Developing Active Learning Exercises for Any Content

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Teaching and learning both should be fun, engaging, and impactful in lasting ways. Studies show that student engagement and information retention increases when students are immersed in active learning - hands-on usage of the information. Modern faculty members are seeking methods of incorporating active learning into their teaching, but may not know where to start when creating their own active learning materials. This paper will outline a process for creating new activities. Included are appendices full of creative active-learning formats (hot topics borrowed from primary and secondary education), as well as guidelines on when to use them that will make teaching and learning fun and practical. These media are also useful for developing transferable skills that students will bring into the workplace.

Introduction

In a meta-analysis of 225 studies of active learning in science, technology, engineering, and mathematics (STEM) classrooms, it was shown that active learning strategies increase grade performance by half a letter grade and decrease course failure rates as compared to traditional lecture-based teaching (Freeman et al., 2014). This paper outlines a process for creating new activities that encourage active learning. Included are appendices full of creative active-learning formats (borrowed from primary and secondary education), as well as guidelines on when to use them. In the past, one of the strongest criticisms of online teaching and learning pertained to the lack of communication and interaction. The most cited reason why learners are dissatisfied with online and hybrid courses is a perceived lack of interaction (Cole, Shelley, & Swartz, 2014). When online courses were emerging along with the internet, the content focuses on text, with discussion boards the dominant communication forum.

Overview of Strategy

Our strategy consists of five phases: Vision, Creation, Implementation, Evaluation, and Refinement. We suggest an interactive rather than linear approach to these phases where the projected evaluation methods for an activity should play a part in the vision for its design. This strategy represents and ongoing process of developing and continuously improving activities to increase engagement and to improve learning.

Vision

When creating an activity, the first stage of planning is the "vision" stage. In this stage, you will identify what your overarching goals for the lesson are based on the overarching goals for the course. You will take into consideration the physical limitations of your classroom and study body, the purpose of the lesson that you wish to design, determine a rough sketch of the activity and how you will implement it, and determine whether the planned activity has measurable outcomes for gauging student success. We break these considerations into four conceptual categories: Situational Factors, Goals, Approach, and Assessment.

Situational Factors - Physical, Intellectual, & Social

Class Context

Class Size

In large classes, avoid activities that require movement, experimentation, instructor supervision, or intricate project submissions. Group work, automatically graded, completion graded, ungraded or peer-graded work is most manageable. Consider demonstrations or paper labs in place of experiments, group thinks and gallery walks in place of individual submissions, and "ask the winner" teaching strategies. Small classes allow one-on-one time, individualized assessment, and greater flexibility in learning differentiation.

Class Level

Introductory coursework relies on lower levels of Bloom's Cognitive Taxonomy, requiring students to memorize content and generally understand theories important for later courses. Activities should develop long-term retention, metacognition, and exposure to the discipline for major/career exploration. Clear learning outcomes, transparent grading standards, and individualized formative assessment are critical for inexperienced students unaware of college expectations, particularly first-generation college students (Winkelmes, 2019). Essential resources, like standardized rubrics and sample submissions, require substantial development time.

Upper-level students have the rounded education to produce higher-quality work and the intellectual maturity to achieve higher learning outcomes. They are capable of higher levels of autonomy and are more tolerant of abstraction. Capstone assignments are of great use to these students, as are activities developing transferable skills for the working world.

Learning Space

Consider visibility from all seats, acoustics, movement space, and equipment available in the classroom. Adjusting seating configuration can encourage group work or Socratic discussion. In traditional lecture halls, pair-work or small group work is

easier for students. Activities that require movement may need modification. Click-er polling and printouts can be useful here.

Nature & Importance of the Subject

Utilize the following strategies as helpful guidelines when designing activities with the stated primary purposes. For activities that:

> Seek to **clarify theoretical concepts** or **illustrate abstract concepts**, include data usage, simulations, and real-world examples. Seek to develop cognitive skills in the moderate-to-high levels of Bloom's Cognitive Taxonomy.

> Seek to **clarify difficult concepts**, provide concrete examples of what is true, specifically addressing common misconceptions.

> **Illustrate controversies and alternate rationales**; remember that these activities have the potential to affect student's emotional, social, or moral growth. As such, they are scaffolded using Bloom's Affective Domain or Dee Fink's Significant Learning.

> **Explore enduring questions**; remember that every discipline has **enduring questions** that apply at all academic levels. When planning an activity, identify one or two enduring questions that your topic addresses, then engage students in acknowledging and answering those questions. Enduring questions do not have easy answers; at the end of an activity, students should be able to answer enduring questions with more questions. (McTighe, 2019)

The Learners - Class Demographics, Learning Needs, & Expectations

- General Demographics:
  - Level of Learners: First-year students are less academically mature than upperclassmen and require more structure, less abstraction, less academic rigor, and more modelling of expected standards.   They may perform poorly on assignments that rely on future general education coursework, such as essays.
  - Traditional/Non-Traditional Students & Professional Students:
    - Non-traditional students excel in real-world scenarios, focusing on practical application over theory, but gaps in their educational timelines affect the retention of previously learned foundational knowledge.
    - Traditional students have less grasp of how theoretical information transfers into real-world significance. Engaging them in exercises that integrate the affective domain can be difficult; these students often lack the life experience to relate to real-world problems.

- Professional students have strong educational backgrounds and clearly defined career goals. In their haste to learn "real-world" applications, professional students risk inadequate comprehension of theory needed for professional licensing exams. They benefit most from activities involving hypothetical scenarios that marry the two.
  - Racial, Socioeconomic, Religious, Citizenship, and Social Demographics - Cosmopolitan classrooms pose unique challenges. Be mindful of how topics affect students of varying backgrounds. Activities that successfully utilize diversity allow students to **safely** share their cultures without fear of reprisal, creating a rich classroom culture and highlighting social components of the curriculum. Inclusivity creates interest and personalization; it also equalizes fields that have been traditionally exclusive. When handling delicate topics, always have a plan for controlling student commentary that becomes aggressive or inappropriate. In uniform classrooms, primary literature can humanize a perceived outgroup and promote tolerance.

Goals for the Lesson - Teaching What Students Should Know & Preventing Typical Misconceptions

- *Lesson goals* are strongly intertwined with the nature of the discipline. Common goals are listed below.

  Sample Goals:
  - Teach Real-World Skills & Work-Related Tasks
  - Create a Product
  - Develop Foundational Knowledge
  - Licensing Exam Preparation
  - Promote Long-Term Retention
  - Work Through Difficult Concepts
  - Illustrate or Apply Content
  - Promoting Critical Thinking
  - Explore Primary Literature

- *Administrative Objectives* are overarching objectives carried through multiple lessons.
  - *Institutional objectives* create a campus culture or ensure institutional compliance.
  - *Disciplinary objectives* help students to develop professionalism and think like a (professional). Professional licensing standards often state these objectives.
  - *Departmental objectives* create uniformity and clarity for all students across the program. These include conceptual and foundational

knowledge goals for development as students progress through the program.

- ◦ ***Instructor objectives*** are related to your teaching philosophy, the affect your class should have on students, and how you want a lesson to change their outlooks.

- ◦ ***Developmental objectives*** help students develop cognitively, socially, or emotionally. The University of Louisville suggests implementing the Paul-Elder Critical Thinking Framework (University of Louisville, 2020):
  - ▪ Intellectual Humility
  - ▪ Intellectual Courage
  - ▪ Intellectual Empathy
  - ▪ Intellectual Autonomy
  - ▪ Intellectual Integrity
  - ▪ Intellectual Perseverance
  - ▪ Confidence in Reason
  - ▪ Fair-mindedness

- • Expectations - Students' class expectations, interests, and needs can determine transferable skills to teach using activities. Departmental and professional expectations inform the level of detail needed and the methods with which students should be familiar.

The Teacher

- • Teaching Philosophy - Identify why you teach. Students will engage if you share your passion with them. Students enjoy activities and topics that really matter, while teachers and students alike hate tedium and menial details.

- • Subject Knowledge - It is easy to get overwhelmed, particularly when teaching a new course, and feel like you are not the expert. List the experiences that make you an expert in your field and identify how they relate to the topic at hand. Pull from first-hand knowledge when planning an activity, supplementing with external resources.

- • Strengths/Weaknesses - Play to your strengths, but do not hesitate to try something new; seek help/critique from a colleague when doing so. Telling students that you are trying a new activity can humanize you as a teacher, model academic perseverance, and generate student support in creating, implementing, and revising the activity. Avoid creating activities that you dislike or cannot envision, as these ultimately lead to low student morale or ineffective ambiguity.

Approach - Educational Models

Many different learning scaffolds have been proposed for instructors to use as a tool when designing classroom activities and resources. Three are discussed below.

Bloom's Taxonomy

Bloom's taxonomy is a set of three hierarchical models scaffolding learning tasks by depth and complexity. The Cognitive Domain is scaffolded into Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation (Bloom, 1956). Less discussed in academic circles, the Affective Domain - associated with feelings, values, morals and judgements - includes Receiving, Responding, Valuing, Organizing, and Characterizing (Bloom, 1956). Affective Domain scaffolding is particularly important for students of criminal justice, the political and social sciences, and humanities whose careers call on them to make sound judgements, weigh facts, and evaluate the viewpoints of others. Finally, the Pyschomoter Domain describes the acquisition of skills to perform physical tasks, including Perception, Set, Guided Response, Mechanism, Complex Overt Process, Adaptation, and Origination (Bloom, 1956). Psychomoter scaffolding is useful for trade students, athletes, performers, craftsmen, artists, clinicians, and any hands-on job training. The strength of Bloom's Taxonomy is the identification of tasks that require deeper thinking or higher expertise. A weakness of Bloom's Taxonomy is that scaffold level is not necessarily correlated with detail, difficulty, breadth of knowledge and understanding, or appropriateness of a task.
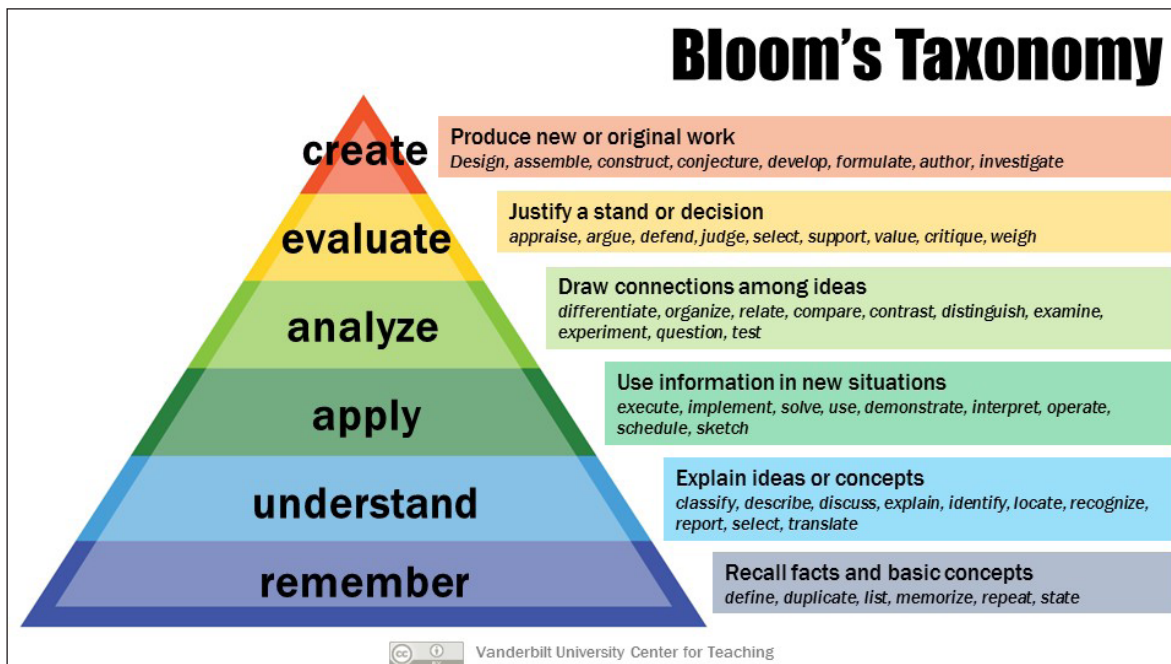
Caption: This image, created by Vanderbilt University's Center for Teaching, is an excellent starting point in activity development. It provides action words to incorporate into activities to ensure that given levels of Bloom's Cognitive Taxonomy are achieved. (Licensed Under a Creative Commons License)

Dee Fink's Significant Learning Taxonomy

Fink's Taxonomy breaks tasks into multiple dimensions, including Foundational Knowledge, Application, Integration, Human Dimensions, Caring, and Learning to Learn. It is not hierarchical, but interactive (The Peak Performance Center, 2020). Fink asserts that utilizing multiple modes of learning increases overall retention and import of learning. Its strength lies in its simplicity and acknowledgement that multiple modes of learning occur, to varying degrees, simultaneously. The weakness of Fink's Taxonomy lies in its ambiguity and lack of scaffolding for tasks.

McTighe's Transfer Model

McTighe's Transfer Model focuses on those tasks which students are able to complete independently within the workforce after graduation (McTighe, 2019). He suggests identifying the large body of knowledge that students should remember short-term, the smaller body of understanding that students should retain for years to come, and the tiny number of skills they will retain for a lifetime (McTighe, 2019). McTighe's model is useful when planning class time allocation and volume of material to cover. It asserts that because students will not retain the majority of information long-term, instructors should spend class time highlighting the truly important material with activities that build life-long transfer skills (McTighe, 2019). This model does not provide concrete advice on how to implement active learning besides genuine application.

Activity Creation - Deciding to Modify an Existing Activity or to Design a New Activity to Meet Specific Needs

Assessing Whether an Activity Already Exists:

- Every discipline has enduring questions that are revisited by every teacher at every level (McTighe, 2019). Before investing time creating a new activity for your classroom, search for activities developed by colleagues. Alternatively, modify existing high school resources to attain an appropriate level of depth.
- Google Image search for "Interactive" or "Active" + your topic. Image searches return worksheets and pictures of activities in progress. General Google searches are more likely to return irrelevant results, but also can return online activities and simulations.
- Search your learning management system for activities, quizzes, and files that have been shared by users from your school or all over the world.
- Search websites that sell or freely distribute teaching resources for high-school teachers. <www.teacherspayteachers.com> is a very large and popular website.
  - AP (Advanced Placement), IB (International Baccalaureate), & dual credit resources can be directly used in first-year classrooms for classes that

have a high-school variant.

  ◦ Foreign language resources usually require no changes.
  • Search Pinterest and education blogs for ideas of what other teachers are doing. A wealth of active learning resources come out of lower education, where hands-on learning is standard.

Creating an Activity

Choose an active learning format that lends itself to the needs identified in the Vision stage. Appendices A-D are tables of potential activity formats, sorted by cognitive or transfer level and feasibility in classrooms of various types. Appendix A, "Activity Type Sorted by Blooms' Cognitive Taxonomy Scaffold", recommends activities that encourage students to use higher-level thinking or that reinforce information at the lower taxonomic levels. Appendix B, "Activity Type Sorted by McTighe's Transfer Model," recommends activities to help students remember material short-term, understand material long-term, or transfer material by utilizing it post-graduation. Appendix C, "Activity Type Sorted by Room Constraints," sorts activities by ease of implementation in large lecture halls, large classrooms, and small classrooms. Appendix D, "Activity Type Sorted by Group Size," sorts activities by feasibility of assignment and grading for individuals, pairs, groups, or entire classes' participation.

Implementation & Evaluation

Utilize the activity in your classroom. Be mindful of student response to the activity, general flow, time usage, and any unforeseen issues that arise. You should immediately notice changes that would make the activity run more smoothly. Formative assessments given directly after the activity and later summative assessment results provide data about student learning. Directly ask students what they feel they learned, what they would change, and what they liked. Some students may complain about disliking an activity, only to reveal that minor changes would resolve the problem. After summative exam results are posted, students can explain how their performance on the activity translated into exam success. Long-term analysis of student success can illuminate how students are transferring learning to later courses and job searches.

Subjective Measures of Success

When considering how to improve an activity, the following questions will assist you in targeting aspects that need to be changed.

Engagement - What do I want to bring back?

Begin by identifying what made the activity exciting and engaging to you and your students. Those aspects of the activity are critical aspects to retain. Student engagement is key to learning; activities that are not engaging require a complete overhaul.

Transfer

Did the activity provide students with transferable skills? If not, consider making the activity more similar to a real-world scenario. Resume-worthy experiences include experimentation, formal presentations, team building and leadership work, professional networking, and activities that develop hard skills.

Connections

Impactful activities help students to develop into responsible citizens and make a deep impact on students' lives by changing outlooks, promoting activism, or influencing important life decisions. If students did not connect with the material, consider modification using Bloom's Affective Domain, or Fink's Caring and Human Dimensions.

Objective Measures of Success

Assessment - Measures of Student Success; Effectiveness & Usefulness of Activities

Activities should always be designed with assessment in mind and should lend themselves to the planned assessment type (or vice versa). Assessment should align with activity goals/learning objectives. Fink suggests a FIDeLity Feedback model, stating that feedback should be frequent, immediate, discriminating, and loving (Fink, 2019).

Student Assessment Options:
- Traditional Grading
- Forward-Looking Assessment/Performance Assessment
- Peer Assessment
- Self-Assessment
- Group Assessment
- Online Assessment
- Low-Stakes Assessment
- Student Surveys
- Formative Assessment
- Summative Assessment
- Adaptive Assessment
- Growth Assessment
- Student Cohort Grades throughout College
- Graduation Rates
- Licensing Exam Scores
- Hiring Data

Activity Assessment

Utilize the following criteria to assess activities before and after implementation:

- Learning Objectives Were Met
- Student Engagement/Enjoyment
- Learning - Information was Successfully Conveyed; Students "Got the Point"
- Logistics - Ease of Implementation, Completion Time, etc.
- Overall Success:

  The activity helped students...
    - ...prepare for the exam.
    - ...apply course content.
    - ...think like a (professional).

Refinement

Assessment provides insight into modifying specific activities as an integral part of developing the course for future years.

Refinement Steps:

1. Establish the core outcomes of course (1-2 per exam unit)
2. Include several activities supporting each outcome. Add supplemental activities if one activity did not meet the outcome sufficiently, but still proved valuable.
3. Refine specific activities, correcting issues identified previously and adding more dimensions from Fink's Taxonomy. Activities lacking in one dimension can be changed slightly to engage additional dimensions, providing for a rounder educational experience.
4. Implement the activity. Assess formative and summative gains. Repeat the process of refinement again in the next semester. Activity design is a process of continuous improvement.

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