

Designing Effective Projects: Teaching Thinking

Explicit Instruction in Thinking

Teaching Specific Skills

Project-based learning offers rich opportunities for providing instruction in specific thinking skills and strategies while emphasizing subject area learning in authentic contexts. By teaching 10-15 minute mini-lessons on skills while students are working on projects, teachers can organize instruction so students can immediately apply what they have learned in meaningful contexts. Effective explicit instruction generally consists of six components.

1. Selection of an appropriate skill or strategy for instruction
2. Labeling and categorizing of the skill
3. Modeling of the skill through a think-aloud
4. Guided practice of the skill with a partner or small group
5. Explanation of how and when to use the skill or strategy
6. Ongoing coaching on how to use the skill effectively

Select a Skill to Teach

Complex projects require many different kinds of thinking, and a teacher must be judicious in selecting those to target during explicit instruction. Barry Beyer in his book *Practical Strategies for the Teaching of Thinking* suggests asking the following questions when choosing skills to target for instruction.

- Will the students have reason to use the skill in their everyday lives outside of the classroom?
- Will the skill have frequent, practical use in learning many subject areas?
- Will the skill build on skills students have already learned and/or lead to more complex skills they will need in the future?
- Can the skill be easily integrated into subject-matter instruction?
- Are the students ready to learn the skill with explicit instruction and appropriate effort?

When selecting a skill, a good place to start is with the higher levels of the revised Bloom's Taxonomy or the comprehension and analysis portions of Marzano's New Taxonomy. Within the skills, select sub-skills that are as narrow and specific as possible. Instructions to "think more deeply" or "use higher-order thinking" are about as much use to students as the admonition to "try harder" is to an athletic team. Without directions on what to do exactly, many students, especially those who struggle, will have difficulty learning new skills.

For example, instead of teaching a lesson on a skill like "analysis", teach students how to make inferences about point of view in a first-person account of a historical event. In a later lesson, students could learn to make inferences about assumptions behind a government press release. By repeating lessons on inferences with different kinds of information and different sub-skills, students can build an understanding of how to apply a thinking skill in different situations.

Students in primary school are capable of learning a great number of skills, some of which are precursors to more advanced thinking in later years. The following skills are appropriate for young children.

- Determining differences and similarities/comparing and contrasting
- Categorizing
- Deciding if something is good evidence

- Differentiating between fact and opinion, science and fantasy
- Understanding different points of view
- Giving reasons for opinions
- Goal-setting
- Checking work
- Making simple inferences about stories and concepts
- Differentiating between important and trivial information

What Skills to Teach

By the time students reach upper primary school and lower secondary school, they are ready to begin to develop formal reasoning skills. Mini-lessons on the following skills would be appropriate for that age of student.

- Creating categories based on specific events or items
- Drawing conclusions based on available information
- Identifying some types of fallacies in informal reasoning
- Understanding the difference between claims and facts
- Evaluating the credibility of evidence
- Judging the quality of a piece of work by a rubric

Upper secondary school students can be capable of quite sophisticated thought processes and can be taught the following skills.

- Constructing valid arguments
- Identifying errors in opinions
- Developing principles based on concrete information and situations
- Drawing logical conclusions based on interpretation of information
- Generating criteria for evaluating a project or idea
- Creating alternative scenarios

Of course, the kinds of thinking that students are capable of depend on more than their year/form. Some teachers can devise ways to help primary school students think logically, and when properly motivated by an engaging project, students can achieve far more than many adults can imagine. The point is to look at the work students are being asked to do and identify some important skills that will help them do it, then to think about the abilities of the students in order to select those skills to target in explicit instruction.

Identifying specific skills to teach can be a challenge. Teachers can get some help from the literature on teaching reading. Skills such as making connections, asking questions, and making inferences are used in reading, but they are also used in thinking about anything else. There is a great deal of practical information about teaching reading skills and strategies in the content areas that can be applied to learning in general.

Examples of Teachable Skills

primary school students in the Unit Plan, [African Adventure Safari](#), help safari guests learn about diversity, interdependence, and the wonder of life in the African wild. At appropriate places during the unit, the teacher could teach the following skills:

- Brainstorming
- Setting learning goals
- Searching for information on the Internet
- Using a storyboard for planning

In [Enduring Heroes](#), lower secondary school students discover heroes of the past and present. As they read about heroes in Greek mythology, they consider a contemporary hero and write a myth about that hero. Some skills that would be appropriate to teach during this unit would be:

- Summarizing by identifying important information and deleting trivial information
- Using induction to develop abstractions based on concrete details
- Evaluating their own work based on established criteria

Upper secondary school algebra students use socially relevant data to plot historic trends and project them into the future in [Track the Trends: Predict the Future](#). Some thinking skills that could be taught during this unit are:

- Searching for information on the Internet
- Judging whether data are reliable
- Interpreting graphs
- Thinking for alternative solutions to problems

Label and Describe How to Perform the Skill

Giving a skill an appropriate label is an important part of thinking skills instruction. A name allows the teacher to discuss the skill in other contexts and gives the students and teacher a common language about thinking. Depending on the age of students, consider creating catchy names for skills that will be used often, such as Mr. Spocking for logical thinking, or Prove It for evaluating evidence.

After giving the skill a name, suggest a series of steps to go through to perform it, keeping in mind that you are explaining to students how to do something that can apply in a variety of contexts. Keep the suggestions general and, whenever possible, include variations that students can apply to suit their particular learning and thinking styles.

For example, give students the following questions to ask about a Web site:

- Who is the author? Is the site supported by an organization with a reputation for credibility? Is it a personal Web page?
- Are the sources cited and can you check them yourself?
- What is the date of the site? When was it last updated?

The steps to performing a skill can come from many places, most often from the minds of teachers who are aware of their own thinking processes. Asking yourself questions like, “What do I do when I have to put items in different categories?” or “How do I know that this article is biased?” can help you determine some steps that will help your students. As you think more about your own thinking, especially in different subject areas, you will become more and more proficient at identifying your thinking processes and better at sharing those processes with your students.

Model the Skill

The most critical part of explicit instruction is modeling the use of the thinking skill. This is most effectively accomplished through a think-aloud, a method through which a person articulates their thoughts as they think about an issue or a problem. This is one way in which students can see how an expert thinks about the subject.

When performing a think-aloud, keep the following tips in mind:

- Decide ahead of time what thinking skill you are modeling and limit your comments to just those that support that skill.
- Explain what you are going to do before you do it and make sure students understand the purpose of the think-aloud.
- If you're performing the think-aloud while reading a text of some kind, practice ways of helping students understand the difference between when you are reading and when you are thinking. You can turn your head in a different direction. Some teachers look out into space or put their fingers on their chins to show that they are thinking, not reading.
- Don't get distracted by expanding your comments to lecture on the topic. It's easy to "explain" about the topic instead of thinking about it.

Doing think-alouds can feel awkward and uncomfortable at first, but with practice it becomes much easier. Teachers are often surprised at the positive response they get from students when they try this method. Asking students to do think-alouds is also an excellent way to help them become more metacognitive, to identify the thinking strategies they use, and to become aware of those of others.

Think-aloud Examples

Primary School Example

I'm going to compare myself to an African animal. Let's see, what are some things I can compare? I could compare our sizes, our homes, what we like to eat, and what we look like. I could also compare the things we're good at. I'm kind of like a gorilla because I walk on two feet and so do gorillas. I also have black hair like a gorilla. I'm fast like a cheetah and have very strong legs. Cheetahs are also good at sneaking around and attacking things. I'm pretty good at sneaking up on my mom, but I don't attack her.

Secondary School Example

I'm going to try to figure out what the symbols are in the book *Lord of the Flies*. I know that some things in a book represent big ideas and some don't. They just are what they are. One way I can tell if something is a symbol is if it shows up over and over again in the book. Well, the conch shows up over and over again, and so does the fire. Another way to tell is if something plays an important role in the story, like Piggy's glasses. I don't think the plane is a symbol because they don't talk about it much.

Provide Guided Practice

After you have modeled the skill, give students some practice using the skill in a structured context. Provide them with a list of suggested steps to follow with a partner or walk them through it as a whole group. It is very important to pay attention to how the students are performing the skill and give them encouragement and suggestions as they try it on their own. They may need close supervision and lots of scaffolds for support, especially with unfamiliar skills.

For example, if the explicit instruction is on how to evaluate a Web site, you could give them a list of pre-selected Web sites to evaluate with a partner using a set of questions. If students were studying comparisons, you could give them two things to compare using the strategy you have explained. After a lesson on determining symbols, you could give them a short poem, video excerpt, or comic strip and ask them to apply the process of finding symbols to that text. This practice should be structured and should call out those aspects of the skill that you want to emphasize.

Discuss Strategy Use

While it is true that students can learn a strategy if it is taught to them, there is no guarantee that they will use it spontaneously with appropriate tasks. In fact, research overwhelmingly suggests that students rarely use what they have learned in new situations, even situations that are very similar to the ones in which the skill was learned. In order for students to have the information they need to become proficient at using a new strategy, they need to think about it metacognitively.

The most efficient and independent learners are aware of how they think. By practicing metacognition, students can learn to control their thinking and make decisions about how to approach complex projects most effectively.

Discuss How and When to Use a Strategy

Possibly the most important part of explicit instruction is a discussion about how to use the strategy. Teachers need to explain when to use the strategy. They can also solicit from students how they might use it and what changes they might make.

For example, after a lesson about comparing and contrasting, a teacher might conduct a discussion like the following:

Teacher:	When might you want to compare two things? In math, we compare numbers. How would we do that?
Student	We say that one number is bigger or smaller than another.
Teacher:	Is there another way to compare things in math?
Student:	We also compare shapes by saying some are round or rectangles or some have more sides than others.
Teacher:	When might we use comparing in social studies?
Student:	We compare different countries, how the people or the products they make are alike.
Teacher:	Good example. What are some tools we might use to compare things?
Student:	We could make two lists.
Teacher:	Good. What kinds of diagrams could we make?
Student:	We could make a chart with two columns.
Student:	Or what about that kind of diagram with two circles.
Student:	A Venn diagram.
Teacher:	Good. Are there any times that you compare things while you're reading?
Student:	When I read a story, I like to compare the characters to my family and friends.
Student:	Sometimes I think about movies I've seen when I'm reading a book
Teacher	So comparing things can help us do a lot of things.

Presenting ways to use a strategy is important, but so is eliciting ideas from students. This is all part of developing a "language of thinking" in the classroom, where students can discuss how they think as well as what they think about.

Coach Students in the Use of the Strategy

The biggest problems with improving students' thinking are getting them to transfer the skills they have learned in one context to another and to use them independently and flexibly when they are useful. The most effective way to accomplish this is by consistent and ongoing coaching in the art of thinking.

When teachers coach students in thinking skills, they assess their proficiency in a variety of ways such as reflections, think-alouds, checklists, and formal and informal conferences. They provide frequent specific feedback on thinking processes. They praise instances of good thinking, describing them in terminology that students understand. They remind students of thinking strategies they have learned in the past and encourage them to modify the strategies to suit different tasks.

Teachers as Thinkers

The biggest challenge to improving students' thinking lies within the thinking awareness of the teacher. Teachers are good at thinking, especially in their areas of expertise, but they are often unaware of the skills and strategies they use when they think about academic problems.

The first step for teachers who want to emphasize thinking with their students is to practice metacognition with their own thinking. By asking themselves questions about how they think, they can become adept at identifying the thinking skills necessary for completing particular kinds of tasks which will help them design explicit instruction in those skills.

To become more aware of your own thinking, record a think-aloud of yourself doing a complex task. The task must be challenging enough so that your thinking processes are not automatic. This means that generally, tasks designed for your students will be too easy to help you realize how you are thinking. Once you have identified some thinking skills that you use, you can apply them to work that you are asking students to do.

Becoming better thinkers benefits everyone, students, teachers, and the communities they live in. Explicit instruction in both the "how-to" and the "when-to" of using different thinking skills and strategies is a teacher's most important tool in helping students grow into the kinds of thinkers that will make their world a better place.

Reference

Beyer, B. K. (1987). *Practical strategies for the teaching of thinking*. Boston: Allyn & Bacon.