Developing TPACK with Learning Activity Types

Mark Hofer | Judi Harris

Having explored several cases of other teachers' efforts to integrate technology in their teaching, you may be wondering how you might go about developing your own technologically supported and curriculum-based lessons, projects, and units. As you know, TPACK is the knowledge that helps teachers to do this successfully. It represents teachers' practical knowledge of curriculum, pedagogy, technology, and teaching/learning contexts that supports integrating technology into their practice and their students' learning. One way to begin to develop TPACK is to explore other teachers' technologically supported curriculum designs. Our hope is that by working through the cases that appeared in previous chapters, you have begun to develop your own TPACK.

TPACK can also be developed during the process of designing your own lessons, units, and projects. This chapter will introduce you to a TPACK-based planning process with learning activity types that you can use to design curriculum-based and student-centered lessons that integrate technology effectively, building your TPACK while doing so. You will maximize your learning from this chapter if you complete all of the phases of the planning process that are described here. Using these steps, by the time you complete this chapter you will have designed a technology-enhanced lesson to use in your classroom. You can then continue to use this process, building your TPACK over time as you design and offer additional learning experiences to your students.

Building Blocks - Learning Activity Types

As you read through the cases, you may have noticed that each lesson or project in the Practitioner's Guide was structured with a combination of different learning activities. What happens during

learning activities tends to differ by curriculum area and students' learning levels. Some learning activities are used in multiple curriculum areas; for example, mapping ideas, conducting research, and developing presentations are activities used in nearly every curriculum area. However, even though a learning activity might be used in different curriculums, the way it is interpreted and conducted differs (Stodolsky, 1988). For example, a student-created presentation of common literary themes reflected in a collection of poems is structured quite differently than a presentation documenting the process and results of an experiment done by students in a chemistry class.

Typically, lessons, units, and projects in different curriculum areas comprise learning activities that are more different than similar. You would not likely challenge your students to engage in sentence analysis in a science class or to do computation in an English class. The rich media-infused cases featured in this book are structured primarily with these kinds of discipline-specific learning activity types in mind. For example, the estimation and evaluation of mathematical work learning activities in the Elementary Mathematics case are unique to mathematics. Similarly, creating a timeline and designing an exhibit – both learning activity types included in the social studies cases – would most likely be found in social studies lessons and projects. A review of lesson, project, and unit plans in any curriculum area will quickly reveal the range of different learning activity type possibilities available for teachers to choose among and combine as they structure curriculum-based learning experiences for their students. The ways in which these learning activities are selected, combined, sequenced, and facilitated guide student learning.

Taxonomies of Learning Activity Types

How, though, does a teacher – especially a new teacher – know which types of learning activities are possible within differing curriculum areas? While working with both experienced and novice teachers, we have discovered that it is helpful to know the full range of plausible learning activities in each curriculum area to assist with planning lessons, projects, and units. This knowledge encourages teachers to be creative in the ways in which they design learning experiences, reach a broader range of student learning needs and preferences, and prevent overuse of particular learning activities in their planning, which helps to build and maintain students' engagement.

Experienced teachers tend to identify favorite learning activities that seem to work well for their students and for them. They then may use these particular types of learning activities with greater frequency than others. This kind of "routinization" (as described in Yinger, 1979) is both understandable and efficient for busy teachers. Naturally, we use what works. This practice can, however, cause teachers to miss instructional opportunities. If teachers employ only a small subset of possible learning activities in their classrooms, other effective and engaging approaches may be omitted or forgotten.

While these favorite activity types may work well for some students, they may create unintended and unnecessary barriers for others. The Universal Design for Learning (UDL) framework encourages teachers to consider these learning barriers, planning a variety of learning activities that give students multiple ways to access curriculum content, express their understanding, and engage in the learning process. (Learn more about UDL from Meyer, Rose, & Gordon, 2013). Therefore, the

more comprehensive the set of learning activities that exist in a teacher's mental toolbox, the more likely barriers to learning for students with diverse learning styles and preferences will be minimized.

Once we realized that it is helpful and important for teachers to have access to a collection of all possible kinds of learning activities in particular content areas, we began to collaborate with experts in each core curriculum area to develop comprehensive taxonomies of learning activity types (LATs). We purposely chose to develop the taxonomies with as broad a range of LATs as possible – from student centered to teacher centered and everything in between – to provide teachers with as many learning activity options as possible. In this way, we hope to support effective technology integration in every teaching approach, rather than advocate for particular pedagogical styles. To date, we have developed comprehensive taxonomies of LATs in nine different curriculum areas:

- K-6 Literacy
- Mathematics
- Music
- Physical Education
- Science
- Secondary English Language Arts
- Social Studies
- Visual Arts
- World Languages

Each of the LAT taxonomies is organized by key themes or foci in each content area. This organization differs substantially among different content areas. For example, in K-6 Literacy, the LATs are classified first according to the two primary focal areas in English language arts: reading and writing. In mathematics, the taxonomy is subdivided into categories that correspond with the National Council of Teachers of Mathematics (NCTM) Process Standards. In social studies and science, the taxonomies are divided into LATs that encourage knowledge development and knowledge expression. The primary goal of these organizing ideas is to make the taxonomies as intuitive and usable as possible for teachers.

The taxonomies themselves are structured in a table with three columns that offer the name of the LAT, a brief description, and possible technologies that can be used to enhance or support learning and teaching with this type of learning activity. The descriptions are brief so that they can help teachers envision the possibilities of using particular LATs without constraining ideas for adapting the LATs to fit students' needs and preferences. The list of technologies for each activity type is not meant to be comprehensive. Rather, the possibilities included here provide examples of recommended digital tools for teachers to consider using. The following excerpt from the Knowledge Building Activity Types from the Social Studies LAT Taxonomy illustrates the taxonomies' three-column structure.

Table 1
Knowledge Building Activity Types (excerpt)

Activity Type	Brief Description	Possible Technologies
Read Text	Students extract information from textbooks, historical documents, census data, etc.; both print-based and digital formats	Digital archive, Web site, electronic book, audiobook
Read Maps, Charts and Tables	Students extract and/or synthesize information from maps, charts and/or tables	Textbook supplement, Web-based datasets (e.g., CIA World Factbook)
View Presentation	Students gain information from teachers, guest speakers, and peers; synchronous/asynchronous, oral or multimedia	Presentation software, videoconferencing, video creation software (e.g. Movie Maker, iMovie), concept mapping software
View Images	Students examine both still and moving (video, animations) images; print-based or digital format	Presentation software, word processor, video creation software (e.g. Movie Maker, iMovie), image sharing sites (e.g. Flickr.com)
Listen to Audio	Students listen to audiorecordings of speeches, music, radio broadcasts, oral histories, and lectures; digital or non-digital	Digital audio archive, podcast (e.g., "Great Speeches in History," etc.), audiobook

Many teachers and teacher educators have asked us why we don't simply provide a single taxonomy of learning activities that could be used regardless of curriculum area. This would certainly be more efficient – particularly for elementary teachers who teach in multiple curriculum areas. However, a brief examination of some of the taxonomies and how they are subdivided reveals the substantive differences in both activities and taxonomy structure by curriculum area and, therefore, the need to provide separate taxonomies for each. We will illustrate this point with overviews of the structures of six of the taxonomies next.

Literacy and English Language Arts LATs

Educators have also asked us about accommodating grade-level differences in content to be learned and taught using LATs. We considered this suggestion while working with curriculum experts to develop the taxonomies. Based upon their advice, only one curriculum area – language arts – was divided into separate sets of LATs for elementary and secondary teachers. Not surprisingly, these two taxonomies are structured very similarly, as illustrated in Table 2. In each taxonomy, the two primary categories are Reading and Writing. Each of these two categories are subdivided into Pre-, During-, and Post- stages. The K-6 Literacy taxonomy adds two subcategories: Writing Conventions and Writing Genres. The Secondary English Language Arts taxonomy adds three more: Language Focused, Oral Speaking/Performing, and Listening/Watching. These additional categories are necessary in the secondary-level taxonomy due to the complexity and specificity of curriculum expectations in English/language arts at this level.

Table 2
Overview of the K-6 Literacy and Secondary English Language Arts LATs Taxonomies

K-6 Literacy Taxonomy LATs Categories	Secondary English Language Arts Taxonomy LATs Categories
Reading (Pre-Reading, During-Reading, Post-Reading, Vocabulary, Comprehension, Fluency)	Reading (Pre-Reading, During-Reading, Post-Reading)
Writing (Pre-Writing, During-Writing, Post-Writing)	Writing (Pre-Writing, During-Writing, Post-Writing)
Writing Conventions	Language-Focused (Language Exploration, Awareness & Inquiry, Language Composing, Language Analysis, Language Conventions, Vocabulary Development)
Writing Genres	Oral Speaking/Performance
	Listening/Watching

Science and Social Studies LATs

Another two curriculum areas for which taxonomies are structured similarly are Science and Social Studies. In both of these taxonomies, the primary LAT categories are Knowledge Building and Knowledge Expression. The ways in which these two categories of LATs are subdivided are different. Unlike knowledge building in Social Studies, Science knowledge building is subdivided into Conceptual and Procedural types. In Social Studies, curriculum content is primarily conceptual, so it was not necessary to subdivide the Knowledge Expression LATs. However, the range of ways that students can express their understanding of curriculum concepts in Social Studies is broader than the range of ways students can build conceptual knowledge. Therefore, we subdivided the Social Studies Knowledge Expression LATs into six different subcategories, which are noted in Table 3.

Table 3
Overview of the Science and Social Studies LATs Taxonomies

Science Taxonomy LATs Categories	Social Studies Taxonomy LATs Categories
Conceptual Knowledge Building	Knowledge Building
Procedural Knowledge Building	
Knowledge Expression	Convergent Knowledge Expression
	Written Divergent Knowledge Expression

	Visual Divergent Knowledge Expression
	Conceptual Divergent Knowledge Expression
	Product-Oriented Divergent Knowledge Expression
	Participatory Divergent Knowledge Expression

Mathematics and World Languages LATs

LATs that focus upon process-oriented learning appear in the Mathematics and World Languages taxonomies. The processes are quite different in these two curriculum areas, however, as you might expect. In Mathematics, the LATs are delineated using the NCTM Process Standards. In World Languages, the LATs reflect the American Council on the Teaching of Foreign Languages (ACTFL) Standards for Foreign Language Learning, which emphasize communication skills. These two sets of process-oriented standards—which also organize the mathematics and world languages taxonomies—are summarized in Table 4.

Table 4
Overview of the Mathematics and World Languages LATs Taxonomies

Mathematics Taxonomy LATs Categories	World Languages Taxonomy LATs Categories
Consider Practice Interpret Produce Apply Evaluate Create	Listening Speaking Writing Reading Viewing

These comparisons of LAT taxonomy structures reflect the realities of teaching and learning within and across different curriculum areas as they are practiced in most districts, schools, and classrooms. Although some similarities exist among the structures of the taxonomies and in the LATs included in each curriculum area, more differences than similarities are apparent. These differences in content and teaching practices are why we have created differing taxonomies of learning activities in different curriculum areas.

Identifying and Substituting LATs

How do teachers learn to use LATs to assist their instructional planning? It is helpful to begin by unpacking existing plans for lessons, projects, and units to see how sequences of LATs are combined to create curriculum-based learning experiences. During this process, you can see how the teacher-designer structured the plan and consider also how substituting different LATs might change the nature of the planned learning experience.

Identifying LATs

First, we encourage you to print out a copy of the LAT taxonomy(ies) for the curriculum area(s) in which you are doing instructional planning, and keep the paper copy beside you as you continue to explore the rest of this chapter. All of the taxonomies are available on the LAT website (http://activitytypes.wm.edu) in both interactive and .pdf formats. Read through the introduction to the taxonomy with which you will be working first, reviewing its structure, then consider the LATs that it contains.

Next, go back to one or more teaching cases in this book and try to identify the LATs that are incorporated within each lesson or project, using the relevant taxonomy as a guide. If there are other teachers working with this book at the same time that you are, it might be helpful to discuss the LATs present in particular cases with those colleagues.

Substituting LATs

Then, think about other LATs that could be substituted for the ones that you discerned in one of the cases in this book. Considering alternative LATs for a particular lesson, unit, or project is one of the most powerful ways to utilize the LAT taxonomies. By generating multiple combinations of LATs to address a particular learning goal, you can meet a broader range of student learning needs and preferences (a UDL-based approach) or the specific requirements and predilections of specific students (a differentiation-based approach). The nature and outcomes of a learning experience can be altered dramatically merely by substituting one LAT for another.

For example, in the Secondary Social Studies case, students shared their understanding of a global issue at the end of the project by Developing an Exhibit in the form of a website. This approach enables students to use a variety of digital media to educate their peers and other Web viewers about the issue they selected. Imagine, however, if they were challenged to Engage in Civic Action related to the same global issue at the end of the unit. Students could instead take action related to the issue in a number of ways, which can both enable students to express their understanding (UDL Principle 2) and apply their learning in a real-world application (UDL Principle 3). If students were, for example, to organize a letter-writing campaign to local governmental representatives to encourage action or plan and conduct a public rally in support of a particular cause, they would come away with very different understandings and experiences than they did by creating a website.

Test this LAT substitution process for yourself as you review the TPACK case that you selected and explored. Note that although alternative combinations of LATs will be used to address the same learning goal(s) that were introduced in the case, the new learning experience may be quite different for students.

Explore another case in the same curriculum area as the one you selected earlier. First, identify the LATs that seem to be present in the case, then consider and note alternative possibilities as you did previously. This time, though, consider ways that you could make the learning design either more teacher directed or student centered. Also, consider how you might make the activity more open ended or more scaffolded.

When you view the LATs as interchangeable components in a learning design, they become like building blocks. Just as when children use wooden blocks to build castles of different shapes, sizes, and designs, in altering the building blocks of a lesson or project, you can create entirely different experiences for your students.

By exploring existing combinations of LATs in practice and considering how different LAT choices alter the nature of a lesson or project, you will both build familiarity with the LAT taxonomies in your curriculum area(s) and begin to understand how different combinations and sequences of activity types can assist different types of learning. Once you have built this familiarity, the next step is to use the one or more LAT taxonomies to plan entirely new experiences for your students. In the next section, we will explain how you might select and sequence particular LAT combinations from all of the choices available to you.

Planning with the LAT Taxonomies

We encourage teachers to design learning experiences with the LATs using a flexible five-step process:

1. Choose learning goals.
2. Consider classroom and school contexts.
3. Select activity types to combine and sequence.
4. Select assessment strategies.
5. Select tools and/or resources.

While this process is presented in a linear fashion here, in reality you may choose to reorder the steps (e.g., some teachers prefer to consider assessments earlier in the planning process than depicted here) or plan using a more recursive process. However you approach planning with LAT taxonomies, we recommend always beginning with learning goals and ending with selecting possible tools and resources. In this way, technology use will be grounded in students' curriculum-based learning needs, rather than in the particular features of educational tools or resources. As you work through the following sections, we encourage you to use these steps in a flexible way to design your own technologically enriched learning experiences for your students.

1. Choose Learning Goals

When first learning about using taxonomies of LATs to plan instruction, novice teachers often ask us, "Where do I begin?" and "How do I know which of all these LATs to choose?" These are understandable questions, given the number of possible choices and combinations of LATs. In reality, the answer is clear and always the same: Begin with your students' curriculum-based learning needs. Whether these are suggested by state curriculum standards or a school district's curriculum scope and sequence, it is important to begin planning all learning experiences with student-focused learning goals clearly in mind. Goals for learning can differ from particular curriculum standards, however. When identifying the particular learning goals around which you will structure a lesson, unit, or project you must decide specifically what you hope the students will take away from the learning experience.

Begin by identifying a learning goal from your curriculum upon which you would like to focus a lesson or part of a project. Choose a standard from your state or district curriculum, then describe in writing as clearly as possible what you hope your students will learn by engaging in a learning experience that is designed to address this particular standard.

2. Consider Your Classroom and School Contexts

Once you have identified the learning goals for a particular lesson, project, or unit, you must consider the context of the classroom in which you are teaching (and in many cases, the school, too). Effective instructional plans are not designed for generic classrooms or students. They are designed for a particular classroom context that includes a number of different elements, including

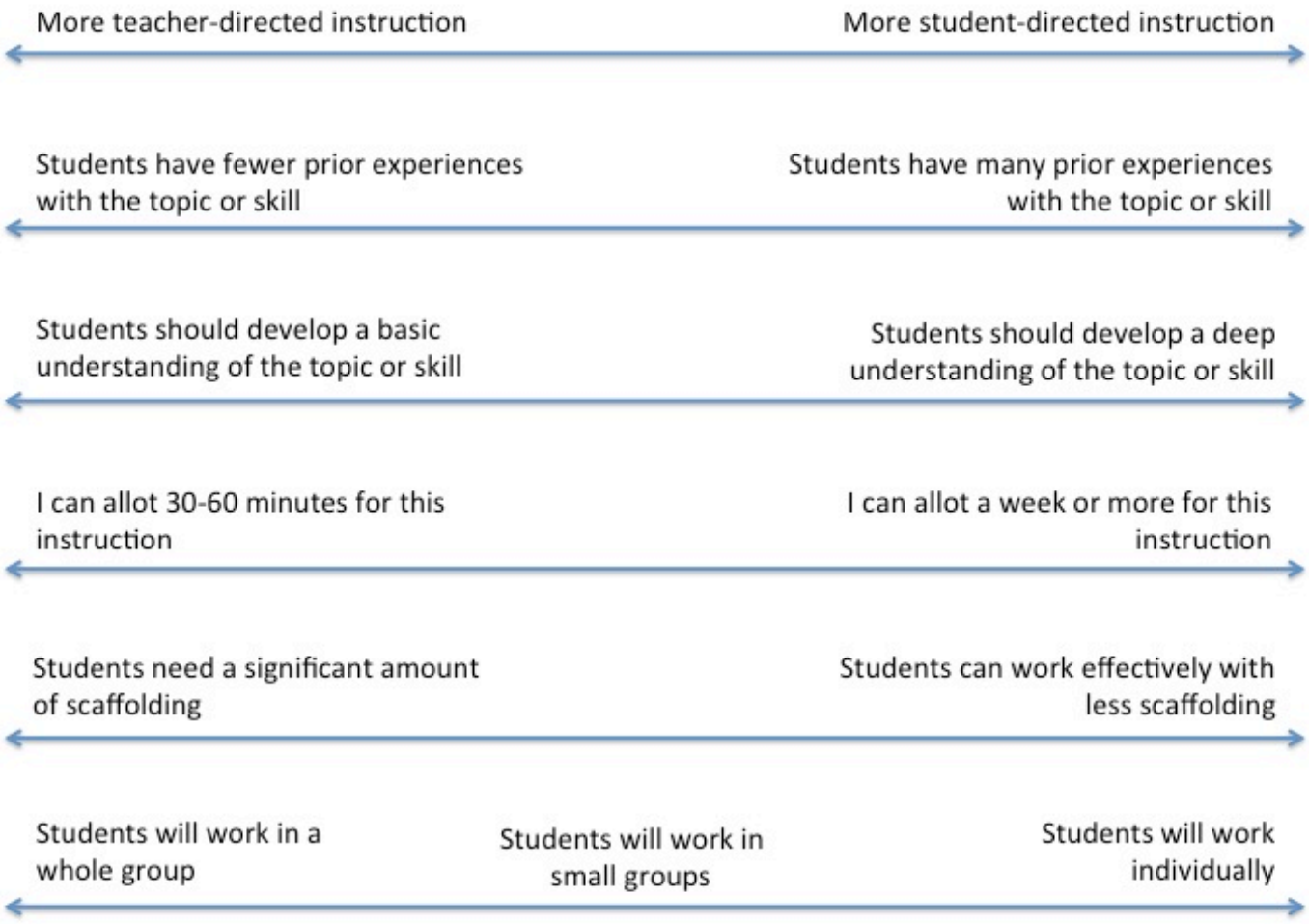
- the physical classroom space,
- the time of day during which the planned learning will take place,
- the degree to which student desks or tables can be rearranged,
- the amount of time available for the learning experience, and
- the digital and non-digital tools and resources available to your students and you.

Of course, teachers also plan with specific students in mind. Specifically, teachers consider student-related variables including the following:

- students' prior knowledge and experience with the focus of the learning experience being planned,
- students' learning preferences (e.g., preferred types of activities and materials),
- the amount and type of structure required for these particular students, and
- collaborative grouping strategies that are most effective for these particular learners.

These contextual realities — and many more — should be considered when determining the optimal combination and sequence of learning activities in a lesson, unit, or project that is being planned.

To prompt your thinking about some of these contextually influenced decisions, we have created the following chart. While experienced teachers consider these types of variables almost automatically when planning instruction, novice teachers may find it helpful to place their design decisions on the continua pictured here as they work through the planning process.



Now that you have identified learning goals for your lesson or project, think about what you know about the classroom and school in which you will be sharing this learning experience with your students. Choose places on as many of the pedagogical decisions continua as you can that represent your knowledge of the students and their classroom and school contexts. Be as realistic as possible. If you are not able to mark one or more of the continua, leave it blank until you learn more about the students and context in which you will be facilitating the learning experience that you are planning.

3. Select LATs to Combine and Sequence

After determining the learning goals and contextual factors that will help shape the learning experience you are planning, it is time to choose the building blocks for the learning design. The LAT taxonomies present the full range of types of learning activities in each curriculum area from which teachers can choose during instructional planning. Each taxonomy is subdivided into categories of LATs to guide this selection. When designing a reading project or unit for a third-grade classroom, for example, it may be important to consider activity possibilities from each of the stages of the reading process: "pre-reading," "during-reading" and "post-reading." Alternatively, in a World Language classroom, if students are working toward engaging in brief conversations in the target language, it might be helpful to combine and sequence different Listening and Speaking activities to structure that experience.

If you have decided to use a particular pedagogical model or approach in your planning, its characteristics and emphases can guide your selection of LATs. For example, many science teachers utilize some form of a 4 E's learning cycle, which recommends a sequenced lesson structure of engagement, exploration, explanation, and extension. If you intend to use a 4 E's approach in the lesson you are designing, you could consider different LAT possibilities for each of these four phases of the lesson plan before selecting the particular activities that will comprise the lesson.

During earlier stages of planning, consider multiple possible combinations and sequences of LATs. As illustrated earlier, slightly varying combinations of LATs can produce quite different learning experiences for students. It is critical to focus upon the learning goals for the lesson while keeping the contextual factors in your peripheral vision as you consider different LATs to combine and sequence to form the lesson, project, or unit you are planning.

Complete the LAT Planning Guide (http://editlib.org/go/PlanningGuide) for your lesson or project. Once you have identified a range of possible LAT options, decide upon the optimal combination, then sequence the LATs for your lesson using models and/or strategies that you have learned about in your teaching methods courses.

4. Select Assessment Strategies

Teachers can employ a range of different types of formative and summative assessment activities to monitor, assist, and evaluate student learning. When you hear the word assessment, you may think of different types of summative assessment strategies, for example, quizzes and tests. Summative assessment activities are included in all of the LAT taxonomies.

However, many of the other LATs can be used for either formative or summative assessment purposes. For example, in the K-6 Literacy taxonomy, Retelling, Discussing, and Evaluating activity types can all serve as formative or summative assessment opportunities. In mathematics, almost any

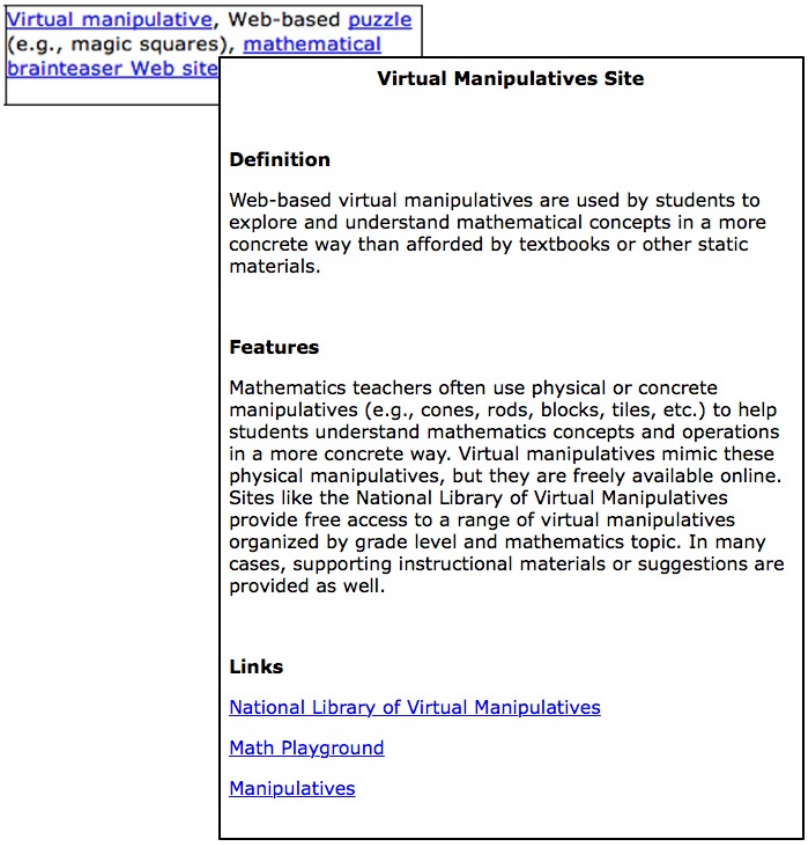
of the LATs in the taxonomy can be used either formatively or summatively for assessment of student learning. As you are planning each learning experience, consider one or more ways of monitoring or assessing students' progress in relation to the learning goal(s) for the lesson, unit or project.

As you review the LAT sequence that you constructed during the previous planning step, consider what assessment opportunities you have included. If there are limited formative or summative assessment opportunities in your emerging plan, go back to the taxonomy to identify more LATs to add.

5. Select Tools and Resources

You may have noticed very little discussion of technology up to this point in the planning process. While this omission is perhaps unusual in a book designed to explore curriculum-based technology integration, we deliberately chose to wait until this last instructional planning step to consider incorporating technologies. Too often, learning designs can be overly influenced by the features and opportunities provided by specific digital tools and resources without sufficient focus upon the appropriateness of using those particular technologies to help students to meet specific learning goals. It is important to determine learning goals, student needs and preferences, LAT sequence, and assessment opportunities before considering how digital tools and resources might support or enhance the learning experience being planned for students. Once the basic structure and sequence of the lesson, project, or unit have been determined, you can consider suggested tools and resources recommended for use (in the taxonomy) with each of the LATs that comprise your emerging design.

Many of the suggested technologies that appear in the LAT taxonomies are probably familiar to you. For less familiar technologies, links are provided to descriptions and examples in the interactive versions of the taxonomies available on the LAT website (http://activitytypes.wm.edu). An example of this supplementary information appears to the right.



How might you choose whether to include a particular recommended tool or resource in your lesson plan?

1. Identify which tools are readily available in your classroom or can be borrowed from resources available in your school. There is little value to designing a plan that includes use of a tool that is not available to you or your students.
2. Determine whether the tool is appropriate for your students' use and the learning goals of the lesson or project. If the tool or resource is either too difficult to use or too simplistic, its use may actually diminish the quality of the learning experience for your students.
3. Consider whether the tool or resource adds value to the learning experience. Integrating technology always increases the time required to plan, prepare, and facilitate learning, the complexity of the experience, and the potential for things to go wrong. When you choose to include a tool or resource, its potential benefit should outweigh these additional costs.

When deciding whether to incorporate a particular tool or resource in a lesson, project, or unit, consider the tools listed for the LATs incorporated in the plan both one at a time and collectively. Each tool or resource should add value to the learning experience. Including a technological enhancement to each of the LATs in a lesson may not be a good idea. Instead, consider where and how the use of particular tools and resources would add the most value for students in a particular learning experience. Focus upon these high yield integrations, rather than incorporating technology per se. Remember that choosing not to use a digital tool or resource may be the best option for you and your students, if their learning is assisted just as well or better by using a non-digital tool or resource.

Review the sequence of learning activities (including assessments) that you have selected. Identify possible digital and non-digital technology options for each. Considering the technologies to which you and your students have access and with which you and they have experience (or would like to explore), decide which of the technologies would add the most value to the learning experience you are planning.

Conclusion

Our research suggests that using the LATs taxonomies to design technologically enriched lessons, projects, and units during the planning process helps teachers build their curriculum-specific technology integration knowledge (Hofer & Grandgenett, 2012; Hofer & Harris, 2010). Since the LATs are organized by curriculum area and emphasize pedagogies connected uniquely with each discipline, using the LATs for instructional planning is a practical way of building TPACK. Developing TPACK occurs as part of your daily activities, rather than being added to your already overbooked schedule. Also, because recommended educational technologies are listed for each of the learning

activities in each curriculum area taxonomy, the LATs approach to instructional planning addresses content, pedagogy, and technology integration in a balanced and authentic way.

Our work with both novice and experienced teachers using LATs for instructional planning also suggests that using the LATs in instructional planning can help you to be even more responsive to your students' learning needs and preferences, while you express your creativity as an instructional designer. You have probably heard that teaching is both an art and a science. Artists (including teachers) are inspired both by what they want to communicate (e.g., the learning goals for a particular learning experience), and the possible ways to communicate (e.g., with particular pedagogical methods and media). Engaging your creativity, along with the planning tools provided here, can help you to design differentiated learning experiences for your students with multiple options for their active engagement, facilitated by savvy use of a full range of digital and non-digital educational technologies. More choices – of both LATs and tools – made available to you as an instructional designer can help you to reach more of your students in ways that are effective for each of them. As you do so, you will be building your professional knowledge – your TPACK – in authentic and pragmatic ways.

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Practitioner's Guide to Technology Pedagogy and Content Knowledge (TPACK)

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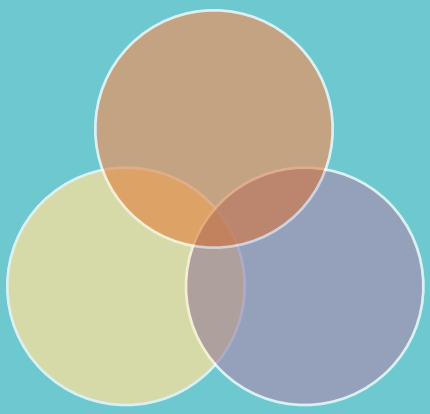

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