

21st Century Skills Map – Project Management for Learning

DESIGNED IN COOPERATION WITH THE PMI EDUCATIONAL FOUNDATION*

The P21 advocates and supports the integration of 21st Century Skills into K-12 education so that students will be well prepared for learning, work, citizenship, and life in the 21st Century.

Introduction

The world runs on projects – everyday life projects like planning and planting a garden, school projects like devising and performing experiments for a science fair project, and work-world projects like designing and building a bridge or developing and delivering a community program to reduce energy use.

Managing and leading projects are essential life skills, learning skills and career skills.

As a set of life skills, project methods are learned starting at a very young age and continue throughout one's life.

As a progression of learning skills, students begin applying project approaches to their learning in primary grades and continue through adulthood as lifelong learners.

And as a series of developing career skills, students begin learning the professional aspects of project management in secondary school and continue their learning throughout their careers, with some choosing professional project management as a profession:

Project Management and Leadership Pathways



In a very real sense, our own lives are far-reaching master projects, made of thousands of short- and long-term projects in living, learning, working, relating and creating.

Much has been learned about how to (and how not to) effectively manage and lead projects – how each step in a project can be thoughtful, collaborative, productive and creative; and how the learning gained in each project can empower students with the knowledge, skills, and personal qualities most needed for success throughout life.

* More information about the PMI Educational Foundation (PMIEF) at: www.pmief.org

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Overview

This Skills Map focuses on project management and leadership as a set of proven methods and activities that can turn classroom and community learning projects into powerful and memorable experiences that build competence in nearly all the skills in the [P21 Framework for 21st Century Learning](#).

This Skills Map focuses on project management and leadership as a set of proven methods and activities that can turn classroom and community learning projects into powerful and memorable experiences that build competence in nearly all the skills in the 21st Century Skills Framework.

Teachers who use learning projects in their classrooms and community know how incredibly motivating and engaging they can be for students. They also know how challenging learning projects can be – especially without clear guidance in how best to plan, organize, set up, launch, lead, manage, and make the most of all the moving parts in a rich learning project.

Applying the science and craft of project management to education requires some “translating” of professional terms and concepts into words, ideas and images more readily accessible to educators and learners.

For this skills map, the professional terms used by The Project Management Institute (PMI) to describe the stages of a project are translated into more accessible, teacher- and student-friendly terms that fully align with the PMI professional project model* (also see the respective professional-career, education-learning, and life skills project cycle graphics in [Appendix Three on page 55](#)):

PMI Professional-Career Project Cycle Terms	Aligned Education-Learning Project Cycle Terms	Aligned Life Skills Project Cycle Terms
Initiating	Define	Set a Goal
Planning	Plan	Plan the Steps
Executing	Do	Do It
Monitoring/Controlling		
Closing	Review	Review It

This Skills Map not only shows which of the 21st Century Skills (defined in [Appendix Two – 21st Century Skills Definitions, pages 51-54](#)) are learned through the four stages of a learning project, it also provides tips, guidance, and example projects that incorporate methods that make managing and leading learning projects more straightforward, more productive, and a deeper and more exciting learning experience for both teachers and students.

*Throughout this Guide the Learning Project Cycle terms are followed by the professional PMI terms in parentheses to show their alignment to the professional model: Define (Initiating), Plan (Planning), Do (Executing), Review (Monitoring/Controlling, Closing).

Overview (continued)

This Skills Map not only shows which of the 21st Century Skills are learned through the four stages of a learning project, it also provides tips, guidance, and example projects that incorporate methods that make managing and leading learning projects more straightforward, more productive, and a deeper and more exciting learning experience for both teachers and students.

› [View Appendix Two](#)



School-to-work connections are also highlighted in the example projects, linking the skills students develop in their projects to the skills in demand across a variety of careers and work opportunities. The symbols used for career connections are from ConnectEd's Linked Learning Career Pathways. (http://connectedcalifornia.org/direct/files/resources/LeadingHSTransformation_2012_0925.pdf)

For both teachers and students, learning how to effectively manage and lead projects can be the key to more deeply engaging and self-motivated learning, more productive collaborations and teamwork, more compelling communications and presentations, and to a more creative and successful work life, an active community life, and a lifetime of enjoyable learning.

Source: ConnectEd's Linked Learning Career Pathways, <http://www.connectedcalifornia.org/>

The Projects

The following projects have been selected for their excellence in applying project management methods to learning projects across a number of grade levels and subjects.

There are five projects detailed below from Grades 2 through 12, covering subjects ranging from art and language to science and project management itself.

Each project had the benefit of coaching help from a PMI-certified Project Management Professional with expertise in adapting professional project management principles to classroom education in schools.

The organizing principle for each project is the stages of the Learning Project Cycle or “Wheel” – Define, Plan, Do and Review (Initiating, Planning, Executing, Monitoring/Controlling, Closing) – shared by both teachers and students (see [Appendix One – Learning Projects Primer on pages 31-50](#) for further explanations and guidance on managing and leading learning projects):

EACH PROJECT IS DETAILED IN FIVE DESCRIPTIVE TABLES:

General Project Description

- Project Goals
- Project Types (Inquiry, Design, Debate, Expression)
- Subject Areas (Language Arts, Art, Design, Science, etc.)
- Related Career Pathways (Arts & Media, Energy, Information Technology, etc.)

Define (Initiating) Stage

- Tools/Activities
- Project Examples
- 21st Century Skills Developed

Plan (Planning) Stage (details as above)

Do (Executing, Monitoring/Controlling) Stage (details as above)

Review (Closing) Stage (details as above)



STUDENT WHEEL



TEACHER WHEEL

Source: © 2009 21st Century Skills, Learning for our Life and Times—Courtesy of Jossey-Bass

Projects from the Future – Puppet Theatre Project

PROJECT OVERVIEW

Project Description



Students in a Grade 2 class in Milan, Italy were reading classical and modern fairy tales, answering questions and having discussions about the structure of the tales – characters, plot, conflicts, resolutions, moral of the stories, etc.

With the help of the art teacher and a Project Management coach from a local PMI chapter, the students designed and created a puppet theater to perform a puppet show based on their selections of fairy tales they thought would work best for a puppet show; they crafted the puppets, sets, props, etc.; practiced the show until they felt ready to present it to the public; and then organized and managed the public performance.

Project Goals

- To read and hear a variety of classical and modern fairy tales, and answer critical thinking questions related to the tale's characters, plot, conflicts, resolutions, moral of the stories, etc.
- To choose a selection of fairy tales to put on as puppet shows, reflecting on why the chosen tales would be best for a puppet show
- To design and build a puppet theater and the puppets, props, scenery, etc., needed to perform the puppet tales
- To practice the performance of the puppet shows until ready to present to the public
- To plan and present a series of puppet shows to the public

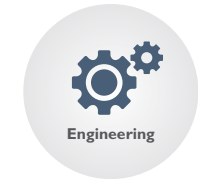
Project Type

- Inquiry
- Design
- Expression

Subject Areas

- Language Arts
- Art & Design
- Math

Career Pathway Links



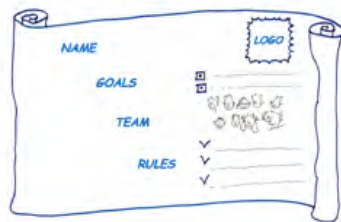
Source: © Project Management Institute Northern Italy Chapter

Projects from the Future – Puppet Theatre Project (continued)

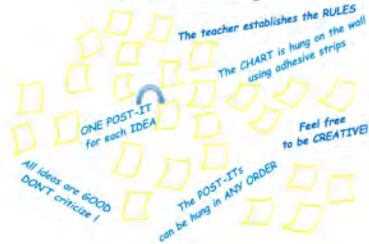
DEFINE (INITIATING) STAGE

Project Management Tools/Activities

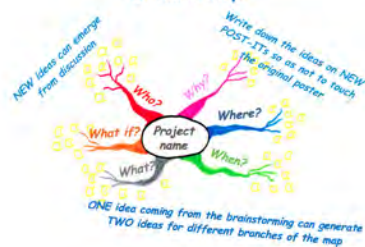
1. Project identity card



2. Brainstorming



3. Mind map



Examples of Project Methods Used in the Projects

The project involved two teachers – a language arts and art teacher, one classroom of students, their parents and families, and local PMI chapter project coach, who developed a series of engaging tools with his spouse, a primary grade educator – the Projects from the Future tools – to help guide students through their projects. The PMI Northern Italy Chapter also provided some funding for materials and expert help in constructing the puppet theater.

Puppet theatre - Involved actors



Puppet theatre - Brainstorming



Brainstorming

Students visually brainstormed all the parts of the project.

Mind Map

They then organized the parts of the project into similar functional clusters, creating a Mind Map of the overall project.

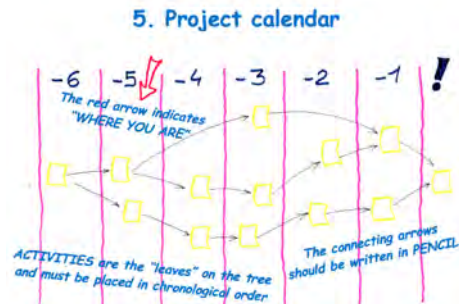
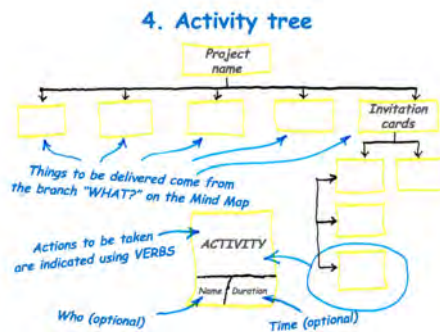
21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy

Projects from the Future – Puppet Theatre Project (continued)

PLAN (PLANNING) STAGE

Project Management Tools/Activities

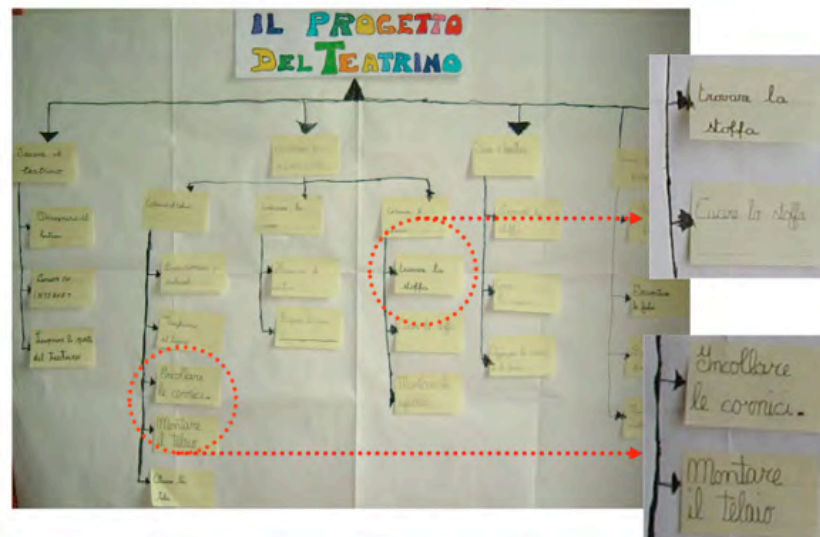


Examples of Project Methods Used in the Projects

Activity Tree

The students created a list of activities with the detailed tasks each activity needed to be successful under each category – an Activity Tree, which later turned into a Project Calendar when deadlines and names of team members responsible for each task were added.

Puppet theatre - Activity tree



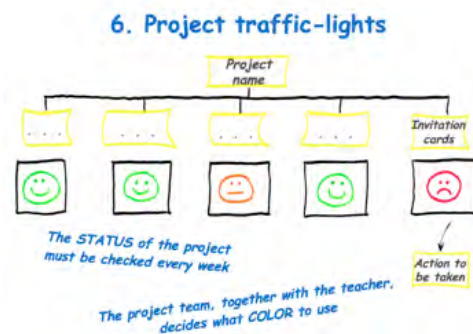
21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy
- Flexibility and Adaptability
- Initiative and Self-direction

Projects from the Future – Puppet Theatre Project (continued)

DO (EXECUTING, MONITORING/CONTROLLING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects

As the students progressed in carrying out each of the activities of the project, they regularly assigned a color (and happy, neutral or sad faces) to a Traffic Light Chart that monitored the progress of important tasks:

Green Light – all is going well, **Yellow Light** – some worries and caution about the progress, and **Red Light** – this needs critical attention now!

Adjustments were made if necessary to the Project Calendar and the resources needed – more student workers, more materials, more help, etc. – until that activity was back in the Green Light zone.

21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy
- Social and Cross-cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

Projects from the Future – Puppet Theatre Project (continued)

REVIEW (CLOSING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects

Each student created a “Lessons Learned” chart that answered the following questions:

- What new things did I learn?
- What was the most difficult thing?
- What was the most enjoyable part?
- What would I change for the next time?
- What could I have done better?

This led to sharing of each of the students’ Lesson Learned charts and some additional reflections, as well as a party celebration for a Puppet Theater project well done!

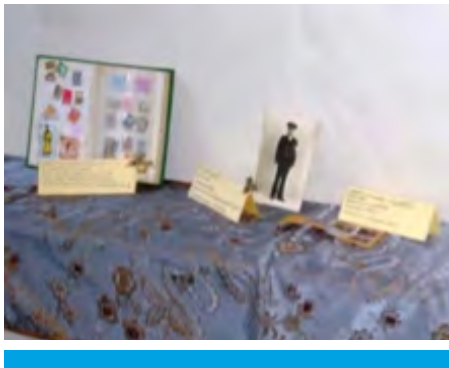
21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Flexibility and Adaptability
- Initiative and Self-direction
- Leadership and Responsibility

Projects from the Future – Art Exhibition Project

PROJECT OVERVIEW

Project Description



Students in an elementary school in Milan, Italy planned, organized and ran a large exhibition of student portfolios of art, showing development of artistic and project skills across Grades 3, 4 & 5.

Students planned and designed the exhibition space, designed and created the invitations to the exhibition, and a web page to advertise the event. On the exhibition night, students explained their art projects to parents, community members, and other students, and ran a sale of home-made artistic “gadgets” to raise funds for a local charity.

Project Goals

- To showcase the developing creative and expressive skills of each student in a gallery-like showcase event
- To develop the project management skills of students in planning, designing, and running the art exhibition
- To develop technical communication and reflection skills of students as they present their project work to the public and advertise the event on the web
- To develop student entrepreneurial and marketing skills through raising money for local charities by selling small pieces of student artwork – “gadgets”

Project Type

- Design
- Expression

Subject Areas

- Art & Design
- Language Arts
- Technology Skills

Career Pathway Links

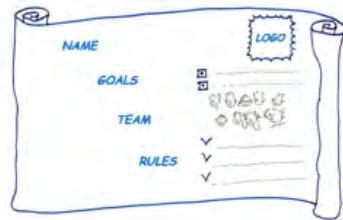


Projects from the Future – Art Exhibition Project (continued)

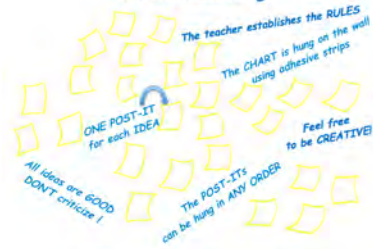
DEFINE (INITIATING) STAGE

Project Management Tools/Activities

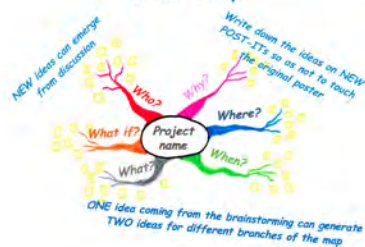
1. Project identity card



2. Brainstorming



3. Mind map



Examples of Project Methods Used in the Projects

Art Exhibition - Project Identity Card

The project:

- Year: 2005/2006

The team:

- Grade: 5A
- Teachers Laura Bollina, and Barbara Quaranta



The goals:

- Illustration didactic program developed in three years through the study of art
- Organization and exhibition ground with the utmost care to make visitors welcome and collection of offers for charity aim through the sale of small gadgets

Students in grades 3-5 planned, organized and managed an art exhibition featuring student artwork from projects completed over this three-year period. They also created a variety of artistic “gadgets” that were sold to raise money for local charities.

In their Brainstorming and Mind Mapping project activities, the students outlined all the things that must be done to have a successful art exhibition and sale, from choosing the artwork to be displayed, to advertising and inviting attendees to the exhibition.

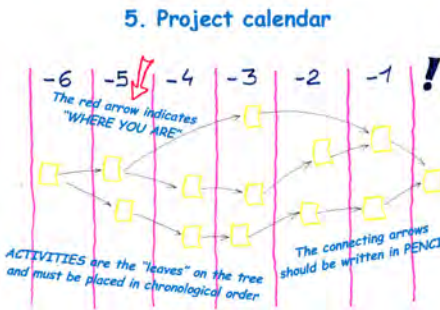
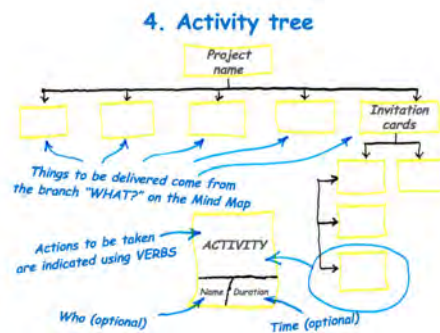
21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy

Projects from the Future – Art Exhibition Project (continued)

PLAN (PLANNING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects



In developing the Activity Tree and the Project Calendar, the students organized and sequenced all the tasks necessary for project success, assigned deadlines and owners for the tasks and mapped out the workflow for the entire project.

21st Century Skills

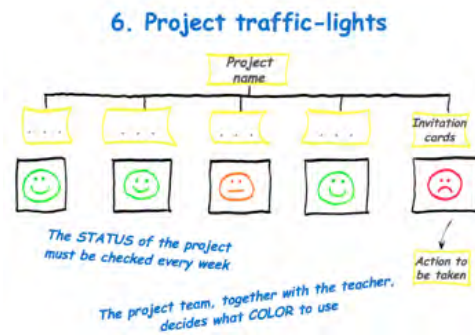
- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy
- Flexibility and Adaptability
- Initiative and Self-direction



Projects from the Future – Art Exhibition Project (continued)

DO (EXECUTING, MONITORING/CONTROLLING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects

As the work proceeded of getting all the art exhibits ready, sending out invitations, organizing the layout of the exhibition, considering how the best flow of experiences should happen for the attendees, how the “gadget” sale should be organized and run, etc., the students found that parts of their activity plan and calendar needed adjustments.

The **Red Light, Yellow Light, Green Light** Traffic-lights Chart helped the students re-prioritize their work and see that certain critical resources (like more table cloths for the exhibit tables, a better way to deal with cash sales at the gadget table, and adjustments to the plan when a student was absent, etc.) had to be addressed to keep the project on schedule, ready for the opening evening of the exhibition.

21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy
- Social and Cross-cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

Projects from the Future – Art Exhibition Project (continued)

REVIEW (CLOSING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects

Each student created a “Lessons Learned” chart that answered the following questions:

- What new things did I learn?
- What was the most difficult thing?
- What was the most enjoyable part?
- What would I change for the next time?
- What could I have done better?

This led to sharing of each of the students’ Lesson Learned charts and some additional reflections, as well as a party celebration for an Art Exhibition project well done!

21st Century Skills

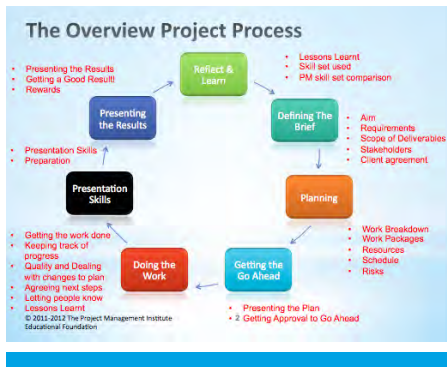
- Critical Thinking and Problem Solving
- Communication and Collaboration
- Flexibility and Adaptability
- Initiative and Self-direction
- Leadership and Responsibility

Source: © Project Management Institute Northern Italy Chapter

Project Management Skills Program – Olympic Stadium Design

PROJECT OVERVIEW

Project Description



Recognizing that all students need to be 21st century learners equipped with life, learning and career skills that will prepare them for further studies and their future careers, Mill Chase Community Technology College, a Hampshire secondary school for students 11-16 years old, embarked on a program to help their students learn the essentials of managing and leading real world projects.

With support from project managers in the PMI United Kingdom Chapter and education consultants, a pilot program was launched with the 11-year-old students and their teachers, the first in a series of projects being a team challenge to design a world-class Stadium for the then upcoming London 2012 Olympics.

Project Goals

Project Management & UK Education Framework Learning Goals – to develop:

- Independent inquirers
- Team workers
- Effective participants
- Self-managers
- Reflective learners
- Creative thinkers

Olympic Stadium Design Brief Goals:

- Develop a winning stadium design for the 2012 London Olympics and Paralympics
- Demonstrate how your design will continue to benefit the local community and the country after the Olympics
- Present and defend your design to a panel of judges

Project Type

- Design
- Inquiry

Subject Areas

- Sports & Physical Education
- Architecture, Art & Design
- Science & Engineering
- Maths
- Language Arts
- Technology Skills

Career Pathway Links

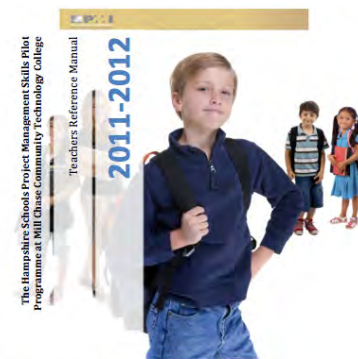


Source: © 2011-2012 Project Management Educational Foundation
Prepared by Simon Robertson, Nick Symes and Ryland Lee.

Project Management Skills Program – Olympic Stadium Design (continued)

DEFINE (INITIATING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects

Prior to the start of the project, the project teachers engaged in an in-depth training with PMI Project Managers and educational consultants, experiencing all stages of the project cycle as they learned about key methods and tools to help manage the moving parts of each project phase.

Acting as the Project Client – the teacher introduced the Project Brief that briefly described the Aims and Requirements of the Olympic Stadium design competition.

The student teams then responded to the Aims and Requirements in the Brief with their initial ideas for a solution in a project Scope statement (what the project will do and what it won't do) and then outlined the project Deliverables – their designs, models, presentations, etc. – that they would develop as part of the project.

The students also filled out a Stakeholders Table that identified each person with a key interest in the project, their role, what they wanted from the project team, and how the team planned on giving them what they needed.

Finally, each project team summarized the entire definition of the project, its Scope, Stakeholders and Deliverables, in a presentation and discussion with the Client (the teacher or business member), ending with a formal signing by all the team members and the client of the final Client Agreement document.

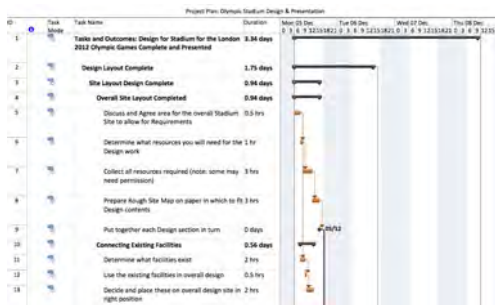
21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy

Project Management Skills Program – Olympic Stadium Design (continued)

PLAN (PLANNING) STAGE

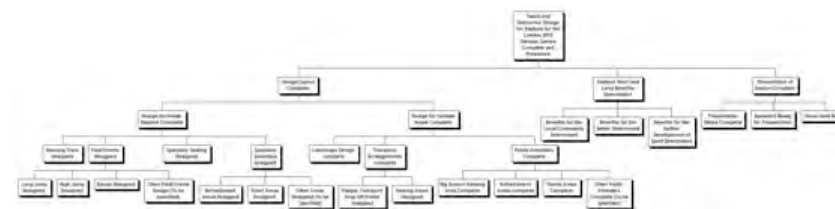
Project Management Tools/Activities



Examples of Project Methods Used in the Projects

The Planning Stage involved a number of project team activities, including creating:

- **A Work Breakdown Structure (WBS)** – breaking down what needs to be done into manageable work chunks, as in this sample Tree Map diagram:



- **Work Packages** – breaking down the larger scale WBS into tasks that each team member will be responsible for; in what sequence the tasks should be done, estimating how long each task will take, what resources will be needed, when must each task be done, etc.
- **A Project Schedule** – often done in an electronic project schedule format such as a Gantt chart or Flow Map outlining each task in sequence, start and end dates and required resources for each task
- **A list of Risks to the project** – where things can likely go wrong and what can be done to minimize the chance that these will happen (often adjusting the Project Schedule to hedge against the risks), and if they do happen, what will “Plan B” (and C and D) look like

The final step in the Planning Stage is to get the “Go Ahead” from the Client to continue on to the next stage of the project cycle.

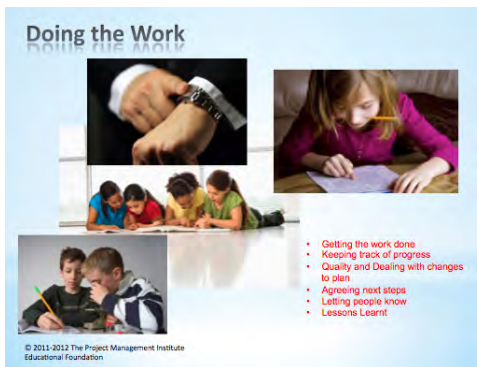
21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy
- Flexibility and Adaptability
- Initiative and Self-direction

Project Management Skills Program – Olympic Stadium Design (continued)

DO (EXECUTING, MONITORING/CONTROLLING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects

The Do Stage is where the research, design, graphics, documents, diagrams, models, presentation slides, presentation practicing, etc., were all accomplished – where the real work of fulfilling the project plan, creating the design solutions, and preparing to present the results were done.

It is important in this stage to continually Track Progress, Monitor the Quality of all project artifacts and deliverables, communicate and collaborate across the team and with the stakeholders, Adjust the Schedule and work plan as needed, and to note lessons learned along the way.

To track progress, project teams filled out a Status Report at the end of each week of the project, answering questions such as:

- Is the project going according to plan? Why or why not?
- Do you need to make any changes to the plan?
- What do you have to do next in the project?
- Does everyone know what's going on, what to do and when?
- Is what is being produced going to please the Client? Is quality good?
- What lessons have you recently learned from doing this project?

To effectively communicate the design solutions and present highlights of the project work each team has accomplished, effort was put into developing Presentation Skills, with time to practice and receive coaching before the final presentations to the judges and the attending audience were performed.

21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy
- Social and Cross-cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

Project Management Skills Program – Olympic Stadium Design (continued)

REVIEW (CLOSING) STAGE

Project Management Tools/Activities



Examples of Project Methods Used in the Projects

The students' design solutions to the Olympic Stadium challenge were presented to a panel of judges, who scored each team on their design, skills learned, project management skills, and presentation factors:

- Design fit to needs, quality and creativity of proposed solution
- Evidence of desired skills learned in the project
 - Research and inquiry skills
 - Teamwork, leadership and participation skills
 - Self-management and self-direction skills
 - Self-reflection and self-correcting skills
 - Creative thinking and doing skills
- Evidence of understanding and application of good project management principles and practices
- Presentation Skills
 - Structure and organization of ideas and content
 - Delivery - clear speaking, connecting with audience, answering questions well, etc.
 - Effective use of visual media and physical models
 - Teamwork in group presentations

Each teacher and student provided an overall evaluation of the entire project so that the lessons learned in this pilot project could be applied to future projects in other grades and in other schools.

Some of the areas indicated for improvement included the need to start with simpler, shorter projects and work up to a complex one; further simplification of project terminology for young students; more time for teacher development; more practice using project tools and templates; and more student work time and teacher collaboration time.

21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Flexibility and Adaptability
- Initiative and Self-direction
- Leadership and Responsibility

Source: © 2011-2012 Project Management Educational Foundation
Prepared by Simon Robertson, Nick Symes and Ryland Lee.

Nuclear Energy – Friend or Foe?

PROJECT OVERVIEW

Project Description



Students in an 11th grade chemistry class studied the pros and cons of nuclear energy as a viable and secure energy source for the future.

After studying the three principle types of radiation, and performing a lab in measuring different forms of energy, student teams were challenged to make the case for or against the use of nuclear energy.

Students presented their positions in a set of PowerPoint slides, offering the most convincing evidence they accumulated in their research to support their argument. A lively discussion and debate on the issues followed.

Project Goals

- To understand the three principle types of radiation, their benefits and risks to society
- To measure a variety of forms of energy and get a sense of the amount of energy produced by various generation methods, especially nuclear power
- To research the scientific, historical, social, political, military, health and global aspects of nuclear energy
- To form position on the use of nuclear energy for the future and support this position with the most convincing evidence possible
- To respectfully debate the issue of nuclear power, weighing the evidence, considering different points of views, and engaging in a balanced discussion of the pros and cons

Project Type

- Debate
- Inquiry
- Design

Subject Areas

- Science – Chemistry, Physics
- Math
- Social Studies
- Language Arts
- Information Technology

Career Pathway Links

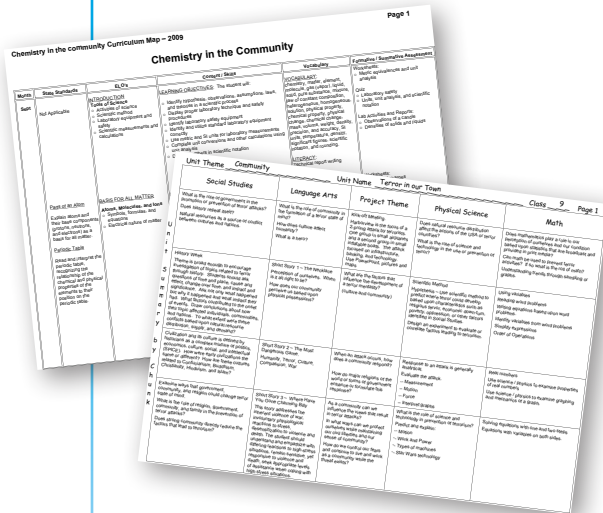


Source: Examples obtained from South Medford High School, South Medford, Oregon, USA

Nuclear Energy – Friend or Foe? (continued)

DEFINE (INITIATING) STAGE

Project Management Tools/Activities



Curriculum Map – South Medford High School uses curriculum mapping to integrate instruction across subject areas.

Examples of Project Methods Used in the Projects

For interdisciplinary projects like this Nuclear Energy project, the teacher follows the school’s Curriculum Map, which outlines the learning objectives and main curricular activities that are suggested for the combination of subject areas – in this case, Science and Social Studies – in a “Chemistry in the Community” theme.

The driving question in this project was “Can nuclear energy be a viable and secure energy source for the future?”

The students formed project teams and performed experiments and did research as part of the curriculum activities guided by the teacher. Each project team took a position on the issue, based on their research findings, and then built a strong case with convincing scientific and historical evidence for their position on the issue.

21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy

Nuclear Energy – Friend or Foe? (continued)

PLAN (PLANNING) STAGE

Project Management Tools/Activities

Conservation of Energy

Interactions of energy and matter form the basis for chemical changes as described by the law of conservation of energy.

Rates of Reaction

Different factors can affect the rate of a chemical reaction.

Energy Labs Notebook

Research Findings

Examples of Project Methods Used in the Projects

From their work in hands-on lab projects, recorded in their Energy Labs Notebook, and from their research on nuclear energy, captured in their Research Findings documents, each project team decided on the position they would take and the further research needed to bolster the case for their position.

Each team self-defined the roles for each of their members, identified the research sources they would explore, and set timelines for when each part of the project would be completed.

21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy
- Flexibility and Adaptability
- Initiative and Self-direction

Nuclear Energy – Friend or Foe? (continued)

DO (EXECUTING, MONITORING/CONTROLLING) STAGE

Project Management Tools/Activities



Issue Questions

Presentation Outline

Examples of Project Methods Used in the Projects

The teacher provided a number of provocative Issue Questions to stimulate critical thinking and for motivating deeper research on the various positions the student teams were taking:

- Would you provide nuclear power plants to a hostile country?
- What would a country need to do to convert a nuclear power plant into a weapon?

Students then created a Presentation Outline and finally a set of PowerPoint slides that provided the best evidence from their research to support their position on the nuclear energy issue.

21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy
- Social and Cross-cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

Nuclear Energy – Friend or Foe? (continued)

REVIEW (CLOSING) STAGE

Project Management Tools/Activities

Project Review

Examples of Project Methods Used in the Projects

After the Nuclear Energy project was over, the students and teacher held a review session on how well the project went and what was learned from managing and leading such a controversial, issues-based project.

Some of the questions discussed were:

- Were project goals met and the end result completed on time?
- Were the resources and research support adequate?
- Were the right roles assigned for each team member and did they perform well?
- Were outside experts, advisors, or information sources used well?
- Was team communication effective?
- Were the team decisions made well?
- Were project changes handled well?
- Were disagreements resolved well?
- What were the most significant achievements, individual and group?
- What would make an even better project next time?
- What were the most important lessons learned?

21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Flexibility and Adaptability
- Initiative and Self-direction
- Leadership and Responsibility

Source: Examples obtained from South Medford High School, South Medford, Oregon, USA

Managing Science & Engineering Projects

PROJECT OVERVIEW

Project Description



In a Seattle, Washington high school Career and Technical Education (CTE) program, students take a variety of science and engineering courses, all managed by a single teacher who has a background in project management.

Students create 3D engineering models, devise digital circuits, invent flying vehicles, and build and program robotic devices, often all at the same time in his classroom and lab, using a personalized, self-paced system of project-based instruction.

Students work in teams on projects with one student always taking the Project Manager role for the team.

Project Goals

- To gain both academic knowledge and hands-on, applied, technical expertise in:
 - Engineering Design
 - 3D CAD Design
 - Digital Electronics Design
 - Aerospace Engineering
 - Robotics Design
- To provide students with the opportunity to learn and practice project management and leadership methods in their work
- To be able to apply both technical and project management expertise to projects in other non-CTE classes in high school and in the community

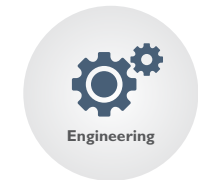
Project Type

- Design
- Inquiry

Subject Areas

- Science and Engineering
- Math
- 3D Design
- Project Management
- Digital Electronics
- Aerospace Engineering
- Robotics
- Information Technology

Career Pathway Links



Source: ConnectEd’s Linked Learning Career Pathways, <http://www.connectedcalifornia.org/>

Source: Examples obtained from Roosevelt High School, Seattle, Washington, USA

Managing Science & Engineering Projects (continued)

DEFINE (INITIATING) STAGE

Project Management Tools/Activities

Project Definitions

Examples of Project Methods Used in the Projects

Students spend the first semester of their CTE project building background knowledge, building small components which can be used in their second semester project, mastering skills on the equipment they will use in constructing their designs, and making plans for their second semester master project.

The first semester is fairly prescriptive, with optional activities that allow students to explore areas of greater interest.

The second semester is devoted to constructing their designs for a device that incorporates virtually all that they have learned in the first semester.

All of these activities are spelled out in the Project Definitions for the different CTE courses.

21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy

Managing Science & Engineering Projects (continued)

PLAN (PLANNING) STAGE

Project Management Tools/Activities



Charts posted around the classroom help students communicate and stay focused on their project goals.

Project Charter

Project Organization Chart

Visual WBS (Work Breakdown Structure)

Project Schedule Gantt Chart

Examples of Project Methods Used in the Projects

Each of the CTE courses is modularized and self-paced so students can work at their own speed in learning about and developing skills in each subject area.

To manage many students, each working on different courses at different times, a **Project Charter**, a **Project Organization Chart**, a **Visual WBS** (Work Breakdown Structure) diagram, and a **Project Schedule Gantt Chart** for each project is always visible on one wall of the classroom, and these are updated regularly to show where each project and its team members are in the flow of project activities.

21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy
- Flexibility and Adaptability
- Initiative and Self-direction

Managing Science & Engineering Projects (continued)

DO (EXECUTING, MONITORING/CONTROLLING) STAGE

Project Management Tools/Activities



Project Status Meetings

Examples of Project Methods Used in the Projects

Student Project Managers hold weekly Project Status Meetings, which includes updates on the work tasks listed in the Visual WVBS, and a review and update of the Project Schedule to adjust timelines and preview upcoming tasks. This weekly “glue” that holds the projects together, gives everyone a chance to evaluate how things are going, prepare for what’s coming, and make sure everyone knows what’s going on in each project. It also provides opportunities for students to exercise their communication, collaboration and negotiation skills.

The Project Status Meetings also provide a safe place to air small and large failures, get help from other project team members, and learn from others how to improve their project skills.

21st Century Skills

- Critical Thinking and Problem Solving
- Creativity and Innovation
- Communication and Collaboration
- Information Literacy
- Social and Cross-cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

Managing Science & Engineering Projects (continued)

REVIEW (CLOSING) STAGE

Project Management Tools/Activities



Project Exhibition

Project Review

Examples of Project Methods Used in the Projects

At the end of the second semester, each project team demonstrates the device they created for their course project at a **Project Exhibition**:

- A taffy-pulling machine for Engineering Design
- A T-shirt printer for Robotics
- A remote-controlled dirigible for Aerospace Engineering
- A school emergency exit sign for Digital Electronics Design
- A T-shirt cannon launcher for 3D Design

Both an individual **Project Review** with each student, and a team project review with the whole team, led by the team's student project manager, are used to evaluate and assess the achievements of each project team.

Some of the questions used for the project review include:

- Were project goals met and the end result completed on time?
- Were the resources and research support adequate?
- Were the right roles assigned for each team member and did they perform well?
- Were outside experts, advisors, or information sources used well?
- Was team communication effective?
- Were the team decisions made well?
- Were project changes handled well?
- Were disagreements resolved well?
- What were the most significant achievements, individual and group?
- What would make an even better project next time?
- What were the most important lessons learned?

21st Century Skills

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Flexibility and Adaptability
- Initiative and Self-direction
- Leadership and Responsibility

Source: Examples obtained from Roosevelt High School, Seattle, Washington, USA

Appendix One – Learning Projects Primer

What is a Project?

Everyone is involved in all sorts of projects throughout our lives, but unless you're a project management professional, we don't often think about what makes a project a project.

All around us are things to be done, tasks to accomplish, decisions to make, skills to learn, problems to solve, results to achieve:

- Families decide what to buy at the food market, purchase the items and make meals
- Farmers plant, cultivate and harvest crops which are then sold in markets
- New houses are planned, designed, constructed, sold, and then families move in
- Teachers plan their lessons, engage students in activities and evaluate the results
- Students receive assignments, do research, write up and present their findings
- Communities develop recycling plans, implement them and measure the impact
- Businesses plan new products, develop and test them, then sell them to consumers

What makes these diverse activities, from small to large, all projects?

There are two key qualities of projects:

1. Projects are *temporary* efforts with a clear start and finish – they are not ongoing.
2. Projects have an *end result* – something created or completed, that is often unique.

In the examples above the end results are: eating meals, food sold in a grocery stores, families moving into new homes, lessons taught, research papers handed in, recycling program impact reports presented, and new products sold in stores and online.

Listening to the daily weather and stock market reports, answering your phone, brushing your teeth each night – these activities are not usually considered projects, because they are brief ongoing activities, and though there are some short-term results, there isn't much of an end result in mind – these simple actions just keep recurring regularly and they don't really require an intentional plan or produce a result that's complex, different, new or unique.

Learning Projects

Learning Project Cycle

Learning projects, or Project Based Learning as it has often been called, is a powerful approach to learning that offers a wealth of opportunities to build all of the essential 21st century skills, as well as the deeper knowledge and expertise needed for life and work in our times.

Learning projects have four stages that occur in a sequence, though backtracking and jumping around among the stages is common in learning projects.

The four learning project stages are:

1. **Define** (Initiating)
2. **Plan** (Planning)
3. **Do** (Executing, Monitoring/Controlling)
4. **Review** (Closing)

A learning project must first be defined, with the question, problem, issue or perspective that drives the learning in the project stated clearly and concisely.

Learning Project Example – The Blood Bank Project

An example of a learning project that combines art and science, plus a social benefit to the community, is The Blood Bank Project (video documentary of the project available at <http://www.edutopia.org/high-tech-high-team-teaching-video>). A high school science teacher and art teacher combine efforts to have students create multimedia exhibits on some aspect of blood – from the history of the science of blood, to blood in religion, to understanding AIDS, to the folklore of vampires. Students create multimedia exhibits to be shown in a gallery next to a Red Cross blood bank to encourage people to donate blood.

The defining challenge for this project is, “How might we combine art and science in an exhibit that visually explains some aspect of blood that will engage community members and encourage them to give blood to a blood bank?”

Both the art and science teachers have a lot of collaborative planning to do for this project – preparing lessons on the science of blood, designing activities that build skills in designing and creating compelling multimedia presentations, planning and supporting student research on their particular topic and on what convinces people to donate their blood to a blood bank, and a whole lot more.

For teachers to be effective learning coaches for their students during a project and provide opportunities for students to learn such skills as problem solving, collaboration, textual and visual communication, and creative design (lectures alone will not lead to project success here!), learning activities must be designed so that students own much of their own planning and work.

Choosing their topic to research and be the focus of their exhibit, deciding who should be part of the project team and what their roles should be, taking on leadership and support roles in the teamwork, managing the research, sharing their findings with others and incorporating feedback, are all important parts of a good learning project that hones skills and deepens understanding.

After planning comes the doing: the real work of the project must be done, the research, design and creation of the exhibit must be completed and set up for display in the gallery. Teachers and students work together, with the teachers playing the “conductor” or coach role, and the students the “researchers and creators” roles as team members in the project.

Finally, the project results and lessons learned are presented and reviewed – in this case by the public as well as other students, teachers and family members. The individual and group learning gained in the project, and the impact the team project has on the community (hopefully an increase in the number of blood donations) are evaluated and further feedback and praise is shared.



Source: High Tech High School, www.hightechhigh.org

Project Learning Cycle

Define, Plan, Do and Review (Initiating, Planning, Executing, Monitoring/Controlling, Closing) – these are the stages in the project learning and teaching cycles – the project “wheels” for both teachers and students.

Though time spent in each of the stages of a learning project may differ for teachers and students – teachers typically spending more time in up-front planning and students spending more time in the doing stage of project activities (hence the different size of the wheel segments above) – both teachers and students work together to co-manage the entire project.

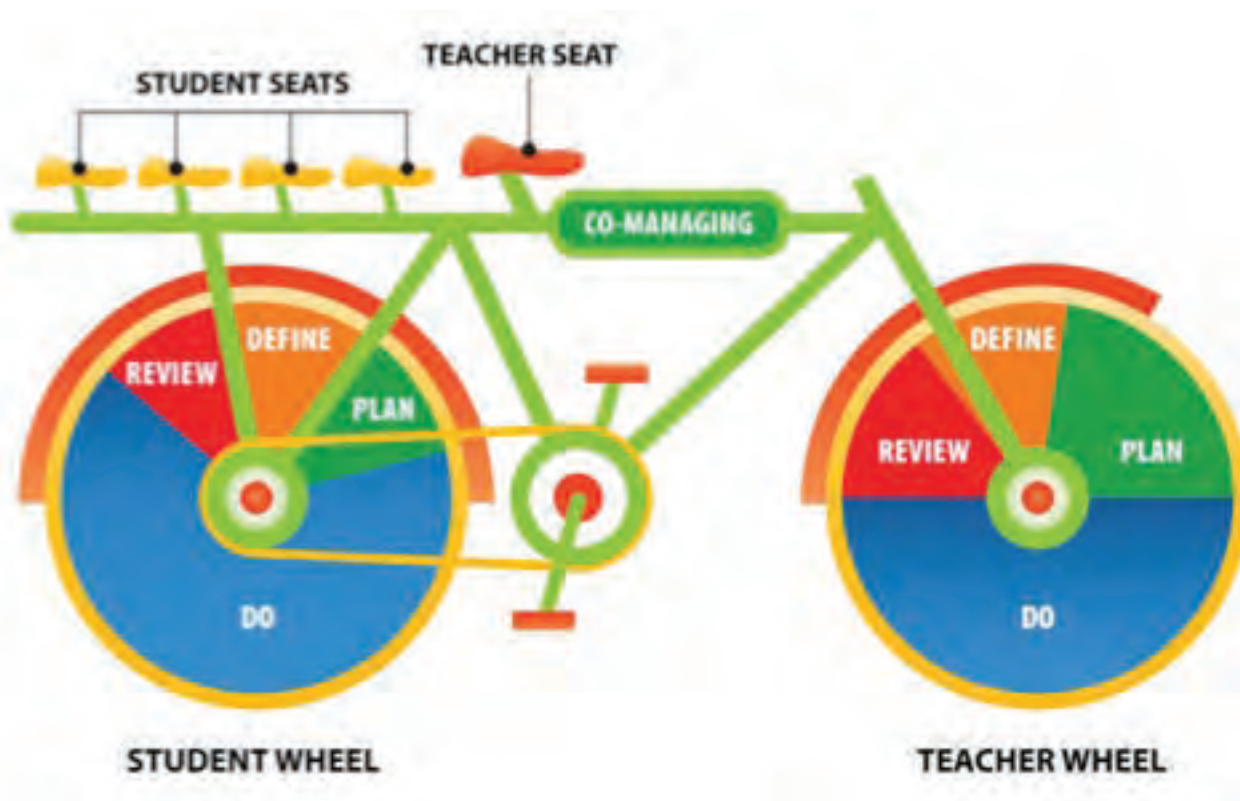


STUDENT WHEEL



TEACHER WHEEL

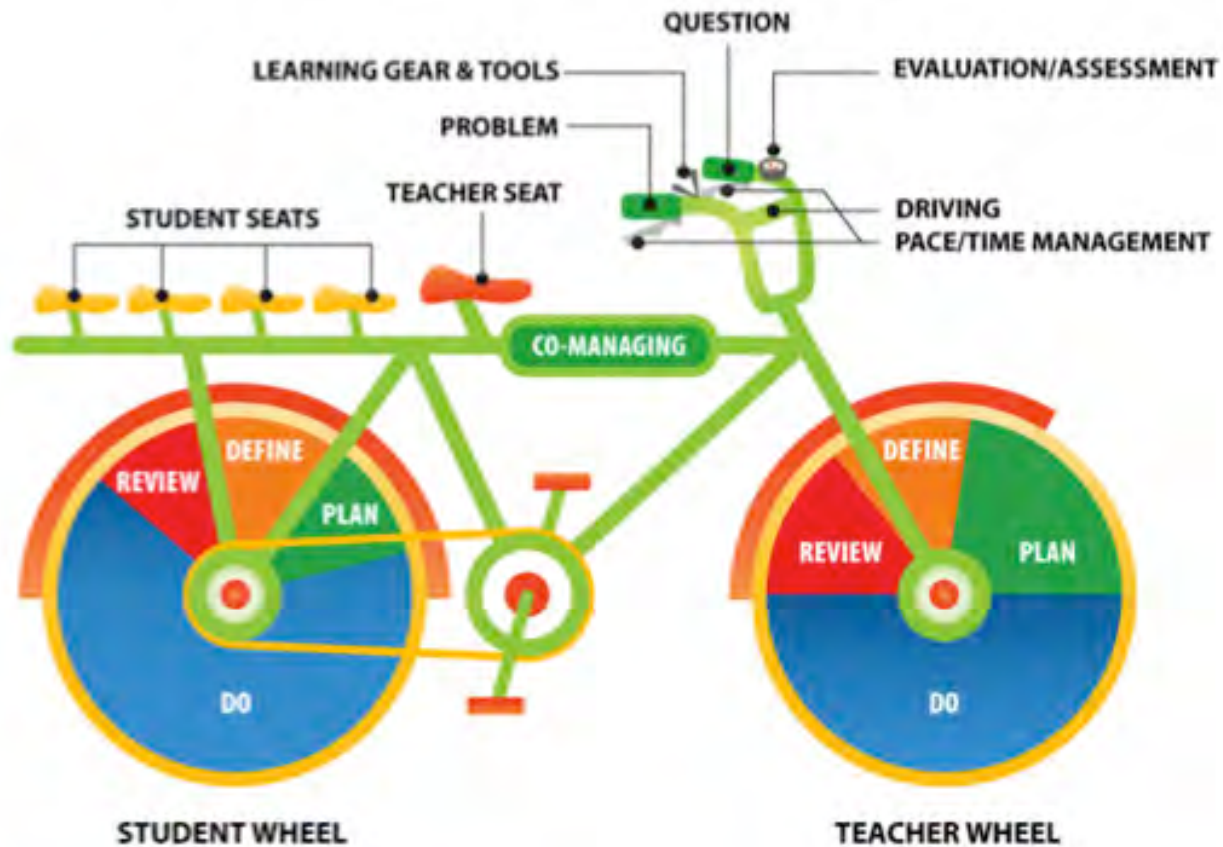
With the project’s wheels and framework in place, we need the other essential components to complete our two-wheeled project learning vehicle – the handlebars, gears, brakes, and cyclometer to measure progress:



STUDENT WHEEL

TEACHER WHEEL

The handlebars represent the project’s driving challenge – the question, problem, issue or perspective – that sets the direction and motivation for the project and keeps it on course.



The learning gear used in the project (books, laptops, internet access, design software, etc.) is signified by the gearshift lever – projects with more powerful learning tools and the ability to use them well are “geared up” for more powerful learning.

The pace and timing of a project – not too fast, not too slow, adjusted for the learning needs of team members – is indicated by the handbrakes and the pedals.

The cyclometer represents the ongoing monitoring and evaluations of student work, giving real-time feedback so adjustments can be made as the project progresses – essential for correcting misunderstandings and improving the outcomes in each step and stage of the learning project.

Once the project is launched and “on the road”, the slope of the roadway denotes the degree of challenge the project presents to the team – steep uphill climbs with complex, demanding projects being more challenging than flat surface, simple, straightforward projects.

Balance is important too – if the project cycle leans too far to the left, the teacher may be over steering and applying too much direct instructional control for the students to exercise their self-direction and ownership of the project; too far to the right, and there may be too much independent and uncoordinated work going in too many directions (otherwise known as “chaos”) preventing deeper learning from happening.

Support from school administrators, parents and community members can provide a nice tailwind to help propel a project; lack of such support could result in strong headwinds to thwart the project's progress.

And last, but certainly not least, the destination road sign indicates the overall goal of the project – a rich learning experience that blends knowledge, understanding, and deep personal engagement in building the skills and expertise needed for success in 21st century learning, work and life:



Source: © 2009 21st Century Skills, Learning for our Life and Times—Courtesy of Jossey-Bass

Designing, managing and leading compelling 21st century learning projects, like The Blood Project, is no small challenge – it has to engage and motivate a wide diversity of students, meet the curriculum goals of the school, align to learning standards, provide evidence that each student is gaining understanding and proficiency, and prepare students for success in the real world.

Understanding how projects work and how to effectively support, manage and lead a variety of learning projects enables teachers and students to focus more on each student's learning goals and get the most out of each and every project for each and every learner.

Types of Learning Projects – Inquiry and Design

Though it may seem there are infinite types of learning projects across all fields of knowledge and possible areas of student and teacher interests – from art to zoology – for purposes of managing and leading learning projects it is useful to identify four common learning project types, with many projects having a mix of two or more of these project “flavors”:

Project Types	Learning Motivation	End Result
INQUIRY	Question	Answer
DESIGN	Problem	Solution
DEBATE	Issue	Position
EXPRESSION	Perspective	Performance

Inquiry projects start with a question – *Why is the sky blue? What causes cancer? How does burning fossil fuels affect the climate?*

Questions naturally fuel the desire to find answers, through research, asking experts, doing experiments to test possible answers, and by comparing answers with others researching the same questions.

The learning power of the right question at the right time has been celebrated throughout history. Philosophers, education theorists, and thought leaders have placed questioning and inquiry – the search for the truth – at the heart of learning and understanding.

One legendary example is Einstein’s early question about what it would be like to travel on a light beam, which initiated a lifelong search for understanding the universe that led to the greatest discoveries in 20th century physics.

Design projects start with a problem – *How can we make airplane travel safer? How can we store more information in a smaller space? How can we use the sun’s energy to heat and power our homes?*

Problems demand solutions, and the motivation to create solutions to problems leads to researching and comparing how others have solved similar problems, designing, building, testing, and refining possible solutions, and sometimes coming up with innovative solutions that change the course of history.

One memorable example of the hunt for solutions is Thomas Edison’s well-known year-and-a-half search for the right materials to make an effective incandescent electric light bulb, which eventually resulted in enlightening the lives of nearly everyone everywhere.

Questions and problems and inquiry and design projects are the foundations for the two most powerful approaches humankind has yet developed for gaining new knowledge and creating new ways of living: science and engineering.

Though the project methods are similar in inquiry and design projects as well as science and engineering, there are some differences in the way answers and solutions are devised and tested as shown here:

Project Phases	Inquiry Project Methods (including the Scientific Method)	Design Project Methods (including Engineering Design methods)
Define (Initiating)	Pose a question	Define a problem
Plan (Planning)	Research the question	Research the problem
Do (Executing, Monitoring/Controlling)	Formulate an answer, explanation or hypothesis that could be tested	Design and plan a prototype or solution to be tested
	Test the hypothesis through experiments or other methods that attempt to disprove it	Create and test the prototype or solution to see if it solves the problem
Review (Closing)	Analyze the results and draw a conclusion about the answer	Analyze the results and improve the solution to the problem
	Communicate and present the results and compare with others' results	Communicate and demonstrate the results and decide to implement or market the solution as a product or service
Next Cycle	Repeat the process with more refined questions or with new questions that arose in the inquiry process	Repeat the process with refined or new ideas for better solutions, or with new problems that arose in the design process

Types of Learning Projects – Debate and Expression

Making a compelling case backed by strong evidence – for a change in policy, a legal decision, a new regulation or law, a business plan or investment, a contribution to a philanthropic cause, a decision to vote for a candidate or to take one course of action over another, and so on – is the lifeblood of civic and community life, the heart of governing and lawmaking at all levels, the core of making good business decisions, and the collaborative give-and-take process by which societies evolve to meet new demands.

Projects centered on a debate over a set of complex or controversial issues help students:

- Exercise their *critical listening* and *thinking* skills
- Hone their *note-taking*, *writing*, *speaking* and *persuasion* skills
- *Work productively in teams* to research *facts* and *collaboratively develop convincing arguments*
- Advance their *information* and *media literacy* skills
- Identify common *flaws in logic* and techniques that may distort the truth
- Strengthen *rational argumentation*, *refutation*, and *reasoning* skills
- Build confidence in *public speaking* and *thinking-on-your-feet* in answering questions and arguing for one’s position on the issue

Whether the project results in a formal debate, or a series of presentations arguing for a specific position on an issue, debate-oriented projects build the skills necessary for a lifetime of thoughtful engagement in civic, political, social, and community life.

Projects based on the artful expressions of students’ perspectives, thoughts, feelings, desires, ambitions and dreams, giving voice to the full range of their experiences and emotions through music, art, dance, theater, poetry, crafts or a mix of these forms of expression, is especially important to the healthy psychological and social development of students.

All too often, so much emphasis is placed on academic performance and externally directed extracurricular activities that time to engage students’ personal reflections and to give voice to deeper thoughts and feelings is very limited.

There is increasing evidence that students who are given the time to reflect and self-direct more of their learning, that are provided opportunities to produce meaningful artifacts and expressions of their self-image and their relationships to others, and that are regularly shown evidence of their positive growth and learning over time, will develop more positive mindsets and beliefs about themselves, their meaning and purpose, their ability to overcome barriers, their confidence to tackle and persist through tough challenges, and their ability to develop a variety of positive relations with others.

Collective forms of expression, as in music, dance and theater performances, and in the collaborative creation of audio, video and multimedia compositions, also build social and teamwork skills, empathy and negotiation abilities, and support and helping strategies that are so valuable for learning, work and community life.

Debate and expression-oriented learning projects have differing goals and methods, but both types of projects help build essential personal, expressive and social skills essential for future success:

Project Phases	Issue Debate Project Methods	Personal Expression Project Methods
Define (Initiating)	Choose an issue	Reflect on a personal perspective, idea, feeling, ambition, dream, vision, etc.
Plan (Planning)	Research the issue	Choose a medium of expression (words, music, video, dance, art, etc.)
	Form a position, based on strong evidence, verified facts, well-founded opinions of experts, etc.	Design, plan and create an outline, storyboard, sketch, prototype, etc., of the perspective, message and feelings you hope to communicate to others
Do (Executing, Monitoring/Controlling)	Present the position and evidence and logically argue its strengths and possible drawbacks, rationally refute opposition to the position, etc.	Test the prototype, rough draft, demo or outline of the work on others to see if it communicates your intention, then create and perform or display the work for an audience
Review (Closing)	Assess the impact of the presentation of the case on others – through polling, surveying, voting, observed actions taken, policies changed, etc.	Evaluate your own views and feelings about the performance of the work – did it express what you wanted it to? – then gauge the reaction from the audience by discussing the messages and feelings they had from experiencing the work
	Capture the results of your efforts to present and defend your position in your portfolio of student work	Reflect on the entire expression project and record your thoughts and feelings along with a recording of the performance or display of the work for your portfolio
Next Cycle	Repeat the process with better research and stronger arguments to strengthen the case for your position, or your new position on the issue, or develop a new position for a new issue related to the previous one, in the next debate or presentation	Repeat the process by further developing and improving the original work or developing a new expression that arose out of the creative process in the original work

Learning Project Approaches – Prescriptive and Exploratory

Learning projects can have a clearly defined outcome right from the start of the project – a prescriptive project; or they can be more open-ended, with the desired result discovered or progressively clarified during the course of the project – an exploratory project.

This prescriptive versus exploratory distinction in the approaches to managing projects is also reflected in two approaches to professional project management:

- Prescriptive “waterfall” project methodologies where all the requirements are defined up front and the work efficiently “cascades” from the original set of project requirements (with an orderly change process for things that just couldn’t be predicted)
- Agile or adaptive project approaches where the end result is not completely prescribed in the project requirements, and a series of more informal small tasks or “micro-projects” are collaboratively designed, implemented, tested and reviewed, which then leads to the next designed mini-task, and the next, until the project work is completed. This agile approach to projects is often used to produce software for online use, where requirements, user experiences and expectations are rapidly shifting.

For learning projects, the distinction between prescriptive and exploratory projects is especially useful, as both project approaches are often used in teaching and learning, depending on the desired learning goals. If the goal is to explore a new topic or field to see what it’s all about or to discover something of interest to investigate in more detail, then an exploratory approach is fitting.

If the intention is to achieve more defined learning outcomes by engaging students in a well-defined project that results in specific desired knowledge and skills outcomes, then a more prescriptive project approach would be appropriate.

Many larger learning projects are composed of both exploratory and prescriptive subprojects that in combination increase the variety and depth of learning experiences for students with diverse background knowledge, learning styles and skills.

The differences between these two sets of project approaches are more clearly understood by identifying their respective variations of the project cycle stages:

Prescriptive Learning Project Phases	Learning Project Phases	Exploratory Learning Project Phases
Identify – the prescribed end result	Define (Initiating)	Imagine – the possible exploration paths and select the most promising ones
Design – the process & steps to reach the end result	Plan (Planning)	Discover – the concepts and principles of a field and possibilities for end results
Create – the end result as designed with small changes that improve the design	Do (Executing, Monitoring/Controlling)	Model – create models (mindmaps, drawings, charts, etc.) that capture your learning and are candidates for further development
Evaluate – the process, learning, and end product in meeting the requirements of the prescribed end result	Review (Closing)	Evolve – your models then pick one or two to fully develop into learning artifacts that best capture your learning and/or your answers, solutions, positions or expressions

Learning Projects vs. Business Projects

There is one further distinction worth noting between learning projects and most business projects managed by professional project managers.

The measure of success in most business-oriented projects is to reach the end of the project cycle “on time, on budget, and on scope.” What’s most important to business is meeting the project deadline without spending more money than has been allocated for the project, without adding extra features (and costs), or without fulfilling all of the project requirements (being “out of scope” of the desired result).

In learning projects, where the major investment is in student and teacher time, and not money, what is learned during the project – the knowledge, skills and perspectives gained – is of prime importance. Going “beyond scope” and learning even more than expected is a good thing, though completing the project on time can be just as important for learning projects as they are for business projects.

Reflecting on lessons learned and the personal impact of the learning gained, and thinking about how the skills developed in the project can be used in other situations are also very important in learning projects, less so in business projects where there is much less time available for evaluating and reflecting as one quickly moves from one challenging project to the next.

Learning Project Players & Roles

These days it often takes a team (and sometimes a village) to get projects in gear and successfully completed.

As work and learning become more complex, more information- and technology-rich, and more connected to entire worlds of knowledge and expertise, projects need a team approach to pool diverse talents and collectively come up with sound answers to perplexing questions, innovative solutions to thorny problems, persuasive arguments for a controversial position, or inspirational works of expressive power.

This is also true for learning projects which often tackle important questions, problems, issues and expressions, giving students opportunities to develop and apply essential skills to real-world and real-life situations, making their learning more relevant and memorable.

Though each project has its own particular requirements for the kinds of talent and expertise needed for success, experience has shown that certain project roles are important to include for the successful managing and leading of projects in general, and for learning projects in particular.

The key learning project players and their roles are listed here:

Learning Project Players	Learning Project Roles
Project Champion [A Sponsor in professional business projects]	The person who initiates the idea for the project and/or is highly motivated to see it happen, who gains commitment from those that have the authority to make the project happen, and ensures that the project has the resources it needs to be successful.
Project Manager	The person responsible for making sure the project meets its goals, the teamwork is productive, and team members achieve their learning goals. Teachers often play this role – in student-centered learning approaches, students often take on this role or share it with the teacher(s).
Project Team Members	The persons who work with the project manager to carry out all the project activities, dividing up project tasks among them and collaborating to increase the productivity, quality and creativity of the project work, with team members regularly reporting their progress to the project manager and each other.
Project Advisors/Coaches	Persons with expertise helpful to the project’s success, such as Project Management Professionals, subject matter experts, business leaders, elected officials, parents, etc. They can be advisors and coaches to the teacher, the student teams, or both.
Project Evaluators	Persons responsible for evaluating the quality of the project work, the effectiveness of the project’s management, leadership and teamwork, as well as the learning gains for each student and the project teams as a whole. This could be just the teacher, the student (self-evaluation), or multiple evaluators including other teachers, parents, advisors/coaches, community members, or other students.

It’s important that all the players in a project continually communicate and coordinate their work throughout all the stages of the project cycle, but more importantly, it is crucial that all the players fully understand the definition of the project and its goals right at the beginning of a project.

Define (Initiating) Phase: Project Definition & Team Agreement

At the beginning of a learning project, there are two resources that are particularly helpful in making sure everyone understands what the project is all about, what is expected of each player, what the intended outcomes of the project will be, and how the project team members will work together on the project – *The Project Definition* document and the Teamwork Agreement.

The *Project Definition* document records the answers to the key questions that define the main characteristics of the project, such as this “Defining Dozen” list of questions:

1. *Why* is this project needed?
2. *What* is this project about? (a brief description)
3. *What* is the *goal* of this project?
4. *What* will be the end results of the project? (the “deliverables” in business terms)
5. *What* will this project *not do*, even if it could be done easily?
6. *What type* of project is this? (inquiry, design, debate, expression; prescriptive exploratory; or a combination)
7. *What* is the *driving question, problem, issue* or *perspective* that motivates the work in this project?
8. *When* will the project need to be completed?
9. *Where* will the project be done?

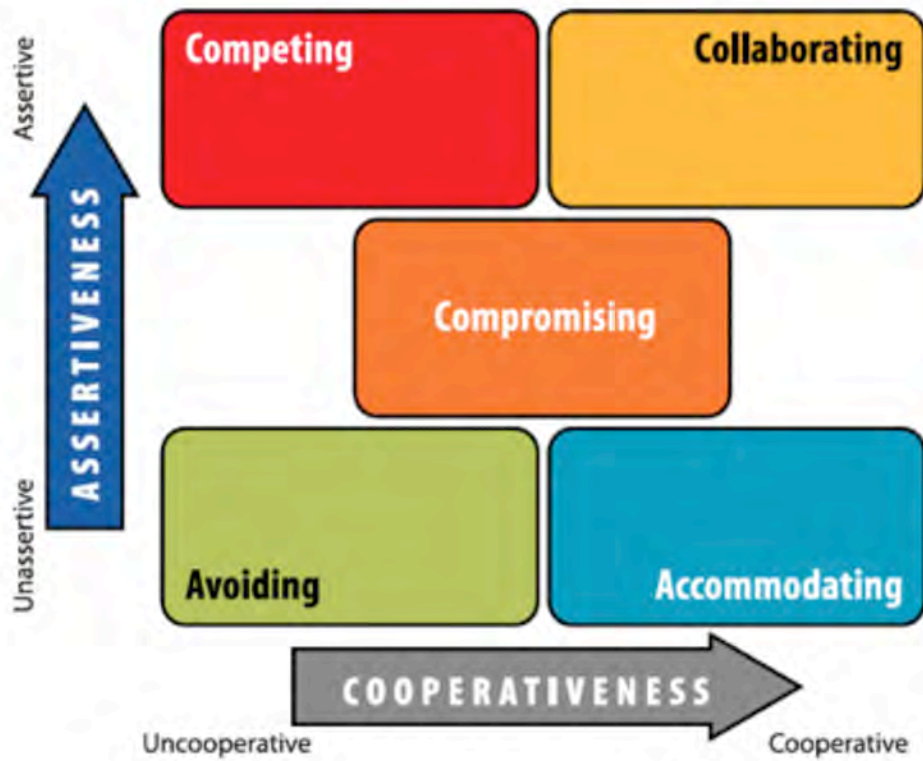
10. *What resources* are needed to successfully complete the project? (equipment, tools materials, funding, technology, online resources, books, etc.)
11. *How* will the project be evaluated? (quality of the project work and end results, the learning outcomes, the effectiveness of the project methods)
12. *What risks* are involved in the project? (events or conditions that may delay or impact project work)

All of the answers to the Who-related, teamwork questions are often recorded in another document, the *Teamwork Agreement*:

- *Who* will be involved in the project, and what is each person’s *role* or *roles*?
- What are each team member’s *strengths*, *expertise* and *preferences*?
- How and how often will the project team *communicate* with each other?
- How will outside *experts*, *coaches* and *advisors* be used in the project?
- How will *decisions* be made?
- How will project *changes* be handled?
- How will *disagreements* be resolved?

With the increasing diversity of student backgrounds, perspectives and personalities now in our schools and communities, the positive handling of disagreements and conflicting opinions is of particular importance to effective teamwork and project success.

Understanding that each person may have a different approach to handling conflict– that each person may have different levels of assertiveness and cooperativeness – can help in developing more sensitive and positive approaches to resolving issues, as the following “Five Styles of Handling Conflict” chart from Educators for Social Responsibility illustrates:



Source: © 2008 Diagram from Oracle Education Foundation, Team Ready Guide.
 Examples obtained from Oracle Education Foundation’s ThinkQuest Competition which is currently suspended.

It's important that the understandings and promises outlined in the Teamwork Agreement are fully acceptable to every member of the project team – it can be helpful if each member puts their personal signature on the document indicating their commitment to following the teamwork guidelines and processes included in the agreement.

These two documents and the WorkPlan described below are often combined into one project portfolio document, sometimes called a “Project Brief” or “Project Charter” or just “The Project Portfolio,” which becomes a constant companion to the project team members and is referred to frequently during the course of a project.

Plan (Planning) Phase: the WorkPlan

In the second stage of the learning project cycle – the Plan stage – organizing and planning out the team members' project work is the focus. It is most helpful in this stage to collaboratively develop a WorkPlan document that includes items such as:

- A list of project *deadlines* for each stage of the project work
(when each of the Define, Plan, Do and Review stages should be completed)
- A list of project *tasks* in the order they need to be performed
- The project *owners* for each of the tasks
- The *resources* needed for each task (materials, tools, funding, expert advice, etc.)
- *Time schedules* for each of the tasks (start and finish dates)

There are a wide variety of templates and tools available, both paper- and software-based, that help learning project managers and team members in their planning, scheduling and managing of the project tasks and activities.

These range from a simple project “To Do” checklist that lists all the tasks in the order they are to be accomplished (and checked off as they are completed), to sophisticated project management software applications that helps track each project task, who owns each task, what resources are needed to accomplish each task, the estimated and actual time to complete the task, which tasks are dependent on others being completed, if the work submitted is of acceptable quality or needs further revisions, which tasks are the most critical to meet the deadlines, and much more.

In prescriptive projects, especially complex ones, closely following a WorkPlan is essential to project success. In more exploratory projects the scheduling of specific tasks can be much more flexible, particularly in the early stages of the project. As the project progresses and the desired end results become clearer, a WorkPlan can be very useful in reaching the goals and timeline for the project.

Continuously updating a WorkPlan as the project moves into the Do stage is often a real challenge. This job is frequently the responsibility of the Project Manager, though with collaborative online project tools it is increasingly possible for each of the project team members to update their own progress and to see what all the others team members are accomplishing in the project as it moves forward.

Do (Executing, Monitoring/Controlling) Phase: Check-in Meetings

Once the team members have entered the Do stage of the project cycle, three important considerations move to the top of the list of project managing concerns:

- Are team members consistently meeting the expectations set in the WorkPlan, and if not, can the WorkPlan be modified without putting the whole project at risk?
- Is the *quality of work* meeting the needs of the project, or must time be taken to improve or redo the work?
- Is the *communication* among team members sufficient to help keep things on track and to see how all the parts of the project are working together?

Team communications are crucial in this stage, and regular *Check-in Meetings* (face-to-face or virtual), led by the project manager or one of the team members, are essential for making sure the other two concerns – following the *WorkPlan* and producing the quality of work needed in the project – are being carefully monitored and any issues needing attention are taken care of.

Check-in meetings can be as simple as having each project team member briefly share their answers to four short questions, with the project manager or a team member taking notes to be added to the *Do* section of the *Project Portfolio*:

1. What have you completed recently?
2. What are you working on now?
3. When do you think the current task will be done?
4. What do you need to keep your work on track with good quality?

Occasionally (and possibly more often than we'd like to admit) it becomes clear from these meetings that a major change to the *WorkPlan*, or even to the *Project Definition*, must be made. At this point, the project manager and a selection of team members must take the time to adjust or redo the definition and planning documents, and then hold a lengthier meeting to update everyone on the project changes.

To keep the quality of the project work at the level needed to successfully complete the project, it is helpful to have evaluation criteria for each of the major pieces of project work produced and for the desired end results. This leads to the *Review* stage of the learning project cycle.

The Review (Closing) Phase: Rubrics, Reflections & Celebrations

Though project monitoring and reviewing is an important ongoing activity in all the other learning project stages (the real-time “cyclometer” readings in the project cycle model), the *Review* stage is where full attention is focused on evaluating, and celebrating, the achievements of the entire project.

There are three project outcomes that need to be reviewed in this stage:

- The quality and impact of the *end results* of the project (a report, product, presentation, performance, model, artifact, device, program, website, etc.), and the key project work that contributed to it
- The *learning outcomes* for each team member, often aligned to a set of common learning standards
- The effectiveness of the *project methods* used in each stage of the project that helped produce the end results (the definition, planning, doing and reviewing efforts of the project team – including reviewing the reviewing process!)

Evaluating Project Results

In [The Blood Bank Project example](#), the review process involved using a number of *evaluation rubrics* – sets of evaluation criteria with descriptions of each level of proficiency possible for each of the criteria, rated by both the teacher and the student, often using a numerical rating for each proficiency level. Rubrics for science content, artistic design, communication skills and creativity were used to evaluate both the final exhibit and the project work that contributed to the end result.

A well-developed example of a comprehensive evaluation rubric that scores the end result of a student project to create a solution to a real world problem, is the scoring rubric used in an international student competition called *ThinkQuest*, where student teams submit a website that presents all the aspects of their problem-solving project.

The evaluation rubric includes rating criteria for the value of the problem, the strength and creativity of the solution, the effectiveness of the communication in the website, and the use of technology to convey the design and details of their project, organized under the headings of Critical Thinking, Communication, and Technology Skills:

Critical Thinking Skills

Criteria	1 Emerging	2 Developing	3 Accomplished	4 Exceptional
Scope & Nature of the Problem	The problem and its solution are unclear and confusing.	The problem is clear but the problem/solution is not reasonable in scope.	The problem/solution is reasonable in scope and seems achievable.	The problem/solution is reasonable in scope, achievable, and are particularly interesting, innovative, or provocative.
Target Audience	Difficult to understand who the target audience is.	Target audience defined too broadly or not well matched to the problem.	Target audience is clear and well matched to the problem.	Target audience clear, well matched to the problem, and there's evidence that the team interacted with the audience.
The Case for the Solution	Not clear how the solution benefits the target audience.	A clear, compelling case for how the solution benefits the audience, but lacks supporting evidence or research to back the solution.	The case for the solution is compelling and cites the team's own research, or uses credible data from others to support the case for the solution.	The case for the solution is compelling, cites the team's own original research, and uses credible data from other sources to strongly support the case for the solution.
Testing & Revisions	Little indication that the team tested the solution, and no info on how the testing informed decisions.	Unclear or incomplete explanation of how the team tested the solution and how the testing informed revisions.	Clearly and completely states how the team tested the solution and how the testing informed revisions.	Clearly and completely states how the team tested the solution, how the testing informed revisions, presents unresolved issues and offers reasons why they're unresolved or how to resolve them.
Effectiveness of the Solution	Two or more are true: <ul style="list-style-type: none"> • Not clear how the problem is solved. • No evidence of the solution's effectiveness. • Parts of the solution are incomplete or missing • Not clear how the solution benefits the audience 	Only one is true: <ul style="list-style-type: none"> • Not clear how the problem is solved. • No evidence of the solution's effectiveness. • Parts of the solution are incomplete or missing • Not clear how the solution benefits the audience 	How the solution solves the problem is clear and complete, there is evidence of the solution's effectiveness with the target audience, and the effectiveness of the solution is clearly and completely demonstrated.	How the solution solves the problem is clear and complete, there is evidence of the solution's effectiveness with the target audience, the effectiveness of the solution is clearly and completely demonstrated, and the team's solution provides a powerful and innovative approach to the problem, perhaps making previous solutions obsolete.
Impact on the Team	It is difficult to understand what the team learned from their description.	What the team learned is described, but is vague or incomplete.	What the team learned is completely and coherently described and includes how their learning applies to future endeavors.	What the team learned is completely and coherently described, includes how their learning applies to future endeavors, and is particularly compelling, genuine or insightful.

Communication Skills

Criteria	1 Emerging	2 Developing	3 Accomplished	4 Exceptional
Content Organization & Writing Style	The content is not well organized and the writing style is inconsistent throughout.	Only one is true: <ul style="list-style-type: none"> • The content is well organized • The writing style is consistent throughout. 	The content is well organized and the writing style is consistent throughout.	The content is well organized, the writing style is consistent throughout, and the content is structured in a way that allows users to explore each topic or issue more deeply if desired.
Writing Conventions	Content is not clearly written and contains many grammar, punctuation and spelling errors.	Much of the content is clearly written, but has a number of grammar, punctuation and spelling errors.	Practically all of the content is clearly written, with only a few grammar, punctuation and spelling errors.	All content is very polished, is clearly written, grammatically correct, with no spelling or punctuation errors.
Plagiarism	Most text is written in student's own words or is quoted properly from cited sources, with only a few questionable areas.	All text is written in students' own words or is quoted properly from cited sources.	All text is written in students' own words or is quoted properly from cited sources, with links to the sources.	All text is written in students' own words with clear attributions to which students wrote each part, and all other non-student written materials are quoted properly from cited sources.
Citations & Reference List	There are no citations or the reference list is incomplete or poorly organized.	Citations/references are comprehensive, but some citations are missing or formatted inconsistently.	Citations/references are comprehensive, consistently formatted, and citations are close to the content cited.	Citations/references are comprehensive, consistently formatted, citations are close to the content cited, and the reference list indicates that sufficient research was done to support the design of the solution.

Technology Skills

Criteria	1 Emerging	2 Developing	3 Accomplished	4 Exceptional
Choice of Tools	The chosen tools are not the most appropriate for the content or the overall user experience.	Some tools effectively convey content and are well suited to the overall user experience.	All tools chosen effectively convey content and are well suited to the overall user experience.	All tools chosen effectively convey content and are well suited to the overall user experience, and are used in unique and creative ways to promote user interest and engagement.
Page Titles	Most of the page titles are confusing, vague, and create user frustration.	Some of the page titles are confusing or vague, requiring users to click for more info.	All page titles provide users with a clear sense of the page's content and allow users to quickly get to the content they want.	All page titles provide users with a clear sense of the page's content, allow users to quickly get to the content they want, and the navigation structure helps users stay engaged and explore more content.

Technology Skills (continued)

Criteria	1 Emerging	2 Developing	3 Accomplished	4 Exceptional
Appearance	Two or more are true: <ul style="list-style-type: none"> • Colors interfere with viewing content • Fonts are difficult to read • Page layout is cluttered • Visual elements are not suited to understanding the content 	Only one is true: <ul style="list-style-type: none"> • Colors interfere with viewing content • Fonts are difficult to read • Page layout is cluttered • Visual elements are not suited to understanding the content 	All of the pages are visually appealing, enhance access to the content, and help create a coherent look-and-feel.	All of the pages are visually appealing, enhance access to the content, help create a coherent look-and-feel that is particularly artistic, creative or visually appealing.
Technical Performance	Two or more are true: <ul style="list-style-type: none"> • There are downloading and viewing issues with files, images, audio or video elements • At least one page does not load properly • There is too much uploaded content or too many external links that make accessing content difficult • There are too many pages used to deliver content 	Only one is true: <ul style="list-style-type: none"> • There are downloading and viewing issues with files, images, audio or video elements • At least one page does not load properly • There is too much uploaded content or too many external links that make accessing content difficult • There are too many pages used to deliver content 	All elements in the website run smoothly and promote a seamless user experience, and the number of pages used to deliver content is appropriate.	All elements in the website run smoothly and promote a seamless user experience, the number of pages used to deliver content is appropriate, and the creative use of the tools to present the problem and solution demonstrates strong technical ability.

Evaluating Learning Outcomes

To review and evaluate each team member’s learning outcomes there are a wealth of educational methods that can be used during the course of a project – formative evaluations, as well as summative evaluations at the end of a project.

Current formative evaluation methods, which may use scoring rubrics like the example above, and are often done online, include:

- Student reports and essays submitted online and scored with online rubrics
- Observation of skills performance, with scoring rubrics on a handheld device
- Online instant polls, quizzes, voting, and blog commentaries
- Evaluations of current project work and mid-project reviews using online rubrics
- Progress tracked in solving online simulations, games and design challenges
- Employer evaluations of ongoing internship and service work in the community

Modern summative evaluation methods aim to go beyond the testing of facts and basic skills in simple “fill-in-the-bubble” tests, to evaluate a combination of content knowledge, basic skills, higher-order thinking skills, deeper comprehension and understanding, applied knowledge, and 21st century skills performance.

Source: © 2012 The ThinkQuest program’s Assessment Rubric was developed by the Oracle Education Foundation to judge entries in an annual global student competition. Examples are from ThinkQuest Competition which is currently discontinued.

Here is an example of a summative test item that moves in this direction, evaluating critical thinking, math reasoning, visual literacy and political and citizenship content understanding, all in one test item, from an eleventh grade state social studies assessment test in West Virginia:

Grade 11–Citizenship
SS.0.11.01.03 analyze the changing nature of civic responsibility
Depth of knowledge 3

Directions: The mayor of your town was asked to speak at a school assembly on citizenship. As part of her presentation, she shared the following charts and information with the eleventh graders at your school. Based on her presentation, fill in the circle next to the best answer for **Question 8**.

Presidential Elections Percent Turnout
 Voter Turnout Report at
<http://mwhodgeshome.att.net/voting.htm>

Chart: Michael Hodges - Data: Federal Election Comm.

Contributions to Charities

Years
Simulated Data

Volunteering Through Civic Groups is Decreasing. The percentage of adult volunteers who serve through civic, political, professional, and international organizations has decreased by 48% since 1989, from 13.2% to 6.8%.
<http://www.nationalservice.gov>

Question 8: Which of the following hypotheses would best introduce an analysis of the above data?

- (A) All forms of civic participation have shown a considerable decline.
- (B) Even though the amounts of charitable giving have held fairly consistent, civic engagement in other areas has shown a significant decrease.
- (C) Civic participation requiring an individual's time is more prevalent than passive participation.
- (D) No conclusions can be drawn from the data presented.

Both formative and summative evaluations are often aligned to a set of core learning standards, which detail what a student should know and be able to do at each grade level in a variety of subject areas. This correlation of learning outcomes with learning standards is an important part of assessing if a student is on track for success in primary and secondary school, is ready for post-secondary education, and has accumulated the skills and expertise to successfully enter the workforce in a career.

Another important evaluation method for both formative and summative assessments, is taking the time for each student to write a short reflection about what has been learned in the course of a project and at the completion of the Do stage of the project, noting thoughts, feelings, and new perspectives, in a personal journal or reflection notebook.

This “thinking about thinking” activity, or “metacognitive” exercise, is very important for the development of self-understanding and self-direction, and especially important for getting a sense of the continuous progress being made in mastering skills and building expertise. Seeing how one can do something now in a project that was virtually impossible before, boosts self-confidence and fuels the desire to learn more and become even more capable and empowered.

Evaluating Project Methods

Evaluating the effectiveness of the project methods used in the project – the teamwork and communications; the managing of time, tasks, resources and quality of work; the handling of risks; and the leadership skills in keeping the end result in mind throughout the project – can be done by reviewing the documents produced for each stage of the project cycle and having each team member rate how well each of the project processes in each stage went and how they could be improved, using checklists, rubrics and/or reflective notes:

Project Cycle Phases	Project Documents in the Project Portfolio	Project Methods Checklist/Ratings/Reflections
Define (Initiating)	Project Definition	Project goal met? End result completed? End result completed on time? Resources adequate? Risks managed?
	Team Agreement	Right roles for each team member? Roles performed well? Were experts, advisors, coaches used well? Communications effective? Team decisions made well? Project changes handled well? Disagreements resolved well?
Plan (Planning)	WorkPlan	Major deadlines met? All project tasks completed? All project tasks on time? WorkPlan changes handled well?
Do (Executing, Monitoring/Controlling)	Check-in Meeting Notes	Regular check-in meetings? Meetings well run? Quality of work good? Teamwork productive?
Review (Closing)	End Results Evaluation	End results evaluation completed? Most significant achievements? Things to improve next time?
	Learning Outcomes Evaluation	Learning outcomes evaluations completed? Most significant achievements? Most important lessons learned?
	Project Methods Evaluation	Project methods evaluation completed? Most significant achievements? Things to improve next time?

One of the most important ways that students can evaluate their project performance is to present their project work to the public – to other students, teachers, parents, community members, project professionals, business leaders, elected officials, etc.

Exhibition nights at school, project fairs, portfolio presentations on parent nights, presentations at PMI chapter meetings or education conferences, etc., are wonderful ways for students to hone their presentation skills, receive rich feedback on their work, and most importantly, offers a way to celebrate all the hard-won achievements in their project work.

Celebrating the completion of projects is an essential part of the Review stage of the learning project cycle that provides an opportunity for students to take pride in their work, receive recognition for their accomplishments, and increase their motivation to jump into the next project.

Appendix Two – 21st Century Skills Definitions

Learning and Innovation Skills

Learning and innovation skills increasingly are being recognized as those that separate students who are prepared for a more and more complex life and work environments in the 21st century, and those who are not. A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future.

CRITICAL THINKING AND PROBLEM SOLVING

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Analyze and evaluate major alternative points of view
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes

Solve Problems

- Solve different kinds of non-familiar problems in both conventional and innovative ways
- Identify and ask significant questions that clarify various points of view and lead to better solutions

CREATIVITY AND INNOVATION

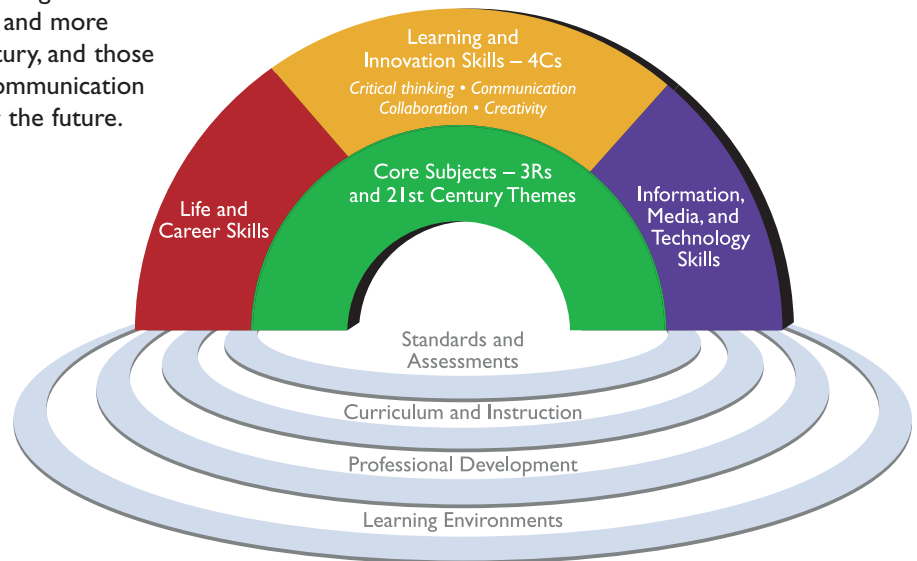
Think Creatively

- Use a wide range of idea creation techniques (such as brainstorming)
- Create new and worthwhile ideas (both incremental and radical concepts)
- Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

Work Creatively with Others

- Develop, implement and communicate new ideas to others effectively
- Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work

21st Century Student Outcomes and Support Systems



P21 Framework for 21st Century Learning

www.P21.org

- Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas
- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Implement Innovations

- Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

COMMUNICATION AND COLLABORATION

Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multi-lingual)

Collaborate with Others

- Demonstrate ability to work effectively and respectfully with diverse teams
- Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Information, Media and Technology Skills

People in the 21st century live in a technology and media-suffused environment, marked by various characteristics, including: 1) access to an abundance of information, 2) rapid changes in technology tools, and 3) the ability to collaborate and make individual contributions on an unprecedented scale. To be effective in the 21st century, citizens and workers must be able to exhibit a range of functional and critical thinking skills related to information, media and technology.

INFORMATION LITERACY

Access and Evaluate Information

- Access information efficiently (time) and effectively (sources)
- Evaluate information critically and competently

Use and Manage Information

- Use information accurately and creatively for the issue or problem at hand
- Manage the flow of information from a wide variety of sources
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information

MEDIA LITERACY

Analyze Media

- Understand both how and why media messages are constructed, and for what purposes
- Examine how individuals interpret messages differently, how values and points of view are included or excluded, and how media can influence beliefs and behaviors

- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media

Create Media Products

- Understand and utilize the most appropriate media creation tools, characteristics and conventions
- Understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments

ICT LITERACY (Information, Communications and Technology)

Apply Technology Effectively

- Use technology as a tool to research, organize, evaluate and communicate information
- Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies

Life and Career Skills

Today's life and work environments require far more than thinking skills and content knowledge. The ability to navigate the complex life and work environments in the globally competitive information age requires students to pay rigorous attention to developing adequate life and career skills.

FLEXIBILITY AND ADAPTABILITY

Adapt to Change

- Adapt to varied roles, jobs responsibilities, schedules and contexts
- Work effectively in a climate of ambiguity and changing priorities

Be Flexible

- Incorporate feedback effectively
- Deal positively with praise, setbacks and criticism
- Understand, negotiate and balance diverse views and beliefs to reach workable solutions, particularly in multi-cultural environments

INITIATIVE AND SELF-DIRECTION

Manage Goals and Time

- Set goals with tangible and intangible success criteria
- Balance tactical (short-term) and strategic (long-term) goals
- Utilize time and manage workload efficiently

Work Independently

- Monitor, define, prioritize and complete tasks without direct oversight

Be Self-directed Learners

- Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise

- Demonstrate initiative to advance skill levels towards a professional level
- Demonstrate commitment to learning as a lifelong process
- Reflect critically on past experiences in order to inform future progress

SOCIAL AND CROSS-CULTURAL SKILLS

Interact Effectively with Others

- Know when it is appropriate to listen and when to speak
- Conduct themselves in a respectable, professional manner

Work Effectively in Diverse Teams

- Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
- Respond open-mindedly to different ideas and values
- Leverage social and cultural differences to create new ideas and increase both innovation and quality of work

PRODUCTIVITY AND ACCOUNTABILITY

Manage Projects

- Set and meet goals, even in the face of obstacles and competing pressures
- Prioritize, plan and manage work to achieve the intended result

Produce Results

- Demonstrate additional attributes associated with producing high quality products including the abilities to:
 - Work positively and ethically
 - Manage time and projects effectively
 - Multi-task
 - Participate actively, as well as be reliable and punctual
 - Present oneself professionally and with proper etiquette
 - Collaborate and cooperate effectively with teams
 - Respect and appreciate team diversity
 - Be accountable for results

LEADERSHIP AND RESPONSIBILITY

Guide and Lead Others

- Use interpersonal and problem-solving skills to influence and guide others toward a goal
- Leverage strengths of others to accomplish a common goal
- Inspire others to reach their very best via example and selflessness
- Demonstrate integrity and ethical behavior in using influence and power

Be Responsible to Others




- Act responsibly with the interests of the larger community in mind

Appendix Three – Project Management for Learning Pathways

Project Management & Leadership Pathways

Learning how to manage and lead effective projects can follow a variety of pathways, often starting simply and moving along a trajectory toward a more professional approach to project management and leadership.

The development of project management and leadership skills can start very early in life as a set of simple life skills that help get things done, move on to a more detailed and rigorous approach with learning projects and mastering of project learning skills, then continue the trajectory to a career or professional project management approach as practiced by Project Managers in every field of work, as shown in this pathways chart:

Life Skills »	Learning Skills »	Career Skills »
<p>PROJECT STEPS (FOUR STEPS)</p>  <ul style="list-style-type: none"> • Set a Goal • Plan the Steps • Do It • Review It 	<p>PROJECT CYCLE (FOUR PHASES)</p>  <p>STUDENT WHEEL TEACHER WHEEL</p> <ul style="list-style-type: none"> • Define • Plan • Do • Review 	<p>PROJECT METHODOLOGY (FIVE PROCESSES)</p>  <ul style="list-style-type: none"> • Initiating • Planning • Executing • Monitoring & Controlling • Closing
	<p>Prescriptive</p> <ul style="list-style-type: none"> • Identify • Design • Create • Evaluate <p>Exploratory</p> <ul style="list-style-type: none"> • Imagine • Discover • Model • Evolve 	<p>Agile-Adaptive</p> <ul style="list-style-type: none"> • Envision • Speculate • Explore • Adapt • Close

Source: ConnectEd's Linked Learning Career Pathways, <http://www.connectedcalifornia.org/>

Source: A Guide to the Project Management Book of Knowledge (PMBOK® Guide) – Fifth Edition

Life Skills »	Learning Skills »	Career Skills »
<p>PROJECT METHODS</p> <p>Goal Setting</p> <ul style="list-style-type: none"> • Project Size • Project Quality <p>Step Planning</p> <ul style="list-style-type: none"> • Steps Sequence • Time • Resources • Team Roles <p>Troubleshooting & Fixing</p>	<p>PROJECT METHODS</p> <p>Project Definition</p> <ul style="list-style-type: none"> • Project and Learning Goals • Learning Project Type • End Results • Driving Question, Problem, Issue, Perspective • Completion Date • Needed Resources • Evaluation Methods • Project Risks <p>Team Agreement</p> <ul style="list-style-type: none"> • Team Roles • Team Member Profiles • Communication Methods • Decision-making Methods • Disagreement Resolution Methods • Change Management <p>WorkPlan</p> <ul style="list-style-type: none"> • Project Deadlines • Project Tasks • Task Owners • Resources Needed • Time Schedules <p>Check-in Meetings</p> <ul style="list-style-type: none"> • WorkPlan Progress • Quality of Work • Communication Effectiveness <p>Evaluations</p> <ul style="list-style-type: none"> • End Results • Learning Outcomes • Project Methods 	<p>PROJECT METHODS</p> <p>Knowledge Areas</p> <ul style="list-style-type: none"> • Scope • Time • Cost • Quality • Teamwork • Communications • Risk • Resources • Integration

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Source: High Tech High School, www.hightechhigh.org

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Source: © 2008 Diagram from Oracle Education Foundation, Team Ready Guide. Examples obtained from Oracle Education Foundation's ThinkQuest Competition which is currently suspended.

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Source: © 2012 The ThinkQuest program's Assessment Rubric was developed by the Oracle Education Foundation to judge entries in an annual global student competition. Examples are from ThinkQuest Competition which is currently discontinued.

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Source: A Guide to the Project Management Book of Knowledge (PMBOK® Guide) – Fifth Edition

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