Learning by Design's Framework for Promoting Learning of 21st Century Skills

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Introduction

Learning by Design (LBD; Kolodner et al., 2003a, 2003b) was an attempt my research group made during the late 1990's and early 2000's to design science curriculum for middle school that would help middle schoolers learn both science content and scientific reasoning, project, communication, and collaboration skills. We created a year of Learning by Design units and enacted them in a number of school environments. Learners learned science content at least as well as matched learners in matched non-LBD classrooms. They learned complex skills associated with scientific reasoning, project work, communication, and collaboration in addition, far better than their non-LBD peers. Many of the complex skills they learned parallel those in the five categories of 21st century skills: adaptability, complex communication and social interaction, non-routine problem solving, self-management, and systems thinking. In this paper, we present the cognitive foundations underlying LBD's design and then present the LBD framework and a picture of LBD in action. Finally, we present a set of guidelines for promoting learning of complex skills.

Foundations

LBD's foundations can be found in a constructivist model of learning called case-based reasoning (CBR; Kolodner, 1993; Schank, 1982; 1999). Case-based reasoning's model posits that we are goal processors who make our way through the world trying to achieve our goals. As we make our way through the world, we interpret what we encounter through the lens of our previous experiences. This allows us to understand and interpret situations we are in, to make predictions, and to make explanations. Some of our experiences we pursue in order to achieve our goals, and these are the ones case-based reasoning focuses on. As we work to achieve our goals, we notice what is occurring that matches our predictions and what is different. When something is different from what we expected, we wonder why and try to explain. Our experiences can help us with that; so does our acquired knowledge. Important to allowing all of this to happen is a good indexing or labeling system in our memories – one that allows us to recall our relevant previous experiences so that we can use them as a lens. CBR suggests that both productive learning and productive indexing happen as a result of good goal tracking and explanation.

This model of learning suggests several principles for promoting learning of complex skills. First, it tells us that the best learning will happen when learners have goals that they want to pursue. This will lead them to track those goals, to reflect on their progress towards achieving those goals, and to want to explain why not and do better when progress is not as expected. Second, it suggests that learners should have experiences that allow them to try out targeted skills in the context of achieving their goals, analyze whether they are achieving their goals through those skills, identify what they need to do better, and have the opportunity to try again. Third, it suggests that they need multiple opportunities for trying out each of the skills they are learning. Fourth, to know how well they are achieving their goals, the CBR model tells us that learners need to be able to easily identify the effects of what they are doing. Fifth, because identifying how well they are using their skills and how to perform them better might be difficult, the CBR model suggests that learners be helped to analyze feedback, identify what they are doing well and not as well, and get help with generating ideas about how to perform more productively. Finally, so that skills are learned in a way that allows learners to use them over a variety of contexts, the contexts in which they are carrying out targeted complex skills should be rich, varied, and representative of the kinds of situations they will encounter outside the formal learning environment.

These suggestions are consistent with those made in the cognitive literature on skills learning (e.g., Anderson, 1983) and transfer (see, e.g., Bransford et al., 1999), with those made by proponents of communities of practice (e.g., Lave & Wenger, 1991; Wenger, 1998), and with those of constructionists (e.g., Papert, 1991).

None of these literatures, however, tell us exactly how to implement a learning environment where these kinds of activities and the reasoning needed to learn from them go on. These literatures tell us about learning, but they do not tell us how to make classrooms work. For this, we looked to Problem-Based Learning (PBL; Barrows, 1985; Koschmann et al., 1994), an approach to learning from experience used extensively in medical schools. PBL implements a cognitive apprenticeship (Collins, Brown & Newman, 1989). It suggests ways of integrating modeling, coaching, scaffolding, and refection into learners' problem-solving experiences and how to integrate individual work and collaboration such that learners are encouraged to reflect on their experiences in ways that lead to learning both targeted content and the reasoning needed to solve problems in some domain. PBL, however, was created for adult learners (in medical school), and we had to figure out how to adapt its suggestions for middle school. Kolodner et al.

(1996) and (2003a) discuss the ins and outs of what CBR and PBL suggest and how they needed to be adapted for middle school classrooms.

Learning by Design: The Framework

Learning by Design (Kolodner et al., 2003a) was created with these foundations in mind. Because CBR emphasizes repeated practice, the need for real feedback on one's decisions, the need for the learner to have personal goals, and the need for failure of expectations, we designed an approach that puts design at its center. In Learning by Design, learners are challenged to achieve a design challenge that they can actually achieve in the physical or virtual world, for example, designing and building a vehicle that can navigate a certain terrain (to learn about motion and forces) or designing and modeling an erosion control system (to learn about Earth's ground processes), though we have also had to figure out how to manage learning from design challenges that do not allow actual construction and testing.

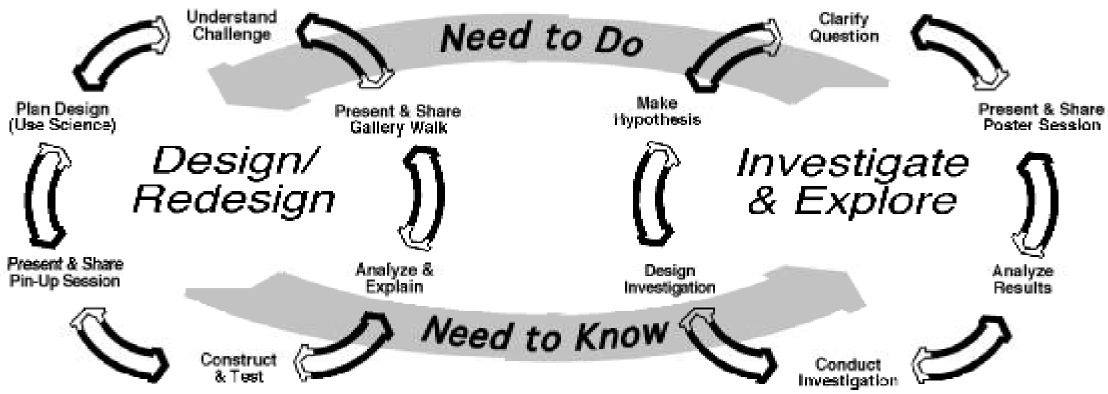
When we refer to designing, we refer to the full range of activities that a professional designer engages in to achieve a design challenge. A designer must understand the challenge and the environment in which its solution must function well. The designer must generate ideas, learn new concepts necessary for achieving the challenge (sometimes through systematic investigation), build models and test them, analyze solutions, rethink and revise ideas, and iterate until a solution is found. Furthermore, designers communicate with clients and other stakeholders, collaborate, make informed decisions, manage complex sets of criteria and constraints, and need to adapt to changes as they arise over time.

Learning in the context of designing a working artifact thus has many affordances for promoting learning. An engaging design challenge gives learners a goal to strive for and opportunities and authentic reasons to engage in all of kinds of the reasoning designers do. If design challenges are both engaging and complex enough, achieving them provides authentic reason and motivation for learning the concepts and reasoning needed to achieve the challenge. If complex enough, achieving a design challenge provides a natural reason for collaborating and communicating with others. Once learners internalize the goal of achieving the design challenge, they become motivated to discuss their reasoning as they engage in achieving a challenge; discussing their reasoning with others can help them get to better solutions. Building and testing solutions affords real and authentic feedback. Designing provides opportunities for applying content that is being learned; feedback and iteration provide opportunities for recognizing that those concepts need debugging and for working out those bugs. And so on.

Our big challenges in designing Learning by Design included (i) designing sequencing and activity structures for a classroom that would hold promise for realizing the affordances of learning in the context of design activity and (ii) identifying how to help students and teachers accept, become comfortable with, and become adept at new roles they would have to take on to learn from design activity.

Learning by Design's Sequencing

At the macro level, Learning by Design's sequencing is as in the diagram below. Students engage in iterative design (left-hand cycle), and as they need to learn something, they engage in inquiry (right-hand cycle) and then apply what they have learned to completing their designs. Overall, activity moves back and forth from designing to investigating. A need to know often requires further consideration of some concepts that had already been explored. Because design is iterative, iterative deepening of understanding of concepts being learned is afforded.



Students begin by being introduced to a challenge, e.g., Design and build a small vehicle and its propulsion system that can navigate a set of hills and continue to travel straight and far. They begin by doing what they need to understand the challenge (top of the left-hand cycle in the figure). This may include some examination of the available materials, examination of other devices that can or can almost achieve the challenge, reading about cases, seeing a video, playing a game – whatever is needed for the students to get to where they can identify the criteria and constraints of the challenge and begin to identify what they need to learn more about to achieve the challenge well.

Understanding the challenge includes identifying at least some of the things they need to be learning, and the next step is generally to begin to investigate to find answers to some of those questions. For the Vehicle challenge, learners "mess about" with toy cars, seeing how different cars with different propulsion mechanisms and different constructions manage to go over the hills (or not). They explore the mechanisms of the cars and their performance and ask questions such as these: "What does it take to get a vehicle started?" "How can you guarantee that it will go straight?" "What is making all of these cars slow down?" "Going over a hill seems to take a lot of power; how can we build our cars to have enough power?"

Learning by Design materials are written to encourage and anticipate these questions, and the next step is to identify which questions to address first. In our *Vehicles in Motion* unit, the unit continues with a chapter that addresses the questions "How can you guarantee that it will go straight?" and "What is making all the cars slow down?" The text tells the students that in that chapter they will investigate those questions in the context of designing and building a coaster car. It has no motor, but it is simple, and their challenge will be to keep it going straight and far after using a ramp to get it started. Another chapter focuses on "What does it take to get a vehicle started?" and "How can we keep it going far?" In this chapter, the students are challenged to design their best balloon propulsion system. And so on until all the questions are answered. In the end, the learners pull everything together to address the grand challenge.

Within each of these chapters, learners move back and forth from one cycle to the other as they address the questions and challenge of that chapter. While attempting to create their best balloon propulsion system, for example, they mess about to understand that challenge, identifying that they need to learn about the effects of each of the components of the balloon propulsion system on the distance the car will travel. Generating this need to know takes them into the Investigate cycle. After investigating, they return to the Design cycle, using what they have learned to design their best balloon engine. Then they build and test it, and iteratively go through the cycle again, investigating when needed, redesigning and testing when they learn something new, and so on.

Small-Group Collaboration and Whole-Class Presentations in the Sequencing

But making Learning by Design work is actually more complex. The class is divided into small groups. Each group works together to achieve the challenge, and each group is also a component of a collaborative system that reaches across the class. There is continuous movement from small-group activity to whole-class discussion and back again. Individual work is done as homework. Individuals reflect on the day's activities and draw conclusions from it; they also prepare for the next day's activities. In the sequencing presented above, they work in small groups as they mess about with toy cars; they get together as a class to share their experiences and to generate questions they need to answer to address the challenge.

It works the same way during each chapter. While addressing the balloon-car challenge, students work in small groups messing about with balloon engines. Then they get together as a class and generate questions they need to answer to design a good balloon engine. Then the across-the-class collaboration gets more interesting. Each small group in the class takes on answering one question about the effects of some component on a balloon car's performance. Each group designs and runs an experiment to identify the effect of changes in their component on a car's performance. For this, they have to identify a procedure they can repeat using several different variations on that component, they have to decide how to measure performance, and they have to figure out how to control variables so that they get good results. Some of this they discuss as a class before the small groups design their experiments. Some they figure out in small groups as they design their experiments. In some classes, groups share their experiment plans before they run their experiments and give each other advice about how to design the experiment to get better results. In some classes, groups run their experiments and then have those discussions. The important thing here is that each group in the class needs the results of each group's investigations.

After running their experiments, each group analyzes their results to answer their question, and they report their procedure, results, analysis, and answer to the question to the class. This is listed as a *Poster Session* near the top of the Investigate cycle in the diagram.

Because students need each other's results to achieve the challenge, theylisten to each other and focus on how trustworthy their peers' results are. Discussion of experimental procedure and trustworthiness of evidence ensues. Students may decide that some groups did not design or run their experiments well, help those groups redesign their experiments, and send them back to run the experiments again. They are also challenged, at this point, to explain why they got the results they did in their experiments. Earlier in the unit, while building their coaster cars, they had discussed net force and the way forces combine with each other, so they are able to identify the way the propulsion force and friction interact with each other to get their results. But they do not know how balloons give their cars power. Some get curious about how that works. The teacher helps the curiosity spread throughout the class, and they read about and perhaps explore forces in pairs. They work as small groups and then as a class to attach the best explanations they can to the trends they found in their experiments.

Once questions are answered, activity moves back to the Design/Redesign cycle. Next on the agenda is planning the design (left side of the Design cycle near the top). Here each small group uses the results of the class's investigations to design their best balloon-powered engines. They choose components for their balloon engines that experiments told them would maximize the propulsion force, using a 3-column chart to help them. The chart asks them to list each design decision, and for each, to list the evidence that justifies the decision and their understanding of the science. But before building their engine and testing their ideas, they present to the class in a *Pin-Up Session.* Here, each group presents its design decisions and reasoning to the class. They have a chance to see each other using the evidence they have produced and the science they are learning. They have a chance to query each other about their reasoning, to ask each other to be clearer about why they are doing what they are doing, and to make suggestions about how to get better results. They practice making informed decisions as they are doing this, first in small groups, and then in a public context where they have a chance to help each other debug their reasoning. They follow this up with discussion about how to make these kinds of reasoned decisions.

Now they have the opportunity (finally) to construct and test their designs. After constructing their designs, they gather performance data and identify to what extent their artifacts are performing as they predicted. Early on, the way their artifacts perform and what they wanted them to do are generally far from each other. Now students need to figure out what they need to do to make their designs better. This requires explaining the behavior of their build artifacts and identifying what they could change to improve performance. That, in turn, requires use of the science they have been learning. This provides another natural opportunity for a public presentation. There are always some students who require help to explain their artifact's behavior and figure out what changes they need to make to the design. Students report their artifacts' behavior to each other in a *Gallery Walk.* They present their artifact's design and demonstrate its behavior and then do their best to explain the behavior and present what they think they need to change to make it work better. They also have a chance to ask for help. This, in turn, affords discussing the science being learned – the way it can be used to explain the behavior of each artifact and the way it can be used to suggest changes that will affect performance. Children discover what they do not understand about the science being learned, and they have a chance to deepen their understanding. There may be additional reading, discussion, demonstration, or investigation at this point. Then students return to working in their small groups iteratively making their designs better.

Iteration continues, with *Gallery Walks* called when classmates need help, until time runs out or everyone is finished designing. In a final *Gallery Walk*, students demonstrate their working artifact, present its design, and present the history of the design and how and why they got to that design. There may or may not be a competition.

Helping Teachers and Learners become Comfortable and Adept at Engaging in Complex Reasoning, Collaboration, and Communication

Engaging in LBD's learning activities requires sophisticated scientific and technological reasoning, and collaboration and communication skills. Middle-school students do not come to LBD with these skills; nor do middle-school teachers come to LBD with experience modeling those skills or facilitating the kinds of discussions that promote learning from experience. Middle-school teachers we worked with early in LBD's design suggested a way of helping teachers and students become comfortable and adept at carrying out these skills. They suggested a short unit early in the year that would introduce targeted skills and classroom activity structures in the context of using or learning relatively simple science content. This was the origin of LBD's *Launcher Units*. LBD also has two other components that contribute to promoting comfort and competence with its sophisticated reasoning: its defined activity structures (we've sometimes called these "rituals"), and its design diary pages (Puntambekar & Kolodner, 2004).

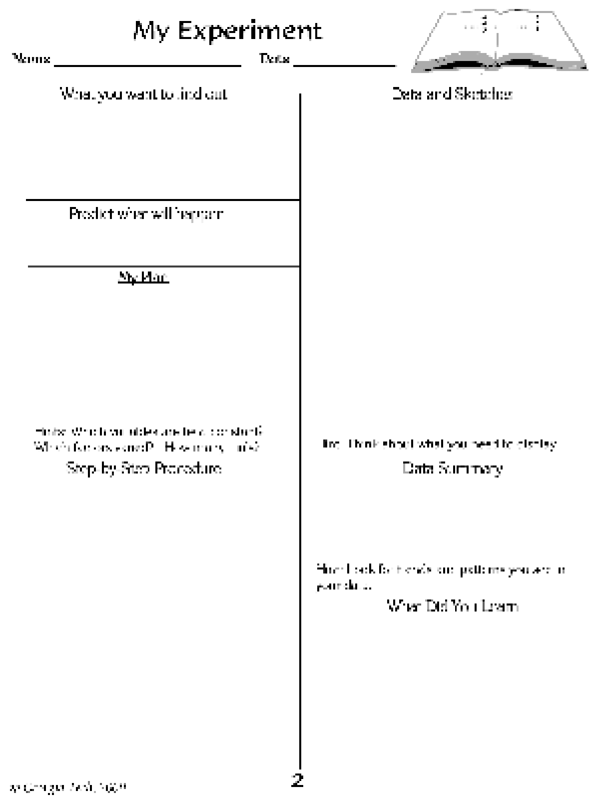
A Launcher Unit is a short unit that begins the year. It introduces students to the essential skills involved in doing science and in designing – making decisions, understanding and discussing devices, construction, collaborating, reflecting, keeping records, and designing and running experiments. It also introduces them to the repeated practices and activities they will engage in, e.g., messing about, poster sessions, pin-up sessions, and gallery walks. While most units guide learners through 8 to 10 weeks of activities leading towards achieving a single big design challenge, Launcher Units guide learners through three or four smaller challenges, each requiring some small set of the skills or activities they will be engaging in later. For example, a simple first design experience in *Apollo 13: The Launcher Unit* has students designing bookstands from index cards, rubber bands, and paper clips. They experience first-hand the value of collaborating, iterating, and building off of each other's ideas, and they have their first experience with a *Gallery Walk*. They identify a need to learn some of the science of structures, and after learning a bit of that science, they experience being able to design a more functional book support. In another activity in the same unit, they design parachutes from coffee filters. They engage in the same practices they engaged in while designing the book supports and have their first experiences messing about, designing experiments, using results of experiments to make decisions, and presenting in *Poster Sessions* and *Pin-Up Sessions*.

Engaging in a Launcher Unit at the beginning of a school year gives the teacher a chance to develop a classroom ethos, gives the teacher a chance to practice facilitating, gives students an introduction to the reasoning and collaborating they will be doing, provides students opportunities to notice the value in this reasoning and collaborating, and provides an opportunity for the students and teacher together to begin developing a classroom culture that values collaboration and rigorous reasoning. Our results show that, indeed, our Launcher Units are successful in achieving all of this. More detail about Launcher Units can be found in Holbrook & Kolodner (2000) and Kolodner (2007).

LBD's repeated activity structures and design diary pages also play big roles in helping teachers and students become comfortable and competent at sophisticated reasoning. LBD's repeated activity structures, sometimes called its "rituals," include the three types of presentation sessions discussed above (*Poster Sessions, Pin-Up Sessions, Gallery Walks*) and several other novel activities (e.g., *messing about, whiteboarding, generating rules of thumb, iterative redesign, explaining decisions, justifying with evidence*). Each has both a pedagogical purpose and a reasoning purpose within the context of productive designing. The purpose of *messing about*, from the students' point of view, is to get to know materials they will be using as they design. From a pedagogical point of view, *messing about* serves to promote question formulation that gets inquiry started. *Poster Sessions*, from students' point of view, are a venue for presenting results of investigations to each other. Remember that they need each other's results to successfully achieve a challenge. From a pedagogical standpoint, *Poster Sessions* are useful for getting learners thinking about and discussing the trustworthiness of data, what makes for good evidence, how to design experiments well, controlling variables, and making presentations that others can learn from. And so on for the other repeated activity structures.

Each of repeated activity structures is introduced formally the first time it is needed and is listed formally in the student text each time it is to be carried out. When each is introduced, it is named, its purpose and sequencing are stated, and students are given hints for what to focus on as they are engaging. Each time each is repeated, students are provided with guidelines about how to focus and what to look out for. All of this helps students to become adept at participating in each and teachers to become adept at facilitating each. Because they know the purpose of each, and because each is used at a time when its purpose is needed, students and teachers engage with purpose.

Design diary pages provide guidance when students are working in small groups. Each is a chart that provides reminders about how to engage page provides space for sketching configurations and jotting down what is tried and what happens. *My Experiment* pages provide space for recording the independent, dependent, and controlled variables, for recording how many trials will be run, for charting results, and for recording trends and confidence in them. *Gallery Walk Notes* pages provide space for recording ideas gleaned from the designs of others. And so on. Each is quite simple and suggests to students, as they are working in small groups, what they should be doing and what they should pay attention to. The figure shows one Design Diary page.



How 21st Century Skills are Learned through Learning by Design

LBD was created with a goal of helping children learn science content, scientific reasoning, and communication, collaboration, design, and project skills. We were not aiming for children to learn every one of the 21st Century Skills. Learning most of them, however, is addressed in LBD's approach.

Adaptability: Adaptability means the ability and willingness to cope with uncertain, new, and rapidly-changing conditions. LBD affords learning to be adaptive in many ways. First, children work on a variety of different teams throughout the year. They stay with a team for the duration of a unit (8 to 10 weeks) and work with new people for the next unit. Working with a team for a period of 8 to 10 weeks means learning how to work with people with a variety of different styles, strengths, and weaknesses. One of the things learners discuss in depth early in the year and then later as it comes up is how they are making their collaborations work, e.g., how they are dividing up responsibilities among their groups. LBD does not otherwise focus directly on helping children learn to cope with uncertain, new, or rapidly-changing conditions, but it does give learners enough variety in solving problems that children become able to address new issues as they arise. Our performance assessments show LBD students immediately getting down to work when confronted with a new task; non-LBD students spent some considerable time simply knowing that they needed to get into their groups and start thinking (Kolodner et al., 2003a, 2003b). LBD participants know to think about constraints and criteria of a situation they are addressing, when they need more information, and the value in justifying decisions with empirical evidence and science knowledge (and that opinion is not enough).

Complex communication and social interaction: Children in LBD classrooms are constantly making presentations to each other, and because they need the results of each others' investigations and recognize the value of their peers' ideas, critiques, and recommendations, they get into the habit of listening and asking questions. The clarifications peers ask for early on in the year serve to help learners identify what is important to present so others can understand what they have to offer, and LBD participants get better over the year at presenting in a productive way. They also get experience with the back and forth communication needed to make sense of each other’s ideas; our evidence shows learners becoming more confident and competent over a school year at engaging in such dialog – both within small groups they work in and as a class. Moving from small-group to whole-class work on a regular basis allows those who are good at such communication to model it for others; it also gives everyone a chance to try out such communication in their small groups (3 or 4 members) before participating in such communication in front of the class. This is useful for the shy and not-as-confident learners.

Non-routine problem solving: Learning to solve problems in a variety of ways is afforded in LBD through working on problems that might have many good answers and the frequent sharing of ideas. Children see that they and their peers might be coming up with different solutions; they get experience judging the goodness of solutions; and they articulate to their peers how they came up with their solutions. Also, throughout a year, they work on a variety of design challenges; each requires different variations of the reasoning they are doing, and each might require a different kind of investigation. For example, in *Vehicles in Motion*, learners design and run experiments; in the Earth Science units, they design models and run simulations.

Self-management: Self-management is a key in LBD, but we do not assume middle schoolers can do it from the start. For this reason, practices students need to engage in are introduced at the beginning of the year in a launcher unit, and the student texts and design diary pages include in them not only content and descriptions of activities but also the reasons the learners are doing everything they are doing; guidelines, coaching, and hints for engaging while they are in small groups so that they can be successful even without the teacher being there for them; and guidelines for participating in whole-class discussions so that they can experience the value in what they are doing and finding out and experience the value of and their success in taking on agency. There are also discussions of how-to's. Nothing is spoon-fed, and the children who get the most out of the units are those who make the effort. Class is no fun, and there are no pats on the back from peers for those who goof off, so students tend to participate. Teachers note that they have many fewer discipline problems because students want to engage. The combination of asking students to learn in the context of engaging challenges, providing them what they need so they can be successful, helping them learn what is expect of them, explicity discussion of the how-to's of what they are doing in addition to explicit discussion of the content they are learning, and giving them opportunities to teach and learn from each other, we believe, are essential to growing self-management skills.

Systems thinking: Several of the challenges in LBD units require understanding a system or set of systems within a system to come to good solutions. For example, making a vehicle go far and straight depends on the ways the bearings are attached, the ways the wheel and axle systems are engineered, the width of the wheels, the mass of the vehicle. All work together to affect the vehicle's behavior. This requires judgment and decision-making (including dealing with tradeoffs), systems analysis, systems evaluation and reasoning about how the different elements of the system interact. Student text introduces learners to representations they can use to help with this reasoning. The keys here are (i) to give learners practice with systems thinking in a context in which they need to do it well for success and (ii) to provide the support the learners need to be able to get started with and then get better at systems thinking. The variety of presentations done in LBD is a real help in promoting systems thinking in the same way it helps in promoting concept learning and learning of other skills. Students report their experiences and results to each other and debug together whatever is not working well. In the process, they hear others using the skills and content, they have a chance to experience its good use, and they have a chance to question what they do not understand.

Lessons Learned: Promoting Learning of Complex Skills

Our experience with LBD suggests several guidelines for promoting learning of complex skills.

1. It pays for targeted skills to be learned in a context of authentic need. In LBD, practice of skills comes at times when they are authentically needed to solve some problem or achieve some challenge, in the context of challenges or problems of interest to learners. Learners design and run experiments at times when they have identified a need to learn. They discuss trustworthiness of experimental results because they need to be able to trust each other's experimental results. They explain to their peers why their designed artifacts are performing as they do at times when they need help with deciding what to do next. And so on.
2. To be learned well, complex skills must be repeatedly practiced over a variety of contexts, and the ins and outs of their successful use must be explicitly discussed. Learners must also experience the value in carrying out those skills well. Our results show that the best learning of skills happens when the teacher values the skill, when the teacher gives students time to carry it out well, when discussion after public presentation sessions explicitly focuses on how the skills were carried out and how they could be done better, and when students give each other guidelines on how they could have been performed better (Ryan & Kolodner, 2004; Owensby, 2006).
3. Designing formal classroom activities to go with each skill or skill set, naming them (e.g., let's do a pin-up), and providing learners with the scaffolding they need to successfully

carry out the skills provides a way of introducing learners to important skills, helping them successfully use them, and helping them experience their value. Scaffolding can include charts, diagrams, leading questions, and sample enactments. These formal classroom activities should be designed so that they are experienced as useful by students and so that they have pedagogical value as well.

4. Foregrounding and discussion of skills is essential if we want learners to learn skills. If the skills are never explicitly reflected on and discussed, learners will not know how important they are, nor will they have a chance to debug and improve their skills. Public presentation and discussion of the particular reasoning students are doing and the results of that reasoning provides a way of doing that. Discussion of particular reasoning each small group is doing grounds discussion of skills in the concrete. Discussion across groups after all presentations are finished allows for abstraction from the many concrete examples of reasoning learners have done or heard about.
5. Skills should each be introduced at a time when students will easily recognize its value. Introduction should include the skill's purpose, and how to do it in general, and learners should be given pointers about how to carry it out successfully in this instance.
6. A classroom culture that encourages rigorous use of skills, learning from each other, and refining one's capabilities and knowledge over time will promote skills learning.

All of this implies that sequencing needs to be thought through carefully in advance. Simply engaging with the design challenge is not, by itself, enough to promote learning of complex skills. Such engagement gives learners the opportunity to engage in using or trying to use complex skills. While some learning can happen simply through having an experience, better learning is promoted when activities are arranged so that learners have the opportunity to experience the outcomes (both immediate and longer term) of their skill use, are helped to recognize those outcomes, have a chance to consider the quality of those outcomes, and then have a chance to consider how unexpected outcomes came about and what they might change in their reasoning and practices to achieve good outcomes in the future.

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