Guidelines for Ed Tech Usage

I. General Considerations

- Technology for technology sakes does not enhance education. There are four questions to keep in mind when selecting an educational technology to use in your course:

- *When* is it appropriate to use the technology?
- *Where* in the curriculum does it make sense to use?
- *How* will the technology be implemented?
- *Why* are you going to use the technology?

- Keep the following in mind when answering the questions above:

- learning objectives
- your student population
- logistical constraints
- the context of the learning experience

II. General Pitfalls and Strategies

-Students get frustrated if they have to learn how to use a tool that they don't see a long term use for (i.e., will they use this tool again in your course? in a subsequent course?) → consider whether there is sufficient payoff for students to balance the overhead of learning a new tool. If the benefits outweigh the costs, highlight these to the students.

-Do not focus on the technical capabilities of a tool that you loose sight of the learning objectives → structure the assignment to reinforce the learning objectives.

-Beware that students may focus on peripheral aspects of the assignment rather than the learning objectives → clearly articulate the expectations for student learning.

-Do not assume that since your students are familiar with the web, that they will automatically know how to use different web-based and software tools → provide guidance on how to use the tool by demonstrating in class or providing online tutorials or written instructions.

-Do not underestimate the time it will take students to develop competencies with a particular tool → give students the chance to practice using the tool before they need to complete a complex set of tasks.

-Budget time for students not only to learn how to use a tool, but also gain fluency.

-Anticipate potentially time-consuming problems → think about logistical and technical issues that might come up; provide adequate resources in case students encounter problems; let students know ahead of time of potential trouble spots or hidden steps.

-Do not deploy a tool before necessary prior knowledge is covered in class.

-If you are coupling the use of technology with collaborative work, recognize that group work comes with added burdens. Provide guidance for how to work together and clarify how grades will be assigned (one group grade, individual grades, etc.).

-Students do not always see the relevance of a particular tool to their discipline → explain why you are asking them to use a particular tool, or ask students to think about why you would ask them to use this particular tool within the discipline.

III. Potential Advantages, Tradeoffs, and Pitfalls and Strategies for Specific Educational Technologies

A. Course Management Systems (CMS)

1. Potential advantages:
-Ease of access to resources for students.
-Low barrier for faculty to post resources.
-Ability to provide students with supplemental learning materials.
-Increases faculty-student and student-student communication.

2. Tradeoffs to consider:
-Course management systems are generally very structured and have limited customization capabilities. Many faculty find this constraining, but will adopt a CMS if they think it will allow them to handle administrative tasks more efficiently, if students request that such a tool be used, if peers recommend it, and/or their department head recommends the use.

3. Pitfalls and strategies:
-Using a course management system that is different from the CMS supported by the university. Studies have shown that students find it frustrating to have to have multiple logins and to have to look in multiple locations to find their course resources. Using a CMS that is not supported by the university will also result in faculty having to carry the load of troubleshooting technical issues.

B. Collaboration Tools

1. Potential advantages:
-Can be used to support problem-based learning.
-Flexible communication options (local vs. dispersed participants, asynchronous vs. synchronous communication).

-Efficiently manage workflow and resources, helping students to develop project management skills.
-May build community, facilitate exchange of ideas, and lead to equal participation by all.
-Peers can efficiently evaluate progress, build off of team member's work, and provide feedback.
-May foster creativity.

2. Tradeoffs to consider:
-When selecting a specific tool, need to consider how many participants it can support and usage context.
-Research indicates that online discussions/collaborations are good at generating a range of ideas while face-to-face communication is better for reaching consensus.

3. Pitfalls and strategies:
-Some tools are not ideal for ascertaining individual contributions.
-If students aren't given strategies for working in collaborative groups and aren't being held accountable, effective collaboration may not occur. Provide guidance for how to work in teams.

C. Publishing Tools

1. Potential advantages:
-Can be used to facilitate "flipped classroom" model.
-Allows for flexible authoring of course material or homework.
-May help students develop writing and/or presentation skills
-Some tools have built-in mechanisms for providing or respond to feedback.

2. Tradeoffs to consider:
-Assignments may be constrained by features/capabilities of the tool.

3. Pitfalls and strategies:
-Be aware that some tools may not protect user data without having the user change default settings.
-Give students guidelines for giving appropriate credit to outside resources.

D. Classroom Response Systems (CRS)

1. Potential advantages:
-Can use in large and small courses.
-Can be used to ascertain prior knowledge.
-Can be used to engage, motivate, and/or spark discussion.
-Can be used to assess student learning in real-time and provide students with instant feedback on their comprehension and understanding, helping them develop meta-cognitive skills.
-Can help instructor adjust pace of course.
-Can be used to ascertain when peer discussion might be beneficial.

-Can be used to identify misconceptions.
-Use may promote deep learning.

2. Tradeoffs to consider:
-Used extensively, CRS will reduce the amount of material you can cover in class. However, use has been shown to lead to deeper learning. You may ask students to read more material out of class.
-Discussions generated can lead to "too many" questions from students and questions that you do not know the answer to. Recognize that the deep learning that you wanted to happen is happening. Answer the questions you have time for (especially if it seems like many students have the same question) and tell other students to talk to you after/outside of class about their questions. For questions you don't know the answer to, admit it and tell students that you will get back to them (and then get back to them in-person, over email, on course website, etc.).
-Use of CRS requires more flexibility on part of the instructor.
-Good conceptual questions can be difficult to write – a significant time investment is required.
-Some time needs to be spent to learn the technology and how you want to manage the data it generates.
-There is cost associated with many CRS. Make sure you use the same system as other courses to minimize student costs or offer rentals.

3. Pitfalls and strategies:
-If questions are too easy, won't result in meaningful learning and students won't see the utility of using CRS.
-Students do not like it when CRS is used to take attendance in class.
-If CRS isn't used frequently, students won't "buy in" to utility and purpose and may feel that they have wasted time/money in the device.
-Technical problems – use a "low tech" alternative such as raising hands or holding up colored/labeled pieces of paper to vote.
-Make sure you have given students enough time to consider question, but not so much time that it causes them to stray off track.

E. <u>Visualization tools</u>

1. Potential advantages:
-Allow students to interact with data, visualize it, etc.
-Allow for the representation of data or concepts in different dimensions.
-Allow students to explore concepts that are difficult to grasp in a text-based setting.
-Help students gain skills in creating effective representations of data.
-May help students gain skills in evaluating and interpreting representations of data.
- Students may develop mastery with a relevant research tool.

2. Tradeoffs to consider:
- Automation may conceal something important for student to learn → but might allow them more time to focus on important concepts.

3. Pitfalls and strategies:
-Don't assume that students actually understand what they are seeing in visualization. Ask students to describe and explain what they are seeing.
-Students do not approach data with a critical eye. Have students think critically about the data, it's limitations, and how it was collected.
-When students are creating representations of data, have students think of pros and cons of different representations.

F. Simulations

1. Potential advantages:
-Provide students opportunity to simulate experiments or phenomena that they may not have the ability/opportunity to do in real life because of time, cost, access, or safety.
-Allow students to develop experimental design skills - create and test hypotheses, manipulate variables, and analyze data.
-Provide students with a hands-on experience.
-Some simulations build in variability in results allowing students to see data that is more realistic.
-Help students understand the inherent nature of randomness in experiments.

2. Tradeoffs to consider:
-Some of the automation in simulations will prevent students from learning certain experimental techniques/skills.
-Some simulations will oversimplify conditions/variables – instructor needs to make this explicit for students.

3. Pitfalls and strategies:
-Do not assume that students have experimental design skills.
-User interface of simulation may lead to misconceptions about how experiment would be carried out in real-life (i.e., order of steps).
-It is difficult to simulate human error in experiments.
-Students may not develop experimental troubleshooting skills.
-Does the tool do a good job in guiding students through the experimental design process? If not, instructor needs to make it explicit for students.
-Higher ordered skills that might be promoted by simulation are not actually assessed by traditional exams.

G. Games

1. Potential advantages:
-May focus student attention.
-Engagement, fun.
-Interactive, hands-on.
-Well-designed games allow players to approach goal in different ways and at different rates.
-Some encourage/provide for collaboration.

-Some provide immediate feedback.
-Provide the freedom to fail.

2. Tradeoffs to consider:
-Oversimplification may lead to misconceptions.
-Fact vs. fiction in games may be hard for user to pick out.

3. Pitfalls and strategies:
-Gaining competency in playing the game could be more difficult than expected.
-Perception that games are not "serious" educationally.
-Assessing learning from games will be very dependent on how game was constructed, what type of data is collected. Assessment is still an open question in educational game development.
-Higher ordered skills that might be promoted by game are not actually assessed by traditional exams.
-Support/training for university faculty and instructors on how to incorporate games into the classroom is generally not available.

H. Immersive environments

1. Potential advantages:
-Allow students to take virtual field trips to distant places, allow students to take on the role of professionals in their discipline (e.g., conduct "fieldwork"), explore phenomena that would otherwise be impossible to observe in the classroom, and collaborate and work on projects in virtual workspaces.
-Provide freedom to experiment, create your own identity.

2. Tradeoffs to consider:
-Some students may be comfortable with open ended-ness of immersive environments, other students may need clearer goals.

3. Pitfalls and strategies:
-Bandwidth and hardware needed to run the software may limit usability. Be sure to identify the minimum requirements.
-Immersive environments are expensive to develop and support. Because of this, many educators do not create their own virtual worlds and use tools such as Second Life and Open Wonderland.

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