generations?

Learning Scenario: Profile of a physician who finds a cure for an environmental illness

Discipline-Specific Formative Assessment Assignments:

- Art—Paint a mural about an environmental issue.
- English and Art—Create a brochure that teaches members of the community about “eco-friendly” habits and their health benefits.
- Mathematics (statistics)—Survey students about their attitudes toward environmental issues; compile results and interpret the data.
- History—Evaluate and write about the environmental quality of life across historical periods.
- Geography—Research and present findings to the class about environmental standards in developing countries.
- Science and English—Research and write about air and water pollution, acid rain, and their effects.
- Information Technology—Build a website on environmental issues.
- World Language—Research environmental issues in Spanish-speaking countries.
- Health Science—Research technological advances in the medical field and their impact on the environment.
- Physical Education and Biology—Study pollution in the air and how it affects the respiratory and cardiovascular systems during exercise.

Culminating Project: Create a website that focuses on environmental and health issues.

Check Standards Alignment

STEP 9

The purpose of the integrated unit is to place important academic content in the context of meaningful, real-world problems *without* burdening teachers with additional content to cover in an already crowded school year. Teacher teams should ensure they are not adding unnecessary additional content to their teaching load by checking the unit topics against their state standards.

- Each teacher should compile a list of all the Key Questions identified in Step 4 that are relevant to his or her subject.
- Each content area teacher should identify which state academic or technical content standard(s) would be covered when answering each question, making note of any questions that do not fit under the standards.
- As a team, review any Key Questions that do not address content covered by the state standards. Some “standards-extraneous” questions are acceptable if they are critical to the overall topic and necessary to answer the Essential Question.
- If most of a single subject’s Key Questions do not fall within the relevant standards, consider whether the focus/contribution (and Key Questions) of that subject should be revised. The teaching of additional material is at the discretion of individual teachers.
- If many of the integrated unit’s Key Questions do not fall within relevant content standards, the team may need to choose a new Topic and Essential Question that have more connection to the state standards.
- If necessary, edit or delete items on the Key Question list. However, when making any changes, remember that Key Questions are intended to help students answer the Essential Question.

Connect with Industry and Postsecondary Partners

STEP 10

The Work-Based Learning Coordinator or another single individual should be responsible for making connections with partners outside the school. This will ensure that there is one point of contact between the school and industry or postsecondary partners.

The following are major Coordinator responsibilities that connect outside partners to the school to build students' education and career planning skills, support the program's academic and technical learning goals, and enrich students' experiences.

- Identify community resources, such as local professionals, businesses, educators, organizations, or libraries that can assist students in their research and project work.
- Invite community partners into the classroom for guest speaking opportunities or team teaching activities that relate to the integrated unit. Speakers can
 - personalize the topic of the integrated curriculum unit and provide additional, local context;
 - talk about how knowledge and skills from specific academic disciplines are used in the workplace (i.e., "In our department we use algebra, statistics, or persuasive writing to ...");
 - describe how they contribute to solving real-world problems in their jobs, and the kinds of teamwork, communications, and problem-solving skills that are needed to do this work; or
 - provide information about the range of more specific jobs and careers within their field and the kinds and levels of education and experience that are needed for these positions.
- Assemble an "expert panel" of local professionals with experience related to the unit topic. Ask panelists to assist in assessing and evaluating student work.
- Establish a network of community partners, including colleagues from other schools, colleges, and universities who can offer feedback on curriculum development and other activities.
- Schedule site visits to different local professional establishments, thus making the real-world connection for the students.
 - Individuals at site visit locations should be prepared to speak about connections to the curriculum topic and to important academic and technical standards.

Write Lesson Plans

STEP 11

Finally, it is time to start writing lesson plans. Each lesson plan should address one or more of the Key Questions relevant to your subject area. Lesson plans should be a complete set of instructions and materials for conducting a lesson: time estimate, materials list, description of lesson activities, ideas for differentiated instruction, etc., as shown in the example be-

low. The lesson plan should also include any relevant student worksheets or other teacher resources.

It is important to remember that lessons from each discipline should result in knowledge and products (student assessment artifacts) that contribute to answering the Essential Question and to the Culminating Event.

<i>Lesson Title Goes Here</i>	
Subject	Essential Question for This Unit <i>What is the essential question (it should go here)?</i>
Time # minutes	Objectives Students should be able to <ul style="list-style-type: none"> • First objective here • Second objective here
Materials Equipment <ul style="list-style-type: none"> • First piece • Second piece • Third piece 	Lesson Activities Lesson Springboard Introduction to the lesson goes here. This portion of the lesson serves as a “hook,” an engaging introduction to the upcoming content.
Resources <ul style="list-style-type: none"> • First piece • Second piece 	Lesson Development Activity Type <i>(e.g., Direct Instruction, Lab, Class Discussion, Small Group Work)</i> A description of the first activity should go here. Include ideas for differentiated instruction whenever possible.
Prior Student Learning Prior student knowledge necessary for this lesson should be described here.	Activity Type <i>(e.g., Demonstration, Guest Speaker, Simulation, Role-play)</i> A description of the second activity should go here.
	Lesson Closure A description of the lesson’s wrap-up should go here. This portion of the lesson should provide students with an opportunity to reflect on what they have learned, and provide teachers with a means to formally or informally assess the learning that has taken place.
	Possible Prior Misconceptions (if applicable) Common misconceptions that students hold regarding this lesson’s content should be provided here for teacher reference. Include correct information where necessary.
	Student Assessment Artifacts First student artifact (e.g., report, worksheet, paper, pamphlet, lab report, model, quiz) Second student artifact
	Variations and Extensions Describe possible extensions or variations on the lesson here, such as possible guest speakers, additional labs, or lessons.
NATIONAL AND STATE ACADEMIC CONTENT STANDARDS	NATIONAL AND STATE CAREER TECHNICAL STANDARDS
NATIONAL Authoring Agency and Standards Title List of relevant standards go here	NATIONAL Authoring Agency and Standards Title List of relevant standards go here
STATE Standards Title List of relevant standards go here	STATE Standards Title List of relevant standards go here

A Note on Differentiated Instruction and Integrated Curriculum

Students bring a variety of learning styles and needs to our classrooms. We can acknowledge and accommodate these differences and maximize each student's growth and success by differentiating instruction. According to an English teacher who writes and lectures on making students better thinkers by using language, differentiated instruction "refers to a variety of classroom practices that accommodate differences in students' learning styles, interests, prior knowledge, socialization needs, and comfort zones. On the secondary level, it involves a balance between the content and competencies expected on the mandated assessments and various pedagogical options to maximize durable learning" (Benjamin 2002).

A multidisciplinary, integrated, and career-themed curriculum combined with differentiated instruction is one effective pedagogical approach that creates learning with deep understanding and enhances *all* students' academic achievement. The integrated curriculum model described in this manual offers abundant opportunities for teachers to motivate students at varying academic performance levels, meet the needs of English Language Learners, and teach effectively in multi-ability classrooms.

Differentiated instruction within an integrated curriculum aims to meet every student's needs and increase the chances of durable learning by

- supporting a student-centered learning approach,
- offering diverse ways to explore core concepts,
- providing multiple opportunities to apply core concepts in varying situations,
- helping students examine *how* they learn and connecting that knowledge to *what* they learn, and
- nurturing students' interests in mastering rigorous academic content and exploring challenging careers by demonstrating that they can achieve academic success.

Forms of Differentiated Instruction

There are several forms of differentiated instruction that teachers can use within a multidisciplinary integrated curriculum. According to Tomlinson (2001), Oaksford and Jones (2001), and Hall (2002), teachers can differentiate instruction in terms of content, process, or products.

- *Content differentiation* offers variety in the ways that students can access information. Teachers have long used one traditional form of content differentiation: students select among topics for a homework assignment. Teachers can also give students options about the ways they take in information, such as viewing a video, doing individual research, or working within a team to complete a research assignment. Finally, teachers often provide direct instruction while also using other methods for delivering content.
- *Process differentiation* gives students alternative ways to make sense of ideas. For example, students can select which classroom team they will join based on the approaches various teams will be using to conduct their research. One team may use library and Internet research, a second may conduct interviews with working professionals, and a third may make systematic observations during a field trip or site visit. Students reflect on their preferred learning style and choose a team based on what works best for them.
- *Product differentiation* provides students with multiple ways to express what they know. Teachers frequently use this form of differentiation by employing several assessment modes, such as written reports, short answer tests, and class presentations by individuals or groups. Teachers can also offer students choices about how to present the results of their research: they can construct statistical tables, create graphical models, write-up narrative case studies, or present a dramatization.

How Does Differentiation Apply Directly to Integrated Curriculum Units?

The following are some examples of places in an integrated curriculum unit where teachers can differentiate instruction and also build student engagement in learning by offering students choices:

- Individual students or groups of students may select a research topic related to the unit's Essential Question.
- Students may select among various modes of data collection to address Key Questions in a particular class: library and Internet research, surveys, interviews, field observations, or laboratory work.
- Students may choose the mode of assessment that will be used to evaluate their Culminating Event. Among students who have been working as a team, some may choose to complete a research paper; others may produce a video, while still others may create a PowerPoint presentation. Together, all of the products will make up the Culminating Event for the team—and contribute to a team grade—but individual students also will be assessed in different ways on their particular pieces of the project.

Evaluate the Unit

STEP 12

After all the pieces are in place, it is time to step back and evaluate the entire integrated unit. It is helpful to consider the following questions.

Engagement

- Is there student voice in this project?
- What impact will this project have beyond the classroom? For the student? For the community?
- Are the connections to the real world relevant to the students?
- Are there multiple connections that will work for students with different interests and backgrounds, and at different academic achievement levels?

Essential Question and Key Questions

- Is the question important to students?
- Do the students understand the question?
- Will researching and answering the set of Key Questions allow students to answer the Essential Question?
- Are the Key Questions subject specific? Do they address subject-specific content standards?
- Do these questions have value beyond the student and also address broader community issues?
- Do the Essential Question and the Key Questions drive investigation?
- Is the Essential Question applicable across disciplines?
- Is the language of the Essential Question broad enough for students to make connections across several disciplines?

Standards

- Do the Essential Question and the project align with both academic and technical standards?
- Are all lesson plans aligned to content and technical standards?

- Do the students understand, and can they articulate, how the standards align with and influence the project?
- Does the unit include multiple assessment opportunities that are aligned to standards?

Lessons and Activities around Processes and Content

- Do all lessons contribute to addressing the Essential Question?
- Do the class activities allow students to answer the Key Questions?
- Does each subject contribute a final product to the Culminating Event?
- Do the lessons and activities provide students with the necessary skills and information to produce the Culminating Event?
- Does the Culminating Event challenge students with content that is complex, ambiguous, provocative, and personally challenging?
- How is each lesson/activity of value to the project and in developing deeper understanding of the Essential Question and Key Questions?
- Do the lesson plans include strategies for differentiated instruction?
- Do the lessons, activities, and assessments include opportunities for students to reflect on what they have learned?

Community Stakeholders (e.g., industry professionals)

- Do community stakeholders have a genuine interest in the product/performance/topic?
- Are the community stakeholders properly informed on the project and assessment methods?
- Do the community stakeholders represent the cultural make-up of the students?

Integrated Unit Logistics

Addressing a variety of logistical issues at the start of the curriculum design work and throughout the year will help make the process go smoothly. One of the most important logistical tasks is to identify the individuals who will be responsible for each activity. The Task Assignment Worksheet at the end of this section can be used to record these responsibilities.

Logistics That Apply Throughout Work on the Integrated Unit

- Establish and record important dates, deadlines, and timelines
 - Date for the kick-off of the curriculum unit—in which class?
 - Timelines for curriculum-related lessons in each class
 - Date for meetings of the integrated curriculum team
 - Dates for periodic check-ins to assess progress and make adjustments
 - Due dates for discipline-specific assessment artifacts
- **Final products in discipline-specific classes: Final products due in classes should be at least 2 weeks before the Culminating Event to allow time for last minute adjustments.**
- Date of the Culminating Event
- Identify and prepare for in-school and off-site activities with industry and postsecondary partners
 - Identify and schedule guest speakers.
 - Identify and schedule experts for classroom team teaching.
 - Identify and schedule lunch speakers.
 - Establish locations and schedule visits to off-site facilities.
 - Invite experts to participate in assessments (formative and the Culminating Event).
- Schedule computer laboratory and library use

Culminating Event Logistics

- Create a schedule of what the day will look like—bell schedule and agenda.
- Identify the evaluation audience—who are the students presenting to?
- Create an invitation list—who is invited to attend presentations?
- Plan for childcare—if a family event, this needs to be provided.
- Plan to provide refreshments—who are we serving, and what will we serve; how will this be funded?
- Make room arrangements—where are groups presenting and how are students being dispersed?
- Create assessment rubrics for evaluators.
- Identify teacher responsibilities—floaters, room assignments, etc.
- Arrange for coverage by substitute teachers.
- Identify needed materials—Tri-folds, LCD projectors, memory sticks, etc.
- Is off-site transportation needed?—pick up/drop off times and locations (3 weeks prior).
Permissions slips for all students if going off site
- Are chaperones needed?—will classes be covered by substitutes or other teachers (3 weeks prior)?

Integrated Unit Evaluations: Teacher, Student, and Industry Partners

After the Culminating Event is over and all students have completed their work, teachers can meet as a team to reflect on the integrated unit, identify what went well, and determine what could be done differently the next time around.

Some Ideas for Evaluating the Integrated Curriculum Unit

Teachers

1. What links did you make between the subject areas?
2. What links did you make with the community?
3. What aspects of the integrated unit engaged and inspired the students?
4. How effectively did your lesson plans incorporate academic content and career and technical standards?
5. What would you do differently next time you deliver instruction regarding this unit?
6. What ideas and suggestions do you have for improving the integrated unit process?
7. **How did the integrated unit enhance student learning?**

Students

1. What skills have you developed in the course of this integrated unit?
2. What would you say is the major lesson you have learned about the theme of this integrated unit?
3. How would you apply the knowledge you learned to help your community?
4. What connections did you make with industry partners related to your integrated unit?
5. What career opportunities have you discovered?
6. What would you do differently if you designed this unit?

Industry and Postsecondary Partners

1. In what capacity did you help the students with their integrated unit projects?
2. How does the theme of the integrated unit relate to your field of work?
3. How in depth was the research the students presented?
4. What components would you add or remove from the Culminating Event?
5. What suggestions do you have for improving the integrated unit?

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