

PORTABLE KNOWLEDGE



A VISIBLE THINKING BUNDLE TO FOSTER TRANSFER OF CONTENT AND 21ST CENTURY SKILLS

DEVELOPERS OF THE PORTABLE KNOWLEDGE BUNDLE:

FLOSSIE CHUA, KARIN MORRISON, DAVID PERKINS, SHARI TISHMAN

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AN INTRODUCTION TO PORTABLE KNOWLEDGE

When we teach something, we aspire to what might be called *portable knowledge*. We're hoping that learners won't just be storing up knowledge for the unit test or essay. They'll connect what they learn to other studies and to their lives now and later in their roles as family members, citizens, and workers.

We'd like them to connect ideas from history to contemporary conflicts and policy issues. We'd like them to connect 18th-century literature or folktales to modes of expression thriving today and to abiding human problems. We'd like to see fundamentals of math and science they've studied help them make sense of the everyday world and to read newspaper or magazine articles or watch a science documentary with more orientation and insight. We'd like them to draw on their experience and insights in learning one language toward learning another. We very much want not just knowledge for now, for this unit, for this test, for this essay, but portable knowledge.

Educators and cognitive scientists refer to this challenge as *transfer of learning*. We want students to *transfer* and apply what they learn here and today far and wide in their lives. We want knowledge that travels, not knowledge that stays at home.

The good news: typical curricula in any discipline are rich with ideas, themes, and methods with high potential for transfer – with portability in principle. To be sure, typical curricula also have more specialized technical aspects that don't necessarily invite broad transfer. But there's plenty that does!

The bad news: portability in principle isn't portability in practice. You might think that if a student had learned X for a particular unit, the student would apply X far and wide. After all, the student knows X. Oddly, knowing X isn't enough. Research going back more than a century shows that commonly students do not connect what they are learning far and wide. What they are learning tends to get stuck instead of traveling.

How does knowledge get stuck in the place and time it was learned?

Part of the problem is simply forgetting, but the main bottleneck is not forgetting – it's activating. When themes students have studied connect in principle to a particular newspaper headline or a family conversation or a theme in another academic subject entirely, for the most part students just do not notice the relationships. When students face personal decisions that might be informed by a topic they have studied formally, commonly the relevance never comes to mind. The knowledge is portable in principle but not portable in practice.

HOW TO GET PORTABLE KNOWLEDGE

The way forward reflects a simple fundamental of human learning: *What you learn is what you do*. When classroom and assignment activities focus just on the topic, then students learn the ins and outs of the topic as an isolated topic...and that's that for the most part!

Even if the activities guide students to dig into the topic in some depth with real understanding, still, basically they are learning to think *about* the topic...not learning to think *with* the topic about other things. So the knowledge tends to get stuck. The students may enjoy their studies and do well on tests or essays, but they really haven't understood the topic broadly or gotten the most out of it as they go forward in life to other studies and practical situations.

To be sure, some students adopt a broader stance toward learning. And some circumstances can cue connection making. So transfer occurs here and there from time to time. However, "business as usual" in the classroom usually does not get us nearly as much portability as we would like.

The basic solution is as simple as the basic problem. If *what you learn is what you do*, let's be sure that students expect and do a good deal of connection making around topics. Then that will become part of what they learn, bringing them to a broader understanding and to knowledge that can play a more rich and active role in their lives. They will have truly portable knowledge!

To get practical about this, students will acquire much more portable knowledge if we attend to these three things in our teaching:

1. *Framing the learning agenda for portable knowledge from the beginning.* Make it clear that what's being learned applies far and wide and encourage students to think about it that way.
2. *Weaving multiple connection-making experiences into the learning process.* Remember, *what you learn is what you do*. Students who do considerable connection making with what they are learning are much more likely to continue that connection making later.
3. *Fostering strong identities as thinkers and learners.* This will encourage transfer in general and help specifically with transfer of thinking skills and other 21st century skills.

IS PORTABLE KNOWLEDGE WORTH THE INVESTMENT?

But wait...what are the trade-offs of spending time on portable knowledge? This is the sort of question that any educator has to take seriously. An investment in framing for portable knowledge, weaving in multiple connection-making experiences, and fostering identities as thinkers and learners will certainly take some time – not necessarily a huge amount of time, but some time – away from digging into the details of the topic.

Is that worthwhile? Let's consider the pluses and minuses.

On the minus side, an information-oriented test at the end of the topic might show that learners have a few fewer details "in their heads." However, those details will almost certainly get forgotten in a few days anyway.

Also, now and then one finds what's called negative transfer, when learning in one area causes mistakes in another. For instance, people used to driving on one side of the road in one country need to watch out for negative transfer of habits when they drive in a country with a different convention. However, negative transfer is a minor phenomenon compared to positive transfer. Most people quickly learn their way past the mistakes.

Now for the plus side: Attention to portable knowledge will almost certainly motivate learners by making the learning more meaningful, build a deeper and broader understanding, help the knowledge stick for a long time because it has more associations, provide a better basis for returning to the same topic later in other contexts, and enable the learners to apply some of what they've learned broadly in their lives. That's a pretty good deal!

The rest of this document shares a flexible systematic practical approach to attaining the three goals of framing for portable knowledge, weaving in multiple connection-making experiences, and fostering identities as thinkers and learners.


GOAL 1.

FRAMING THE LEARNING AGENDA
FOR PORTABLE KNOWLEDGE
FROM THE BEGINNING
OF A TOPIC OR UNIT

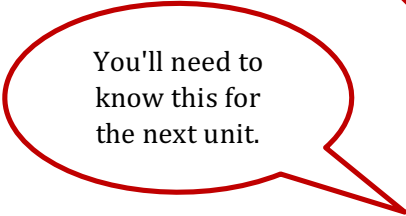


INTRODUCING A TOPIC WITH EXPANSIVE FRAMING

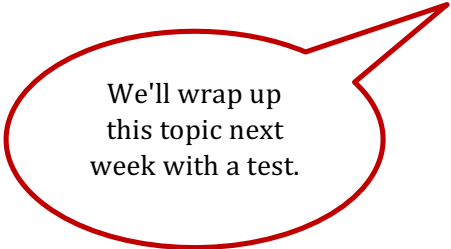
Avoid
NARROW FRAMING



This topic has been a standard part of the subject matter for many years.

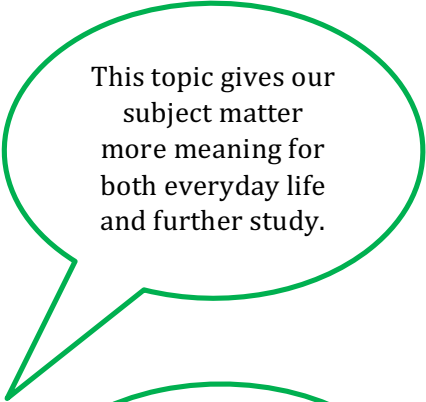


You'll need to know this for the next unit.




We'll wrap up this topic next week with a test.


Embrace
EXPANSIVE FRAMING



This topic gives our subject matter more meaning for both everyday life and further study.



Here's how this topic helps us to understand our world.



We're making a good start on a rich topic; there's much more to explore later.

Q&A: INTRODUCING A TOPIC WITH EXPANSIVE FRAMING

What's the basic idea of expansive framing versus narrow framing? Studies of classrooms and texts show that sometimes topics are introduced in ways that suggest "we're studying this here and now; let's master it and move on." That's narrow framing. In contrast, sometimes topics are introduced in ways that suggest "we're studying this because it connects widely and importantly to other parts of the subject matter, later studies in other areas, and understanding our world." That's expansive framing.

Why is expansive framing important? It sends the message that what we're studying today isn't just for today; it's for multiple important occasions in the near and far future. Expansive framing creates in students a mindset of expecting portable knowledge, i.e. transfer of learning. Not only is this motivating but it also turns students' attention to possible connections as they study the topic.

Why begin expansive framing at the beginning of a topic? Because it establishes expectations for portable knowledge from the first, even though the students probably have to learn some about the topic before they can begin to see connections for themselves. Of course, expansive framing should continue as the class advances through the topic.

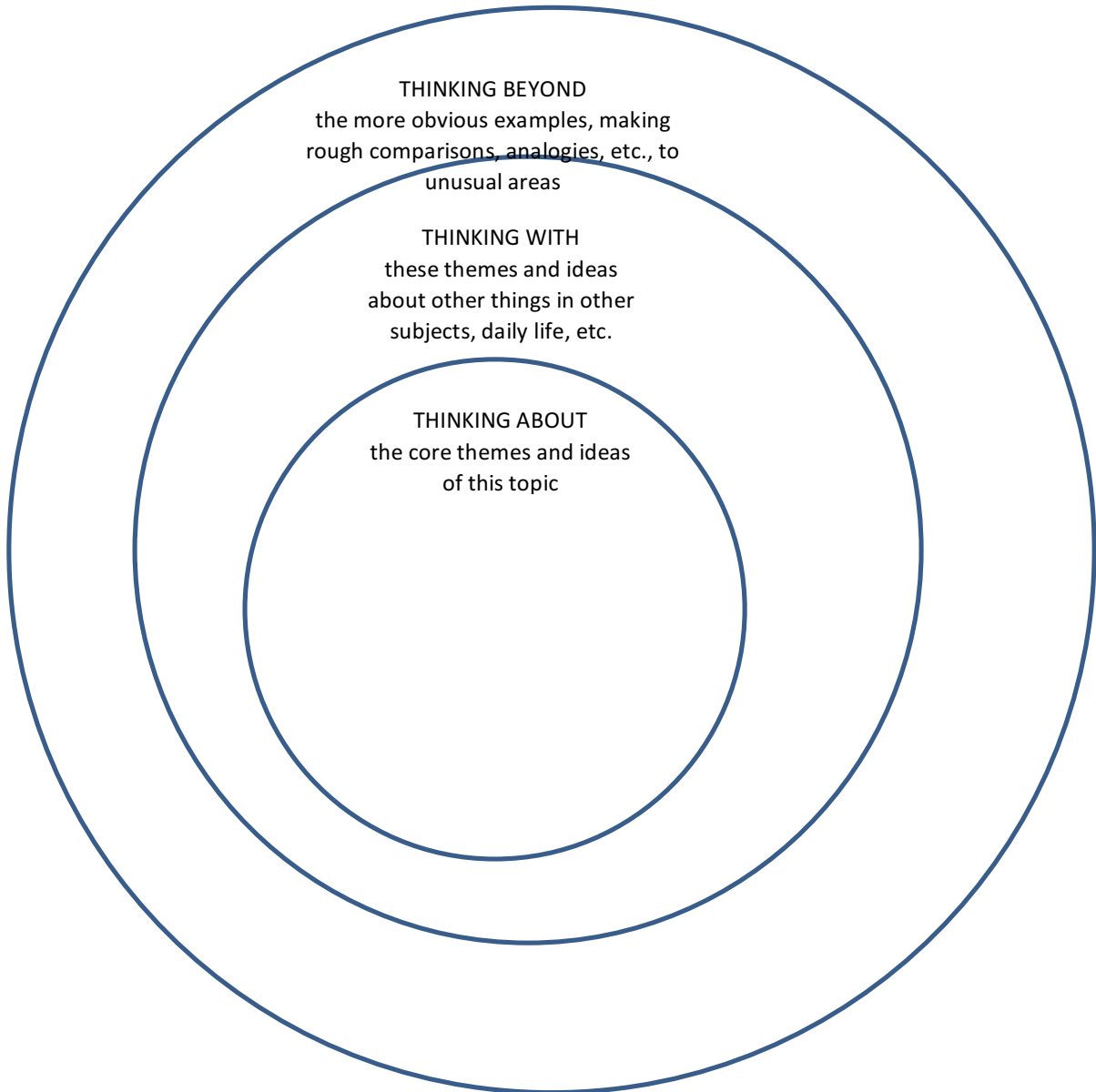
After I introduce a topic with expansive framing, will that stick or do I need to keep framing things that way? You want to keep framing things that way from time to time, reminding students of the broader relevance of what they are learning. That said, the beginning is particularly important.

So is the end, when you are wrapping up a topic. For instance, you might lead a conversation provoking the learners to wonder about the topic and where it might go next.

Is expansive framing entirely up to the teacher? Students can participate in the process through a kind of brainstorming. The next strategy gives one way to do this. However, the very first words you say about a topic begin to establish students' expectations. Accordingly, it's a good idea to begin with at least some of your own expansive framing.

Where does the idea of expansive framing versus narrow framing come from? It's the product of research on transfer of learning conducted by Prof. Randi Engle and colleagues at the University of California Berkeley Graduate School of Education. For one source, see Engle, R. A., Lam, D. P., Meyer, X. S., & Nix, S. E. (2012). How does expansive framing promote transfer? Several proposed explanations and a research agenda for investigating them. *Educational Psychologist* 47(3), 215-231

THREE CIRCLES: AN EXPANSIVE FRAMING ROUTINE TO LAUNCH A TOPIC



Q&A: THREE CIRCLES

What's the basic idea of the Three Circles? It's an invitation for students, with your help, to map the broad relevance of the topic for understanding the world and for further studies, in the spirit of expansive framing.

Also, you can use the three circles in planning, to think in advance about the broad relevance of a topic you teach and anticipate where students might take it. Some teachers do this with colleagues, coordinating their teaching.

Some ideas within a large topic seem to offer a lot more portability than others. What do I do about that? For the Three Circles and transfer in general, focus on the opportunities! Pick ideas within the topic that offer the most stretch.

How do the three circles fit together? The inner circle, thinking about, invites identifying a few core themes and ideas, the kinds of headlines that might be mentioned in an introduction to the topic.

The next circle, thinking with, invites identifying possible applications beyond standard examples used in the instruction. For instance, if students are studying food webs, a possible application would be to explore how human beings today fit into a food web, how pets fit into a food web, and how prehistoric human beings fit into a food web (a distinctly different picture than people today!).

The outer circle, thinking beyond, invites analogical thinking about other situations that might in some way be like the topic. For instance, if students are studying food webs, how is the mining of minerals like and unlike a food web? How are companies' promotion and sales of products like and unlike a food web?

There's not that much room in those three circles! – What if my students have lots of ideas? Feel free to improvise a different layout, for instance using lines to connect items into the circles, or simply having three columns – whatever works for you! Just try to keep the spirit of pushing further and further outward, from thinking about to thinking with to thinking beyond.

At the beginning of the topic, how can students know what ideas for thinking about, thinking with, and thinking beyond might be fruitful? They can't know with confidence. However, in introducing the topic you've told them a little bit about it, especially helping to fill in the center, and some of them probably know a little bit about the topic already. They can speculate. And you can help.

What if some students mention areas of thinking about, thinking with, or thinking beyond that don't really fit very well? No big deal! Just quietly accept the ideas. You can loop back later in the topic and ask which ideas seem to be working out best. At the beginning, the aim is to energize the exploration of the topic by generating curiosity.

What happens to the Three Circles chart? Keep it around! Make the chart on newsprint. Or take a digital photograph of a chart that you can project later. As the students learn more about the topic, engage them in exploring some of the ideas for thinking with and thinking beyond. The thinking routines from the next section will help with this!

And of course you can add new ideas to the Three Circles at any time.

GOAL 2.

WEAVING MULTIPLE CONNECTION-MAKING
ACTIVITIES INTO THE LEARNING PROCESS



THINKING EXPEDITIONS

Thinking expeditions are conversational thinking activities that explore how a topic connects to broader applications and themes, beyond the immediate straightforward examples that might be used in standard instruction.

Ideally, thinking expeditions occur several times during the treatment of a topic. They help students build portable knowledge by active connection making, following through on the principle from earlier that *what we learn is what we do*.

In this way, thinking expeditions reinforce the broad relevance of the topic, helping to sustain motivation, curiosity, and engagement. In other words, thinking expeditions help to maintain expansive framing throughout the topic. They exercise thinking with and thinking beyond, as in the Three Circles chart.

There are many different ways to structure thinking expeditions. Perhaps it's most useful to begin with a quick example and generalize from there. This example uses a thinking routine called Portable Surprise. The details of Portable Surprise and several other thinking routines useful for organizing thinking expeditions appear later. Also, teachers sometimes make up their own routines!

A SAMPLE THINKING EXPEDITION USING PORTABLE SURPRISE

The teacher and students in a particular class have been exploring global warming. From the beginning, the topic has been framed expansively.

Today the teacher announces, "Global warming is very interesting as a *controversy*. It's not the only time there have been big controversies about what's happening in the world and what we should do about it. Now that we have a handle on global warming, let's explore some of the differences and parallels in various ways."

The teacher casually introduces a thinking routine called *Portable Surprise*. "When we learn about a complicated theme like global warming, often there are some surprises, things we didn't really expect, things that are alarming or helpful. These can be different from person to person. Let's ask this: What big pattern about the situation and its controversies surprised you? And then ask: where else in the world do you or might you find that kind of surprise?"

Portable Surprise invites what we've called thinking beyond – exploring analogies between the current topic and other situations that might concern very different matters.

Students work in groups to discuss portable surprises and then share their thoughts. A student from one group says, "We were really surprised by how confusing it all is. Some people say this, some people say that. Originally, there was a lot of debate among the scientists. And now there is a kind of a consensus but it took a really long time and there's a lot more agreement about whether there is a problem than about how to fix it."

Another student from the group continues, "We were thinking where else that happens. We were remembering that a while ago it was really controversial whether cigarettes cause cancer, and that lasted for a long time."

The teacher asks, "Why do you think it took so long to sort that out?"

A student suggests, "Well, for one thing lots of things just take a long time to figure out. I mean I guess that's part of the reality. You can't do a single experiment and nail it."

Another student suggests, "And on top of that, there are people who really care one way or another and they want to push their case and that can even confuse things – like the cigarette companies or, say, as we

learned about global warming, industries that don't want to make adjustments because it would be really expensive so they don't want to believe in global warming and don't want others to believe."

Another group identifies a different contemporary controversy: genetically engineered crops. The class discusses this for a while and posts stickies comparing and contrasting the controversies around global warming and genetically engineered crops.

The teacher prompts them further: "Let's not just put up big things, also more local things, around our community here for instance."

The students add ideas like: Hard to tell whether Morris would make a good mayor; what to do about the old town dump; whether there is really a lot of prejudice here about immigrants because some say yes but some say it's nothing.

At the teachers prompting, the students mark which cases seem most like the global warming case in the uncertainties and debates and speculate on what's behind the difficulties. They also discuss how such situations might be handled better.

THE BROAD ORGANIZATION OF THINKING EXPEDITIONS

There's plenty of room for variation, but here are some steps you could consider.

1. IN ADVANCE, EXPLORE THE POSSIBLE THINKING AND LEARNING GOALS

What seem to you the most important connections that might be drawn from the particular topic, in the spirit of thinking with and thinking beyond? For instance, if the class has been studying global warming, perhaps it seems especially important to make connections to the local environment. Or perhaps it seems important to make connections to the general nature of controversies, as in the above example. Or both, at different moments. There are many possibilities!

You can decide, or you might want to engage your students in discussing what the richest connections might be, for instance with the help of a Three Circles chart from the beginning of the topic.

2. IN ADVANCE, CONSIDER HOW TO ORGANIZE THE THINKING EXPEDITION

It's generally helpful to use a thinking routine, such as Portable Surprise. Several possible routines appear at the end of this document, and sometimes teachers make up their own. There are two advantages to using these thinking routines: (1) they are structured deliberately to get at thinking with and/or thinking beyond; (2) after students use a routine a few times, students get familiar with it, develop skills around it, and incorporate it into their general thinking repertoire as a useful tool.

3. LAUNCH THE THINKING EXPEDITION

Announce that we're going to undertake a thinking expedition. Or, if you don't like the term thinking expedition, you can say connection expedition or connection safari or make up your own label. The point is to frame the activity as a deliberate expedition beyond the topic taken straightforwardly. This is part of expansive framing.

It may be useful to have a Three Circles chart in view, as a source of ideas. The conversation may even lead to adding to the chart.

4. ENGAGE THE CLASS IN THE THINKING ROUTINE

Thinking routines do not have to be followed in exactly the same way each time. In fact, variety is energizing. Sometimes there might be small group discussions leading to a class discussion, sometimes just a general class discussion. Sometimes students might prepare a little as homework, sometimes not. Etc.

Q&A: THINKING EXPEDITIONS

The sample thinking expedition for global warming looks as though it could take a class period or more. With my schedule a bit jammed, do thinking expeditions have to be that long? Not at all! Much depends on your context. Typically, the "same" expedition from the standpoint of the routine used can be done in shorter or longer form, simply by adjusting the number of items considered and the length of discussions. A *short* thinking expedition is generally a better choice than *no* thinking expedition.

As my students and I advance through a topic, when should we start thinking expeditions? Try to make a fairly early start, at least with a small-scale thinking expedition. There's a temptation to push thinking expeditions toward the end of a topic, after the core has been covered. However, to ensure the learning of portable knowledge, you'll want to start early. Also, matters planned for the end often fall off the end, as time runs out.

How many thinking expeditions should my students and I undertake for a topic? Of course, "topic" is a very loose term; the treatment of the topic might range from a couple of class periods to a couple of weeks or more. For a short topic, a single thinking expedition might make sense. For a topic that takes weeks, several thinking expeditions keep extending portable knowledge.

Some ideas within a large topic seem to offer a lot more portability than others. What do I do about that? We took this question up earlier, with the Three Circles, and the idea is the same here. Focus on the opportunities! Pick ideas within the topic that offer the most stretch.

What if a student suggests a transfer that is superficial or even mistaken? Treat such responses respectfully, as you would a less-than-ideal response about anything. You might want to invite discussion by the class of that and other proposed transfers – "Which of these connections seems strongest and why?" Try to avoid directly correcting students' responses a lot, because that drains conversational energy...but occasionally if the point is important you may need to do so.

How do I choose the "right" thinking routine for a thinking expedition? Consider your thinking and learning goals as in #1 above: which routines seem to serve those goals? Usually there is no one "right" routine; more than one routine can serve pretty well the same goal.

It's generally a good idea to try out a candidate thinking routine for a topic yourself before using it with students. Does the routine prove generative? Does it get at what you want to? Do your students seem likely to know enough already from general knowledge or what they've studied about the topic so far to use the routine productively, at least in a group context where they can pool responses? Or sometimes routines focus on identifying questions and possibilities, so students do not need to know a lot in the first place.

Should I try to use all the thinking routines in the course of a longer topic? For the most part, no. Students benefit from becoming familiar with a small number of routines. Many teachers, after a little experience, focus on some favorite routines they find particularly useful for their content, their personal style, and their students.

How do I get my students and myself started on a thinking routine we haven't used before? Good news here: thinking routines are designed for easy launch. They are designed to work reasonably well even the very first time you and your students try them (and of course further fluency develops with practice). They are also designed so that they do not need extensive upfront explanation. A quick preview ("here's a couple of sentences about what we're going to do...") and then just getting into it works fine!

Should I use the "official" thinking routines included with this package? These routines have been chosen and refined for the purpose, so they are good choices. However, from time to time teachers make up their own thinking routines. Also, there are many other thinking routines not particularly designed for portable knowledge but that can be turned to that purpose, as part of the general Visible Thinking approach (see the appendix). So by all means proceed flexibly. Just keep in mind the basic idea of thinking routines: two or three or four fairly simple steps, works reasonably well the first time, gets at what you want to get at. Thinking routines should feel easy to remember, easy to use, and immediately productive.

GOAL 3.

FOSTERING STRONG IDENTITIES
AS THINKERS AND LEARNERS





As we think personally or in conversation, let's take a moment to remind ourselves...

— WE GIVE THINKING TIME —

We quiet our impulse to hurry, tapping energy to... • gather ideas and evidence first and then decide • think it through part by part • talk it over with friends or an advisor • think about it for a while, set it aside, come back to it later • sleep on it...

— WE MAKE OUR THINKING BROAD AND ADVENTUROUS —

We reach beyond the ordinary, finding the spirit to... • explore unusual points of view • brainstorm very different ideas • drop typical assumptions at least temporarily • think far away from the usual approach • ask "what if not?" • exchange ideas with others • look for connections far and wide, in other topics and areas of life • listen to our intuitions without necessarily taking them as final • keep open and alert to the world of things and ideas and opportunities around us...

— WE MAKE OUR THINKING CLEAR AND DEEP —

We get beyond the surface, digging in to... • get clear about what things mean • look for parts and purposes, how things fit together, how they are designed • map the larger system around what we're looking at and investigate how things work underneath • look for evidence, look on both sides, think about the reliability of our sources • take different perspectives • test our ideas through conversations with others • express cautions with conclusions: how sure is it reasonable to be, does this really make sense? • think what further points to investigate...

— WE KEEP OUR THINKING ORGANIZED —

We avoid muddling through, getting sharp to... • be clear about our goals: what are we trying to figure out? • use various thinking moves (like those above) and thinking routines • think on paper (or computer, etc.) to help ourselves keep track • think together with others, helping one another to move forward • pause and ask whether we're making good progress and, if not, try a different path...

Q&A: OUR IDENTITY AS THINKERS

What's Our Identity As Thinkers for? It's a routine for broad self-monitoring of our thinking and cultivation of strong thinking practices.

What does Our Identity As Thinkers have to do with portable knowledge/transfer of learning? It fosters the broad use (i.e. transfer) of good thinking practices. In particular, it fosters the transfer of thinking routines, which are referred to in Our Identity As Thinkers as ways of organizing thinking.

Our Identity As Thinkers looks more complicated than most thinking routines. How's it supposed to work? It's actually a quick way of reminding ourselves what to pay attention to! The details under each heading are for *browsing*, not for plowing through every single element.

How can I make Our Identity As Thinkers available to students? You can make a large version of it to hang in the classroom as a constant reminder...you could use just the main headings. You can project it. Or you can copy and distribute it.

When might I use Our Identity As Thinkers? In class discussions around any complicated issue. You can turn to the poster at any time, asking "Are we doing this?" And "Where should we invest in more attention – *giving time, broad and adventurous, etc.*?"

I see how that would work for discussing history or literature, but is Our Identity As Thinkers relevant to disciplines like math and science? Yes it is. For instance, often students rush through math problems rather than giving thinking time. Often in math or science, students may skim on argument and evidence – let's remind them about clear and deep thinking. In solving problems in mathematics and science, it's important to manage your thinking systematically – make thinking organized!

Why "Identity"? The aim is to encourage students to take to heart the idea of being a good thinker, to make the commitment part of who they are, and to apply good thinking far and wide in school and beyond.

Why "Our"? Basically the same idea – to encourage students to develop the social expectation that they and others together will be thoughtful.

THINKING ROUTINES
FOR THINKING EXPEDITIONS



INTRODUCTION TO THINKING ROUTINE FOR THINKING EXPEDITIONS

The following routines are designed to be used with the Thinking Expeditions process discussed in Part 2 of this guide. Part 2 introduced Thinking Expeditions, illustrating the practice with the topic of global warming and the routine Portable Surprise, the first one below.

All the routines below can also be used for general purposes, not just for Thinking Expeditions. Also, for those who are already familiar with other Visible Thinking routines or who simply want to look further, a number of thinking routines not included in this bundle can serve Thinking Expeditions. By all means experiment and please see the Acknowledgments section to find further resources.

That said, the routines here are specifically designed to emphasize portable knowledge, that is, transfer of learning.

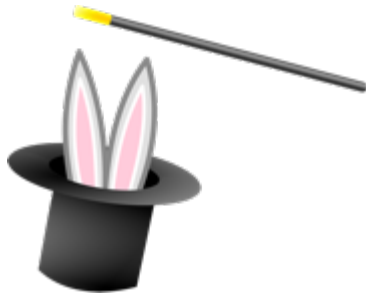
The first routines below can be used to explore how a topic connects to other disciplines and aspects of life in general.

The later routines include elements that specifically ask students to make personal connections, to encourage linking classroom learning to less academic aspects of life.

PORTABLE SURPRISE

A thinking routine for finding patterns in a topic and similar patterns in very different situations

(pattern = any generalized relationship across many cases, often with variations, e.g. good guy/bad guy in literature, transformative inventions in history, food webs in ecologies)

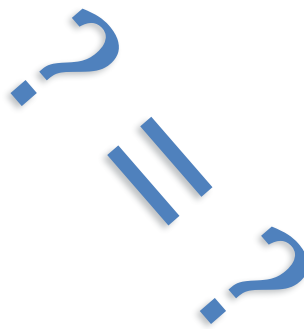
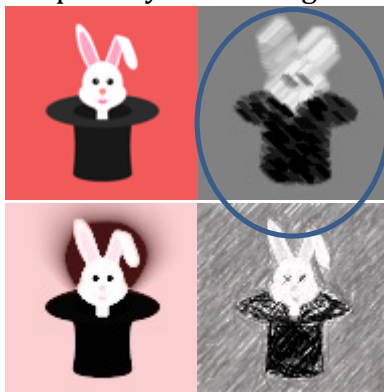


1.

Brainstorm a few big general patterns that showed up in the topic. Point to ones that *surprised* you, like a rabbit popping out of a magician's hat. Pick one to focus on that seems especially interesting.

2.

Brainstorm a few other situations, very different, where the same pattern might show up. Pick one to focus on that seems especially interesting.



3.

Compare and contrast the pattern in the initial topic with the pattern in the new situation. What are key similarities? Differences? What similarities and differences seem most important?



Q&A: PORTABLE SURPRISE

What kinds of thinking does portable surprise elicit? Abstracting important surprising patterns from a topic and also finding somewhat similar patterns in very different situations and comparing.

How does this help build portable knowledge? The thinking routine makes more portable some of the ideas about the topic itself. And also, the thinking routine cultivates the general habit of seeking portable knowledge.

What are some examples? Turning to examples mentioned earlier, one can see in global warming a pattern of confusing controversy that also showed up around cigarettes and today around genetically engineered crops. One can extend the concept of food webs in a natural ecology to ask about the food webs of humans today in our complex societies, or prehistorically, or the food webs of pets, or even the "food webs" in an analogical sense in patterns of consumption around product marketing and sales. Or, for a new example, if students are studying nuclear weapons, one can ask what were the "game changer" weapons of other eras, for instance the bow and arrow, and how were the impacts the same and different in a broad sense. Or, to generalize even further, one could explore "game changer" products (like the iPhone) or ideas (like democracy) in the same spirit. How is the pattern of "game changing" similar and different to that of weapons?

What if students have trouble extracting patterns? Emphasize the idea of surprise. Draw from the students what surprised some of them, at least a little bit. Then what pattern made it surprising? Help and hint a little as you need to.

What if the students have trouble finding other situations that might be similar? Again, help and hint a little as you need to.

What if students want to compare and contrast with a new situation that actually isn't a very good analogy? It doesn't have to be a really good analogy. Remember, step 3 invites similarities and differences and an assessment of their importance. You can easily ask at the end: As it turns out, is this a really good analogy or only a so-so analogy? Even so-so analogies can be illuminating, the contrasts as revealing as the similarities!

Can we discuss more than one pattern and connection? By all means, if time allows. One way to get more ideas in play is to have students apply Portable Surprise in small groups, each group picking a favorite analogy to develop. At the end, the groups share a few headlines about their discoveries.

PROJECTING ACROSS DISTANCE

This thinking routine invites learners to consider how a topic, event, or issue impacts not only their own community and country, but also other communities and countries far away.



Pick a topic, event, or issue that might be approached differently in different parts of the world or even your own country, such as food security, population growth, or marriage practices. Then, consider it from the following perspectives.

How is the topic, event, or issue playing out or viewed in...

- your community?
- another city or town in your country?
- a country east or west of your country, where people may think differently about the theme, event, or issue?
- a country north or south of your country, where people may think differently about the theme, event, or issue?

What might account for the similarities and/or differences **between** and **within** the communities and countries?

Q&A: PROJECTING ACROSS DISTANCE

What kind of thinking does this routine encourage? This routine encourages learners to take a broader, multi-perspectival view of a topic, event, or issue. While there are other thinking routines that also encourage learners to take diverse perspectives, this routine differentiates itself by inviting learners to specifically compare and contrast perspectives with firstly another community in their country, followed by countries that are geographically different from their own country. In doing so, learners come to understand that:

- Not everyone in the same country or even in the same city, holds the same views, and even if they hold broadly similar views, it's the shades of differences that may be of greatest interest.
- People in countries that seem to be like theirs may not always think the same way, and that in fact it could be the case that people who are most geographically distant that may share similar views as them.
- It is important to gather a diversity of perspectives on a topic, event, or issue if one is to try to understand it as fully as possible, or to try to walk in someone else's shoes for a day.

What are some tips for starting this routine? An important thing to keep in mind is that learners may not be able to immediately identify communities and countries where the selected topic, event, or issue is approached differently. In that case, you may want to do any of the following:

- Have ready a set of communities and countries that you put forward for learners to explore.
- Invite students to pool what they already happen to know, taking advantage of the diversity among them. Then, assign them to research (e.g. conduct Internet searches; interview adults like parents) some points from the pool of knowledge and bring back their findings.

What are some things to watch out for? As this routine involves discussing different communities and countries, it will be important to keep a lookout for learners who make sweeping assumptions or broad generalizations about other cultures, peoples, and places. This could lead to misunderstandings and stereotyping of other cultures, peoples, and places, which need to be addressed quickly. Some ways to do so are to follow up with "What makes you say that," introduce a counter example to highlight the discrepancy in their thinking, etc., or ask the question: *do you think everyone in that country/community is likely to think the same way?* At all times, it's crucial not to let the misunderstanding or stereotype take root.

PROJECTING ACROSS TIME

This thinking routine invites learners to understand a topic (e.g. ideas, phenomena, problems) across a broad span of time reaching backward into the past, and forward into the future.



Pick a topic (e.g. tourism; computers; global migration patterns). Then, consider it using the following prompts:

Map what you think or already know. What do you know about the topic?

Reach back in time. How has the topic played out in different forms / contexts / places over the last 10 years? The last 100 years? The last 1000 years?

Reach forward in time. How do you think the topic will play out 10 years into the future? 100 years? 1000 years?

Map how your thinking about the topic has changed. How do you view the topic now?

Q&A: PROJECTING ACROSS TIME

What kind of thinking does this routine encourage? This routine encourages learners to view topics (e.g. ideas, phenomena and problems) from the vantage of a broader timescale, than what they have learned from the media, or experienced in their own lifetime. Often, ideas (e.g. childhood; debt; happiness), phenomena (e.g. the Internet; migration), or problems (e.g. lack of access to clean water; terrorism), can look very different depending on how far back in history or how far forward into the future we look.

For instance, the idea of "childhood" can seem relatively unproblematic when learners explore it through their own lived experience, or even by going two or three generations back to how their parents or grandparents experienced it. Imagine inviting them to go even farther back in time, to before the 17th century when "childhood" as an idea did not exist and children worked in the fields from a young age. How would that impact the way learners understand what being a child means? Similarly, inviting learners to project forward in time to understand the idea of "childhood" requires them to consider the conditions that make "childhood" possible or even viable, as well as how what they have come to accept as "childhood" may change dramatically.

What are some tips for the step "Map what you think or already know?" This step is intended to invite learners to make visible what they think about the topic. A good way to begin the routine is to have learners map this step on a large chart in one color, and then each of the next steps in a different color. That way, at a glance, they can see how their thinking develops with each step.

What are some tips for the step "Reach back in time?" Here, it may be necessary to circumscribe the problem space for your learners: how far back do you want them to go? Is there a particular context(s) you want them to pay attention to? If so, you may want to provide resources that will help them explore the topic, e.g. a carefully curated set of websites, articles, books, etc. Where feasible, this step also offers the opportunity to teach learners about historical understanding and evidence, e.g. how do we know what we know about the past? Whose past is it, and who decides? What evidence has been offered for the conclusions?

What are some tips for the step "Reach forward in time?" This step should encourage a certain amount of imagination and fantasy (especially the farther into the future one reaches for), but not fantastical imaginings that are simply meant to be outrageous. A good follow-up is "What makes you say that?" to prompt learners to provide thoughtful reasons to support their responses. Also, learners may choose to hedge in their response - "Maybe X, maybe Y, depending" – which is perfectly reasonable.

What about some other time frames? It's important that the routine is adapted for your learners, context, and purpose, so if the time frame of 10/100/1000 does not work well (e.g. 10 years is too short for any observable change), feel free to choose other time frames like 20/100/1000 or even 20/200/2000.

WALK THE WEEK

Log, Connect, Apply



Walk the Week is aimed at heightening sensitivity of the many connections there are in our everyday lives with the topics we are studying at school, broaden our understanding of these topics and think beyond, and far beyond them being only school subjects.

It begins with keeping a log this week with a target of five or so instances where these ideas come up in your everyday life – TV, the newspaper, conversations with family or friends about other matters....

Focus on a topic you are learning about.

Log some instances as ideas about this topic came up this week.

How do these ideas **connect** with what you are learning about this topic?

How can you **apply** what you have learned in this topic to other parts of your life?

Q&A: WALK THE WEEK

What is the purpose of Walk the Week? Too often, subjects and topics are learned at school to meet curriculum and assessment requirements and what happens outside of school is another part of life. When students can see connections between what they are learning at school with the world outside of school and vice versa, it can foster intrinsic motivation in understanding what they're learning.

How could I help my students see how this thinking routine can be of value to them? Choosing something that students can immediately relate to and modeling how it has helped can provide a concrete example.

For example, consider the science topic Energy, discussed as a property of objects that can be transferred to other objects, with explorations of the energy we use to keep warm or cool, read at night or on a cloudy day. During the week, what could students notice that connects to this? Could it be something to do with the new sleek windmills in fields just outside of town? On the news, there was talk about hydroelectricity. On the bus, I heard someone talking about solar energy.

Looking at Mum turning up the thermostat, I thought about our old log fire that we could watch as we warmed up in front of it. Advertisements in shop windows showed pictures of different foods, describing them as energy foods. The basketball coach talks about building up our energy. How do all these different things connect to what we are learning? Maybe thinking more about this will help me be fit, energetic and comfortable despite the weather.

Why is the Log step included as part of the structure of this routine? Away from school, it's easy to miss things that connect to a current school topic. The request to "log" some connections brings the topic to the forefront of the mind and heightens sensitivity.

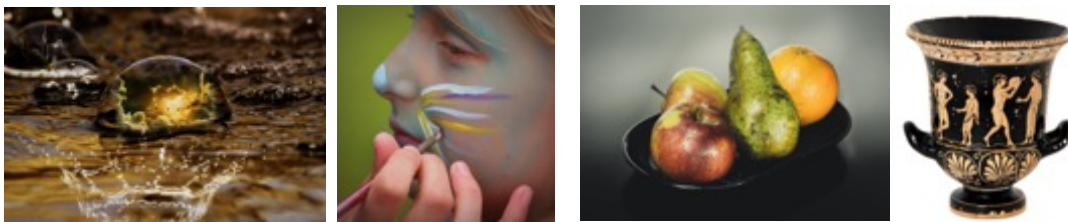
When this happens more than once with the same topic, but through different sources, what may at first seem to be a novel experience evolves toward an instinctive routine: looking for possible connections. Logging, whether in a notebook or digital device, as the ideas come to mind or soon after, also builds a visual memory of something noticed that can be retained and referred to.

When the week is over? Invite students to share the instances they logged and the connections they made and how they have or could apply what they learned. After observations and experiences are shared and discussed, enable time for reflections on the topic, perhaps incorporating the thinking routine "I used to think...And now I think..."

What is the broader impact of walk the week? In today's busy world, the week is often neatly parsed into separate parts. School days are usually structured around the timetable. After-school time gets shaped around family commitments, homework and extracurricular activities, weekends around family matters, social engagements, time and sporting or club meetings or practices. Getting into the habit of holding onto current school topics while going about the rest of your week can broaden understandings and surface examples of how what's being learned applies to day to day living.

SEE | WONDER | CONNECT X 2

EXPLORE AN IMAGE, OBJECT, OR WORK OF ART



1. Look closely: What do you notice? Make many observations.
2. What questions do you have? What do you wonder about?
3. How could this connect to subjects you study in school?
4. How could this connect to your personal interests or hobbies?

Q&A: SEE | WONDER | CONNECT X 2

What is the purpose of this routine? The goal of the routine is to help students appreciate how looking closely at something can expand one's understanding of it, which in turn can provide a basis for making connections to other things. The routine encourages students to explore the interconnectedness of knowledge, and to understand that if they intentionally *look* for connections, they can find them. And because this routine is supposed to be used 'routinely,' the eventual goal is for students to internalize the habit of looking for connections.

When should the routine be used? It works well toward the beginning of a topic of study because it begins by drawing on visual information students can readily see, and thus tends to be immediately engaging. Also, using the routine early in a topic of study encourages students to frame their learning as transfer-oriented from the outset. That said, the routine is a variation of the Visible Thinking routine, See | Wonder | Connect, which is a highly versatile routine that can be used at virtually any point in a learning trajectory.

What kind of image or object should the routine be used with? The routine encourages students to look deeply and go beyond the obvious, so it works with a wide variety of images and objects—even items whose surface appearance is plain. Everyday objects, images in the media, book covers, works of art, all work well. Often teachers choose a physical object or image that directly relates to a topic—a ruler, a map, a leaf, a portrait, a historical artifact or photograph. But don't be afraid to experiment: Let yourself be surprised by what students will be able to uncover, even when you can't envision ahead of time where students' observations will lead them.

Are there specific ways to encourage the 'See' step? The main thing is to provide a timeframe that encourages students to prolong their looking, but doesn't feel too long. For example, give students a full minute to look quietly, noticing as many details as they can, before asking students to share their observations. Also, encourage students to elaborate by asking them to describe a particular observation in more detail. It also helps to simply prompt them to keep looking by periodically asking, "what else do you see?"

Are there specific ways to encourage students the 'Wonder' step? One important thing you can do is to encourage students to ask different *kinds* of questions. For example, they might ask questions about what an item is made of, how it is made, who made it or how it came to be, who it is important to, how it be different, and what role the item plays in larger systems.

Are there specific ways to encourage the 'Connect' steps? There is no getting around the fact that making connections can be challenging. Don't be afraid to encourage students to stretch to make connections: Does the object or image visually resemble something else they have seen? Is it structurally similar to other things they know about? Is its purpose similar? Was it made in a way that reminds them of other things? Does it connect to events they know about or can imagine? Does it have a history that connects to other things? Are there ideas or assumptions behind the object that connect to other contexts? Is it part of a larger system that connects to other things?

PASS THE PARCEL

A thinking routine for fostering intrinsic motivation for deep learning and understanding both in and out of school



Invite students to think about a goal they have and imagine it as a treasure inside a parcel that is wrapped in many layers. With each layer they unwrap, they get closer to their treasure:

As you REFLECT on what has been learned about... (*current or past topics*), think about connections with (*this topic*) ... and your goal.

With these connections, you have unwrapped the first layer of the parcel.

IDENTIFY significant connections that you would like to explore further and think about why they are significant to you.

With each significant connection you identify, you unwrap another layer.

EXPLORE all ways you can to understand what it is about these connections that can help you unwrap the parcel and reach the prize.

Each exploration removes another layer.

What will you do to ACT on all you have learned, so the last wrapping paper will come loose and your treasure is in reach?

Q&A: PASS THE PARCEL

What is the purpose of this thinking routine? To heighten awareness that what is learned in and out of school are often connected with each other. These connections can enable moving forward to achieve goals. This fosters intrinsic motivation. It provokes curiosity, wonder and delight in finding the unexpected. Exploring the connections can broaden and deepen understanding.

What is meant by goals? Short term goals, career goals, health and wellbeing, sporting, social. See examples on the following page.

Why Pass the Parcel? Pass the Parcel is a children's party game where, through a process of unwrapping layer after layer of paper, the child who unwraps the last layer receives the prize hidden deep inside. The exact form varies, including passing the parcel around a circle of children as music is playing, and, when the music stops, the child holding the parcel unwraps a layer, and so it continues. This thinking routine uses Pass the Parcel as a metaphor. As learning and understanding broaden and deepen, the layers are removed; core knowledge, understanding and constructive ways forward, are the prize. If students do not know the game, you can explain it briefly.

How could Parcel the Parcel be used in a classroom? A parcel isn't necessary. Teachers can select topics directly from the curriculum, current events, or concepts such as freedom, democracy, peace, measurement etc. (see next page). Students can also suggest topics. Students commence progression through the steps quietly with reflection, then with discussions and recording the responses either individually, in a group, or as a whole class, sharing what they think they know about the topic and connections they are making.

After this, encourage students to continue their explorations any ways they think will be particularly helpful e.g. time in the library for research, drawing concept maps or diagrams of how things are connected or effect each other, list questions you would like to ask, places you could go to find out more... At a later stage invite students to share experiences related to the topic and what they have explored. The last step can be composed of discussions and formulating action plans to reach goals.

How and why invite students to suggest something they would like to explore? When students suggest topics, there is immediate engagement and shared ownership of the learning and it can evoke intrinsic motivation toward seeing how these topics connect to the curriculum.

How might you follow up this thinking routine to maximize the portability of knowledge? When students have had time to explore the topic using their own goals as a focus in their explorations, perhaps they could adopt the more traditional version of Pass the Parcel to share their new learning about the topic. They might list key points they have found out about the topic and wrap the list up as a 'treasure', providing a brief overview of their findings; and continue wrapping up this treasure, on each layer pasting a question that they had been asking on their learning journey; and then invite other students in the class to play the game. The lucky student unwrapping that final layer would instantly have the results of this exploration of the topic. This way individuals or small groups could share their experiences and new knowledge of the topic seen through different perspectives and build on their learning and experiences.

HOW PASS THE PARCEL CAN FOSTER BIG LEARNINGS

Following are some examples of fostering transfer between topics, learning in and out of school, and student goals.

'Ancient Rome,' a history subject

Some students were imagining themselves as engineers or architects and had shown great interest in the aqueducts of Ancient Rome. When asked to Reflect on connections between their goals and the topic, they were very engaged with looking at the buildings and other designs of Ancient Rome.

The significant connections they Identified and explored further were the number of arches they saw in pictures of ancient buildings, so many roads, not tracks, and fountains also. When they looked at recent photos of Rome in current books and travel brochures, they were surprised many of the ancient constructions are still around. They wondered why these constructions are still standing.

There was so much they wanted to Explore. In the library and on the internet, they found out that arches were a feature of walkways and highways, not just aqueducts and the Colosseum. Also, what the ancient Romans had invented was later adopted as a way of supporting structures without using support beams. They also found out that the concrete that Romans developed in ancient times was much later studied by scientists who found its composition superior to modern day concrete. The students then walked around their city, looking at bridges and big buildings. They arranged to meet one of their classmate's father who was an architect, taking with them a list of questions, images and drawings they had made.

From that time on this small group of students became very interested and engaged in physics and math classes. They were keen to learn and understand more. Sometimes they sat together taking on the roles of engineers and architects and discussed different challenges they were interested in resolving.

The theme of 'water'

Typical treatment of a theme like 'water' in school might focus on one or more of the following: The Water Cycle. Water is healthier to drink than soda. Water is composed of two elements, hydrogen and oxygen H₂O. Our bodies are made mostly of water.

Possible personal goals: Fitness and wellbeing, looking after our planet.

Connections that could be made to matters outside school:

- On hot days, you drink more water
- During very hot summers, sometimes there's not enough water for the ways it's usually used.
- On the news, water and sustainability are grouped together.
- Water isn't always what you think it is. In some places chemicals are added to water. Fluoride can be put in water to protect people's teeth.
- Countries measure the capacity of water being held in dams.

Some ways of acting on what's been learned: If it's very hot for a long time, we can try for shorter showers. Let's make sure we drink plenty of water. Let's drink filtered water when we can.

OUTSIDE-IN: CONNECTING PERSONAL INTERESTS TO TOPICS
IN SCHOOL

OUTSIDE

IN



CONNECTING PERSONAL INTERESTS TO TOPICS IN SCHOOL

1.

List some of your hobbies or interests here.....&..... List some of your school topics or subjects here





2.

Connect a line between one of your hobbies/interests and a school topic. Along the line, write down a possible connection between the two. Do the same thing again with another interest and topic (the interest can connect to the same topic, or a different one).

3.

Imagine what you could do to investigate or expand each of the connections further.

Connection #1: Possible Investigation or expansion

Connection #2: Possible Investigation or expansion

Q&A: OUTSIDE-IN CONNECTING PERSONAL INTERESTS TO TOPICS IN SCHOOL

How can I help students make outside-in connections (and should I worry if the connections seem superficial)? At the broadest level, a connection is any type of relationship or association between two or more things. There is plenty of room for creativity, because connections can be metaphorical as well as literal. One way to help students find connections is to suggest that they look for certain *types* of connections. For example, they can look for connections related to *form* (e.g., how things are shaped physically or conceptually, what they look like, what things are made out of or what materials they use or involve); *structure* (e.g., how things are organized, how they work as a system), *stories* (e.g., the stories things tell or are told about them, or how things evolved over time,); *defining ideas* (e.g., main themes, definitions, key concepts); *learning* (e.g., how people learn about them, the learning challenges they involve); and *culture* (e.g., the customs and traditions people associate with them, the significance they have for groups of people). Don't worry if students make connections that at first seem broad or superficial. Most connections get more interesting once you spend some time thinking about them, and the 'imagine' step of the routine gives students an opportunity to dig into a connection and explore its depth. For example, a student might make a connection between her dance lessons and science class in school by saying that dance involves the human body and the human body is a topic in science. On the face of it, this may seem like quite a broad connection. But, as the answer to the next question illustrates, with a bit of expansion it can become quite interesting.

How can I help students imagine how to investigate the connections they make? A good way to start is to encourage students to brainstorm several questions about their connections. For instance, to continue with the foregoing example about dance, science, and the human body, here are some further questions students could ask. How are different systems of the body involved in dance—for instance the muscular system or the skeletal system? How is dance itself like a body system? What would it be like to create a dance inspired by the firing of neurons in the brain, or by the circulatory system? How does dance affect human health?

What should students do after they use the routine? Should they follow up on their ideas? There are two possible options. One of course is to encourage students to continue to investigate the ideas they came up with. They could do this as a special project, or as part of the regular curriculum. But even if there's no follow-up, just having students seek and expand on connections is worthwhile in itself. Why? Because knowledge likes to be activated, and students will find it interesting simply to reach for connections. Also, using the routine regularly helps students get in the habit of making connections. Recall the principle mentioned in the introduction to the Portable Knowledge materials: *What you learn is what you do*. Students who make connections frequently as part of the learning process are much more likely to continue that connection making later on. Moreover, sometimes school-based learning is seen as unconnected to students' lives outside of school. But learning happens everywhere. By getting in the habit of making connections 'outside-in,' students begin to see learning as what it truly is—a lifelong, lifewide endeavor.

ACKNOWLEDGEMENTS AND FURTHER RESOURCES



ACKNOWLEDGING GENEROUS SUPPORT

This bundle on transfer of learning is one of four related Visible Thinking bundles, all produced with the generous support of Independent Schools Victoria of Victoria State, Australia, Chief Executive Michelle Green. Warm thanks to Michelle and to Independent Schools Victoria for making possible the development of these materials.

FOUR VISIBLE THINKING BUNDLES

The four bundles include:

- *Exploring Complexity*, which offers thinking routines for investigating complex objects, systems, perspectives, controversies and more, across the disciplines.
- *Global Thinking*, which offers thinking routines fostering understanding and appreciation of today's complex globalized world.
- *Pathways to Understanding: Developing Students' Memory & Note Taking Skills*, which leverages contemporary understandings of how memory works to advance both memory for and understanding of content.
- *Portable Knowledge*, this bundle.

VISIBLE THINKING IN GENERAL

This bundle of thinking routines reflects the Project Zero Visible Thinking Approach. Visible Thinking provides a research-based method to integrate the teaching of thinking flexibly into content learning, a method that both deepens content learning and fosters the development of thinking skills and dispositions. The approach has been developed over a number of years at Project Zero of the Harvard Graduate School of Education by several researchers including the present authors, with the participation of several schools and funding from multiple sources. Researchers and educators both within and beyond Project Zero have taken this general approach in several fertile directions while maintaining the general spirit and structure.

Besides the bundles referred to here, Visible Thinking offers many other thinking routines and ideas addressing various aspects of thinking and learning. There are two websites:

http://www.visiblethinkingpz.org/VisibleThinking_html_files/VisibleThinking1.html
and <http://pzartfulthinking.org/>.

Two books by Ron Ritchhart and colleagues present a version of Visible Thinking that emphasizes cultures of thinking: *Making Thinking Visible* and *Creating Cultures of Thinking*.

Online courses from the Harvard Graduate School of Education offer an introduction: *Visible Thinking* and *Creating Cultures of Thinking* – see <https://www.gse.harvard.edu/ppe/programs/online>.

Independent Schools Victoria from time to time offers a three session general online introduction to Visible Thinking, called *Visible Thinking*.

FURTHER ROUTINES FOR PORTABLE KNOWLEDGE FROM VISIBLE THINKING

Concerning *Portable Knowledge* specifically, besides the routines offered in the package several routines from the general Visible Thinking repertoire can foster transfer of learning. These include, just for a sample, *Circle of Viewpoints*, which engages learners in looking at a situation from multiple viewpoints, and *Step Inside*, which asks students to take on a viewpoint and examine the situation from that viewpoint. We have composed this package out of fairly new routines, but certainly educators are welcome to reach for others from Visible Thinking or indeed to make up their own, which teachers often do.

TRANSFER OF LEARNING

Transfer of learning is a theme and a challenge of long standing in education and educational research. As noted in the introduction, investigations beginning more than a century ago have examined whether and how readily learners transfer to other contexts what they are learning in one context. In many circumstances, minimal transfer has been found, a sad conclusion for the impact of education. The stance taken here is simple: transfer is not a "free lunch." To get abundant transfer, we need to teach for transfer. This package offers one way to go about that.

A review of the literature on transfer is far beyond the scope of this document. That acknowledged, here are a few entries into that literature.

This package has drawn on a concept of establishing expectations for transfer developed by Randi Engle and colleagues, "expansive framing." One source is: Engle, R. A., Lam, D. P., Meyer, X. S., & Nix, S. E. How does expansive framing promote transfer? Several proposed questions and a research agenda for investigating them. *Educational Psychologist*, 47(3), 215-231.

It has also drawn on writing and thinking by one of the authors over the years about the nature of transfer. See: Salomon, G., & Perkins, D. N. (1989). Rocky roads to transfer: Rethinking mechanisms of a neglected phenomenon. *Educational Psychologist*, 24(2), 113-142. And Perkins, D. N., & Salomon, G. (2012). Knowledge to go: A motivational and dispositional view of transfer. *Educational Psychologist*, 47(3), 248-258.

A special issue of *Educational Psychologist* edited by Robert L. Goldstone and Samuel B. Day offers perspectives on transfer from several different authors, including those above: *Educational Psychologist*, 47(3), 2012.