Enhancing Student Creativity Through Media Design Projects Using Online Software

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Students in Crisis

Increasing numbers of students are in crises. They are not engaged in their academic classes, are struggling with emotional trauma, anxiety, and lack of resilience made worse by the COVID pandemic, and lack the critical skills of creativity, communication, critical thinking, and collaboration that are necessary for future workplace success.

There are many possible reasons for this, including the increasing use of cell phones with their distractions, fear of missing out, and social anxiety. A focus on testing and school accountability has led to classrooms that teach to the test using didactic, teacher-centered methods. Students have become trained that there is only one right answer, and they are discouraged from looking for creative solutions to problems. The factory model of education is still prevalent and pushes for efficiency and standardization instead of effectiveness and differentiation. For all of these reasons, schools act to kill creativity and innovation; students are literally educated out of being creative.

Yet creativity and innovation are critically important for all fields and careers. Without them, our economy will stagnate and we will fall behind other countries. It is also essential for individual well-being and emotional resilience. Creativity allows us to try new things, take risks, and even sometimes fail, which is the essence of resilience. Teaching for creativity must be a priority for schools..

Research Question

The purpose of this dissertation research study is to answer the following multi-part question:

To what extent can STEM teachers implement choice boards for using browser-based media design software to:

A – promote differentiation through Universal Design for Learning (UDL)?

B – establish the components of "Gold Standard" Project-Based Learning?

C – enhance student creativity and Social and Emotional Learning (SEL)?

Choice Boards

A choice board allows students to choose from several options when creating a project or demonstrating their mastery of concepts. For each concept or standard, there can be several choices that are equally capable of teaching students the concept but allow for different skill sets or difficulty levels. As students choose which option they want to pursue, they pick one that fits their particular learning style and preferences, thus differentiating instruction. Choice boards can provide brief overviews of the projects with links to deeper descriptions and examples.

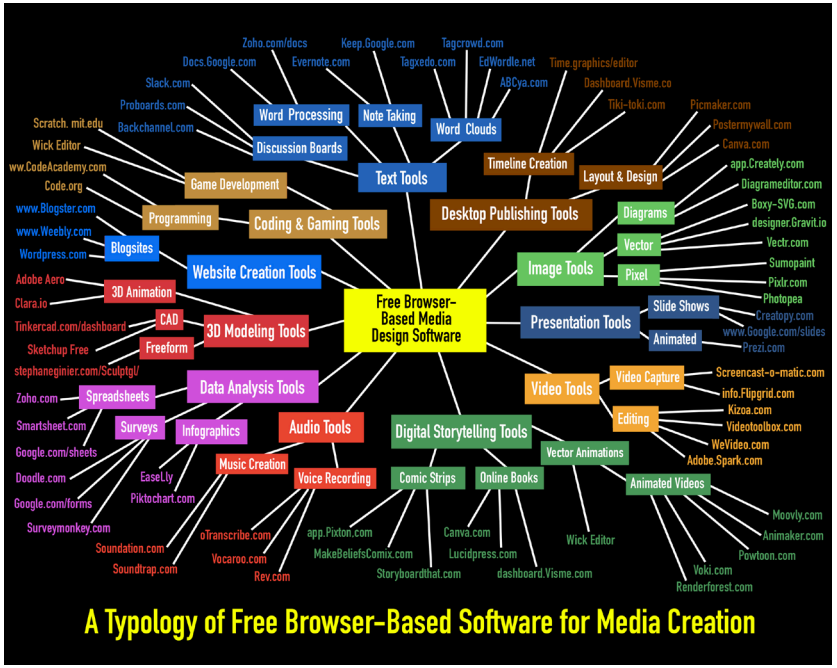
For this research, I have created a website with a Projects choice board that lists types of software students can use and describes potential projects. This page is at: https://science-creativity.com/projects.

Browser-Based Software

The particular niche of project-based learning that I am focusing on is how teachers can train students to use media design software in order to create educational content to demonstrate their mastery of concepts. It is the factual part of each subject area where students often report being disengaged and bored. It often seems pointless to have to learn an endless list of names, dates, and events. Yet understanding the discoveries of the past and how we came to our current knowledge is an essential part of learning. Instead of teacher-centered lectures, textbook readings, or videos, this project proposes that student-centered methods such as project-based learning will be more meaningful and can enhance student motivation and creativity.

Media design software skills are one avenue for creativity. As students create their own media projects and present them to others, they will not only learn valuable and marketable design skills, they will also learn the material well as they research, design, and present it to their peers.

However, commercial software such as the Adobe Creative Cloud applications are expensive and require powerful computers to run adequately. Many students cannot afford it and do not have access to it. In the interest of equity, inclusion, and social justice we must look for free and accessible option. Increasingly, there are browser-based or online media design tools that can run on even basic Chromebook computers, iPads, or even cell phones. Many of these tools are free for basic services, and are therefore far more accessi-

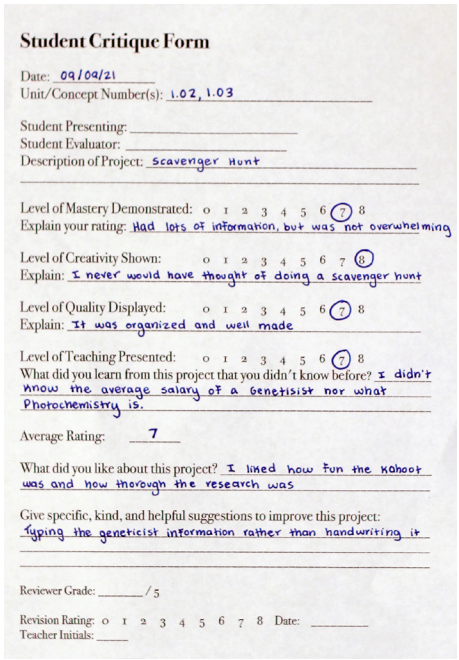


A Typology of Free Browser-Based Software for Media Creation

ble to a wider range of students.

It is unreasonable, however, for most teachers to have the time or inclination to learn new software. Yet it could be of great benefit to their students. To solve this problem, I am creating a series of flipped software training videos and placing them on my YouTube channel at: https://www.youtube.com/@elementsunearthed and with links on the Software Training page of my website at: https://science-creativity.com/softwaretraining.

Students can choose which topic to create media projects for, which type of software to use, and the approach or type of project they will create. For example, in my biology classes currently, students have a choice between DNA replication, transcription, or translation as their topics. They can use video software such as WeVideo or iMovie, MIT Scratch, or Wick Editor (similar to Adobe Flash). They can choose between three types of projects: Linear animations (including stop motion), branching projects similar to websites, or interactive games or quizzes. That allows them 27 possible choices, with descriptions and software training available for each possibility.



Student Critique Form

Date: 09/09/21
Unit/Concept Number(s): 1.02, 1.03

Student Presenting: _____
Student Evaluator: _____
Description of Project: Scavenger Hunt

Level of Mastery Demonstrated: 0 1 2 3 4 5 6 (7) 8
Explain your rating: Had lots of information, but was not overwhelming

Level of Creativity Shown: 0 1 2 3 4 5 6 7 (8)
Explain: I never would have thought of doing a scavenger hunt

Level of Quality Displayed: 0 1 2 3 4 5 6 (7) 8
Explain: It was organized and well made

Level of Teaching Presented: 0 1 2 3 4 5 6 (7) 8
What did you learn from this project that you didn't know before? I didn't know the average salary of a Geneticist nor what Photochemistry is.

Average Rating: 7

What did you like about this project? I liked how fun the Kahoot was and how thorough the research was

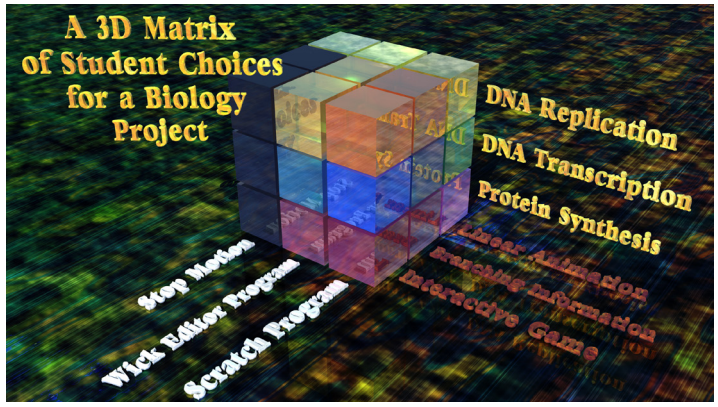
Give specific, kind, and helpful suggestions to improve this project:
Typing the geneticist information rather than handwriting it

Reviewer Grade: _____/5

Revision Rating: 0 1 2 3 4 5 6 7 8 Date: _____
Teacher Initials: _____

In physics class, students could choose between three types of devices to demonstrate their knowledge of work, energy, and power and different types of simple machines. They could choose a Rube Goldberg device, a marble run, or a perpetual motion machine. Each choice required the use of six types of machines, 8 machines total, and was tested for consecutive successful runs or reliability. They had to create an initial sketch or digital drawing, build a 3D diagram showing the device from three orthographic and one perspective or isometric view, and create an animation of the movement of objects (such as marbles) through the device.

In chemistry, students can choose between four topics related to chemical reactions and then choose any of nine categories of digital media software and about 40 different types of projects, with 160 potential choices total.

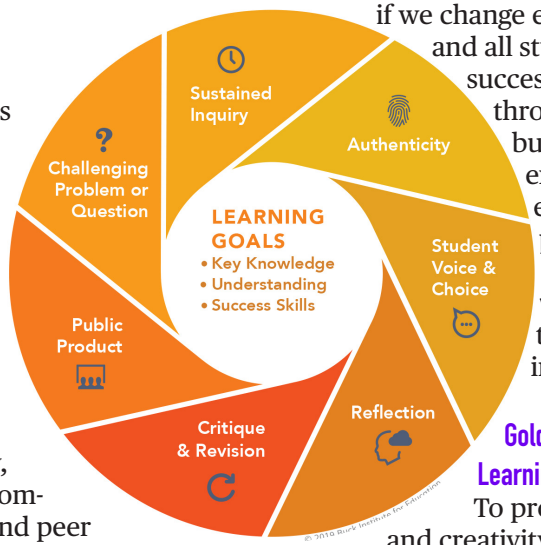


Peer Critique and Revision

In each class, students will be required to use some form of digital media software but they can choose which topic, which software, and which type of projects. As they successfully complete and present their projects, their peers will fill out Google critique forms to evaluate the content mastery, creativity, quality, software competence, and peer teaching of their projects. If student teams receive lower scores than they want, they can incorporate their peers' suggestions, revise their projects, and re-present them to me for a higher score. Through peer critique and revision, students will become more creative and resilient as their projects improve.

Universal Design for Learning (UDL)

First developed by CAST in 1984 to promote full inclusion of students with disabilities, UDL has expanded to include equity and access for all students including those who are from underrepresented and marginalized groups. UDL is based on four beliefs: 1 - All students can reach high expectations; 2 - Barriers to success lie in the system, not the students; 3 - Learner variability is the norm and requires differentiated instruction; and 4 - Student continual self-reflection leads to lifelong, expert learners. Applying these principles to student creativity, all students are creative (although in unique ways), their creativity can be enhanced if we change educational methods, and all students can achieve success as creative learners through making, coding, building, designing, expressing, teaching, experimenting, and presenting. Their emotional well-being will be improved as they become creative innovators.



Gold-Standard Project-Based Learning (PjBL)

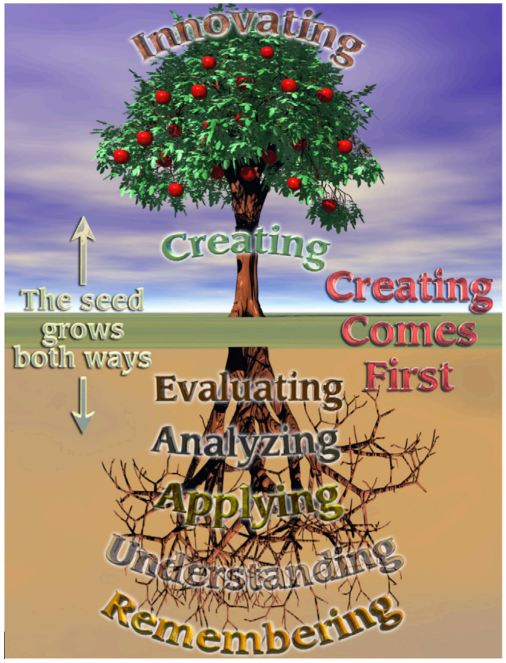
To provide student choice and creativity, teachers need to relinquish control and allow students to become the center of the education process. Project-based learning is one method for allowing students to self-differentiate, create, and achieve deeper learning. The components of gold-standard PjBL, according to PBLWorks, are beginning a project with a compelling and meaningful question, allowing for sustained student inquiry and authentic learning, giving students voice and choice in how they approach the question, providing frequent

formative feedback and chances for revision, setting up a public presentation of the projects, and asking students for final reflection on what they have learned.

Research Methodology

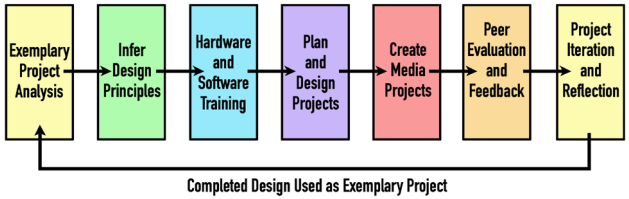
STEAM Showcase: To put all of these pedagogies together, students in STEM classes will work through a series of projects including the current classroom projects described above. Once this first round of projects is complete, they will join into small teams to pick a topic relevant to their subject area and develop a 15 minute mini-lesson that includes a script, short presentation on the science of the topic, a demonstration or activity, and a final handout. These components will be created using the browser-based media design software. They will practice the lessons and present them to each other in class and receive peer critiques, then all teams will make revisions and present again to the K-8 classes at our school. Teachers of those classes will provide feedback, and the students will revise their projects again. Finally, they will present to their parents, siblings, and the community at a STEAM Showcase night in April. We will take over 4-5 rooms and hold 4-5 sessions of 20 minutes each, with sessions occurring concurrently. The audience will provide feedback and student will complete final reflection logs and surveys.

Stanford Innovation Lab: As practice in human-centered design and engineering, on Fridays our students work in teams of 3-6 students to help solve problems for actual clients ranging from local retail businesses to Provo City's recycling program. They work through the steps of the engineering design process, including empathizing with clients' needs, defining the problem, coming with ideas for solutions, designing a prototype, and testing it. They are working through a checklist for each step that requires certain steps but also allows for choice, as in "do 3 of 5 choices." If they complete three items per week, they will stay on schedule for a final presentation to their clients on May 12.



Plant the Seed of Creativity!

A Process Diagram of Learner-Generated Digital Media Design

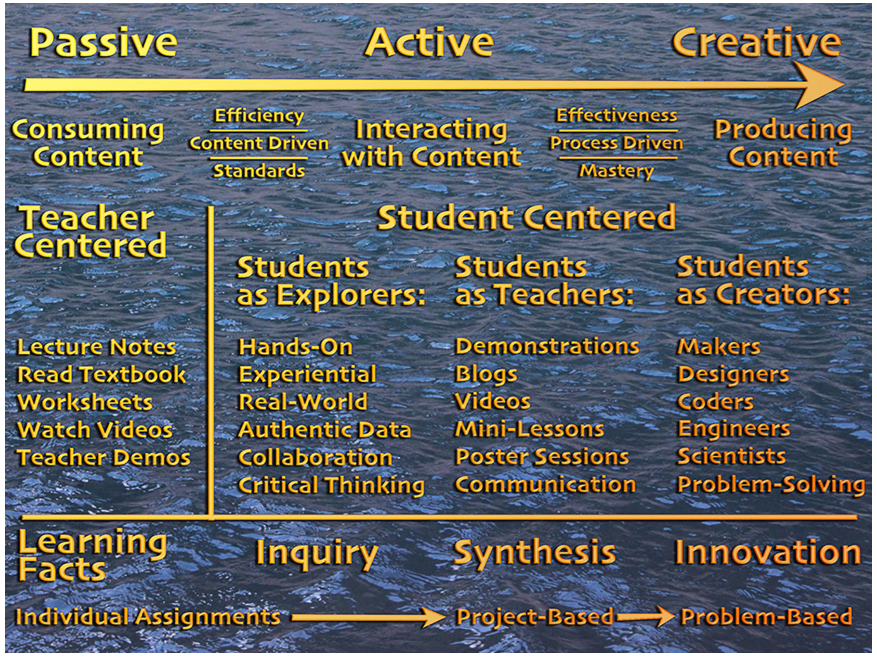


Feedback from Other Teachers

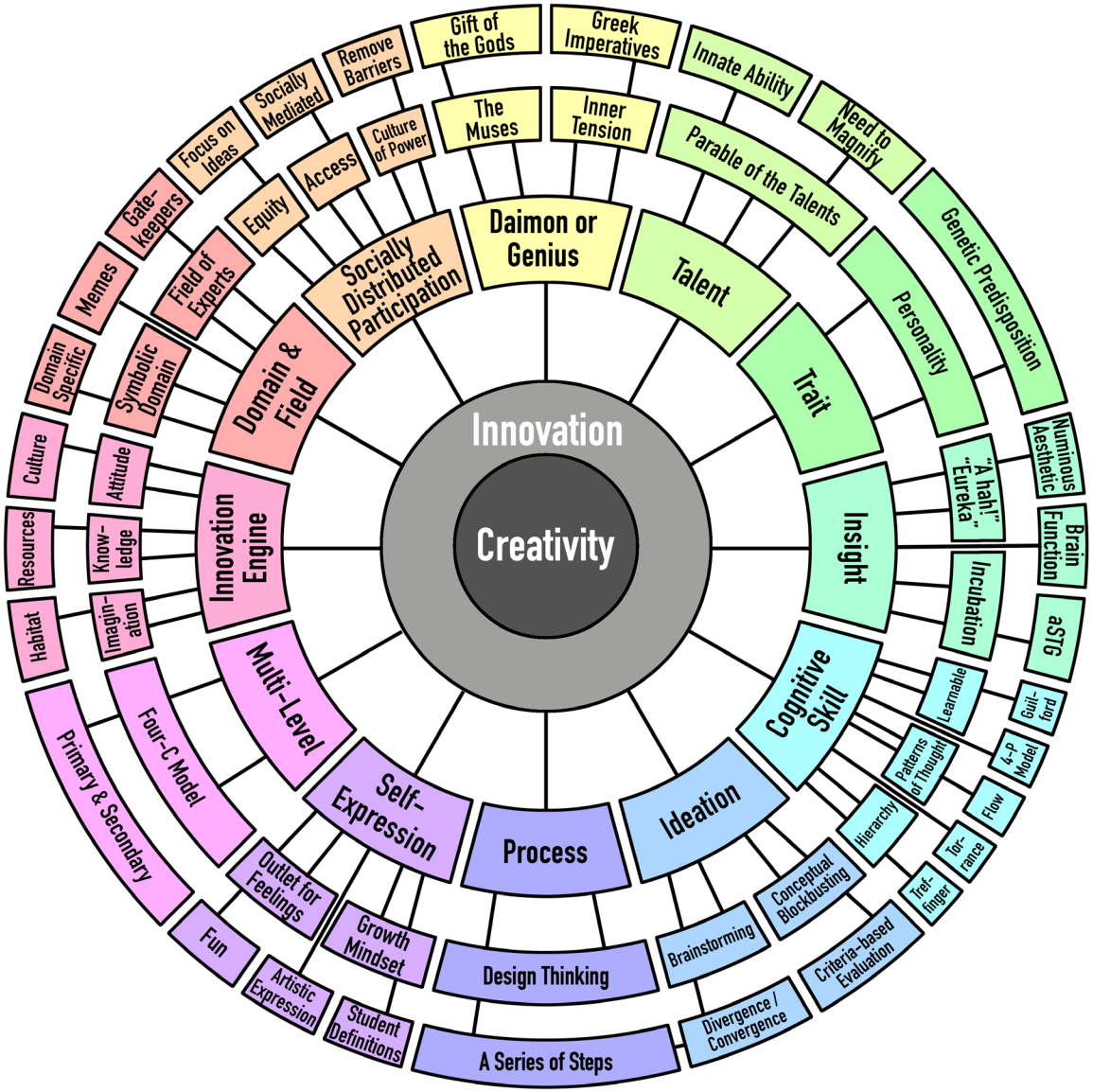
In addition to the action research I am conducting of my own students (including critique forms, reflection logs, artifacts, videotapes of sessions, interview panels, etc.) I want to enlist the help of other teachers at other schools. The website I have built (https://science-creativity.com) needs to be tested and evaluated by teachers, and the flipped software training videos need to be tested and used by students on actual projects.

If you are planning to have your students do any kind of projects before the end of this 2022-23 school year, please consider having them create educational media using my website and flipped videos. As they create projects, please observe how well they demonstrate creativity, content mastery, engagement, and emotional well-being. I will send you a link to a Google form to provide feedback and observations of students' projects and presentations. Have them use peer critique and revision to see how the quality of their presentations improves and they demonstrate resilience.

If you are interested in participating, please fill out the sign-up form on the table and I will contact you with further instructions, a consent form, and the feedback surveys. I hope you can be part of this research study and advance our understanding of STEAM education. Any help is greatly appreciated!



Please Help Out This Research Project! Sign the Form on the Table.



Twelve Models of Creativity

Twelve Models of Creativity

Many theories have been proposed to explain creativity. Anciently, the Greeks and Romans believed that creativity was a gift from the gods in the form of a personal ***daimon*** or ***genius***. The Muses communicated the will of the gods to one's daimon, which acted as a drive to actualize one's potential. It was Socrates who stated the Greek imperatives: know thyself and become thyself.

In the Judeo-Christian tradition, creativity is a talent bestowed at birth that one is expected to magnify for the benefit of humanity. Later theories of creativity saw it as one of many innate traits, a part of one's personality determined by genetic predispositions.

In 1926 Wallas saw creativity as insight, intuition, or inspiration that follows four steps: First, deep focus on a problem followed by relaxation and incubation where one's subconscious mind continues to work on the solution, which would suddenly occur to one's conscious mind as an "Ah hah!" or "Eureka!" moment, a numinous peak experience followed by validation to justify the decision. Brain research suggests that a section of the right hemisphere called the anterior Superior Temporal Gyrus (aSTG) is responible for these bursts of sudden insight as new connections are found.

Other theories posit that creativity is a cognitive or mental state such as flow involving patterns of thought and a series of preconditions which can be learned. Creativity can be seen as fluency at coming up with new ideas through brainstorming, or as a process with a series of steps, or as a means for self-expression and fun.

Kaufman and Beghetto have identified four levels of creativity, from mini-c creativity for learning new things to professional expertise to Big-C world-changing ideas.

Tina Seelig with Stanford's Innovation Lab envisions the engine of innovation as a series of three internal factors (imagination, knowledge, and attitude) and three corresponding external factors (habitat, resources, and culture). Mihaly Csikszentimihalyi saw creativity as memes which change a domain of study, validated by a field of experts. Clapp sees creativity as the evolution of ideas, not as the acts of individuals. Through this viewpoint, all people from all ethnic groups can contribute equally to new ideas and participate in the socially distributed processes of creativity and innovation.