'Becoming da Vinci' Exercise Ignites the Inventor Spirit
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Students often have a hard time understanding the difference between an invention and an innovation and, likewise, the difference between incremental and disruptive innovation. I developed this exercise to help students delve into the mind of an inventor. The inventor mindset is an experience that most students never have; yet, many great entrepreneurial ventures of our time started out with ideas that became inventions in a laboratory with no thought for a possible market. Much of what is created today are innovations and “me-too” applications, so challenging students to create something novel is an important but difficult undertaking for them. Furthermore, as entrepreneurs, your students may one day work with an inventor to commercialize a new product, so it’s important that they have some understanding of how inventors think and work.

For purposes of this exercise, we define invention as an original idea to solve a problem. That solution can be in the form of a machine, a physical process or a product. We avoid inventions that involve “composition of matter” like drugs and such in an effort to keep things simple and understandable for the entire class. An innovation, by contrast, extracts commercial value from an idea. It is often the application that arises from an invention or it may be an improvement on an existing product. It is also the process by which an invention is commercialized.

Process matters more than problems

This exercise is fairly simple in terms of preparation and instructions. Students are given two weeks to identify a problem that calls for a “new to the world” solution. Students are asked to avoid complex problems that may require multiple inventions (solving global climate change or major city traffic come to mind) and instead stick to simpler problems. It’s not the problem itself that is most important in this exercise; it’s the process students will undertake to complete the assignment. As part of the assignment, students are asked to reflect on the process they go through to identify a problem and create a novel solution. Since the exercise calls for an invention, students are challenged to come up with a product, not a new business model, service, or other solution that would not be categorized strictly as an invention. Students are not expected to prove that their product is a commercially viable solution.

During the students’ presentations of their “inventions,” it becomes clear how well they understand the concepts of invention and innovation. Most students will create something that already exists; and their classmates will be quick to point that out, which presents an opportunity to discuss the differences between an invention and an innovation. The students find this discussion very valuable, but it is made more memorable by bringing a real inventor to class to view and comment on their “inventions.” Once the student presentations are completed, you can then call on the inventor guest to talk about the process he or she goes through to invent things that are novel, patentable and have impact.

Exercise Objectives

- To apply critical thinking to a problem and to the process chosen to find a solution
- To challenge students to look beyond the obvious and seek a novel solution
- To understand the difference between invention and innovation

Exercise Format

1. Instructor Preparation: Identify an inventor at your university who has had several inventions, at least some of which have been commercialized. For example, I chose, arguably, the most prolific inventor at the University of Southern California, who has change-the-world inventions in robotics, orthodontics, the oil industry and manufacturing. He is also able to talk to students about his unique life as an inventor and provide insights into how he creates. You will probably discover that talking with inventors is often very different from talking...
with the average speaker you might bring to
class. Don’t be concerned that they aren’t
necessarily charismatic speakers. In my case,
my inventor’s delivery style is very different from
the stylized, entertaining presentations we
generally see in business schools—his delivery
is low key, Zen-like— so you may think that
students would get bored quickly or fall asleep
listening to his soothing voice. Quite the
opposite is true. They are enthralled by this
person who looks at the world very differently
from the way they do and they are fascinated
with how he finds solutions to problems. Once
you have found an inventor, you will need to
decide when to do the exercise.

2. The best timing for this exercise is when you
have planned to talk about the concept of
innovation because it enables students to apply
what they have learned from the class
discussion to the exercise and find out if they
have really understood the concepts.

3. **Students** receive the instruction sheet on the
day the assignment is introduced and can ask
clarification questions.

4. Students have two weeks to complete the
assignment.

5. On the due date students come to class
prepared to describe in two to three minutes
how they came up with the problem and then
show a visual of their solution.

6. For each presenter, the guest inventor can
comment or ask questions of the student and an
open discussion can ensue. I suggest that no
more than five students present for the inventor.
If you have the students submit their
assignments before class, you can scan them to
find the most interesting to call on to present to
the inventor.

7. After the final presenter, the **guest inventor**
may summarize some key thoughts about what
the students did and then talk about his/her own
experiences as an inventor.

**Introducing the Exercise**

Ideally, the topic for the class in which you will be
assigning the da Vinci exercise should be innovation. I
like to add a bit of history to the topic by introducing the
concept of the Medici Effect. The Medici Effect, coined
by Frans Johanssen in his book by the same name,
refers to the explosion of ideas in art, science, literature
and politics brought about through the efforts of a 15th
Century banking family: the Medicis of Florence, Italy.
The Medicis brought together people from every walk of
life and every creative discipline and funded them to
create in a way that had never been seen previously.
The Medici Effect disrupted traditional lines of
association and encouraged new disruptive creations at
the intersection of multiple disciplines: art and science,
science and politics, and so forth. Depending on your
plans for this session, you can go deeper into the
Medicis’ very fascinating story. The Medici Effect
example provides a good introduction to the concepts of
innovation and disruption, because both typically come
about when ideas that normally don’t go together are
juxtaposed. Directional innovation (also called
incremental) is a way to improve on a product in fairly
predictable ways and is the most common form of
innovation. By contrast, intersectional ideas -- which
bring together unrelated concepts in new and surprising
ways -- take us in brand new directions; they disrupt
current thinking and create new platforms for
incremental innovation. For example, the solar panel
was inspired by the biology of leaves and da Vinci’s
canal system in Florence was inspired by tree branches.
You might want to read *The Medici Effect: What
Elephants and Epidemics can Teach Us about
Innovation* by Frans Johansson and Teresa M. Amabile
to stimulate more examples and encourage students to
do their inventions at the intersection.

Your introduction could also take on the concept of
**associative barriers** that often prevent entrepreneurs
from coming up with the best solutions. When we hear
or see something, our minds immediately associate it
with something we know because the mind typically
follows the simplest path. If we say, for example, that
Jon Chang is a professor, depending on your particular
perspective about professors, a chain of associations
may appear: Jon is a man, he’s Asian, he’s politically
left of center, he’s a book worm, etc. The reality is that
none of these attributes may describe Jon who actually
is a Caucasian woman married to an Asian man. She’s
independent politically and only reads when it’s
necessary for her research. If you have low associative
barriers, you tend to be more comfortable connecting
dissimilar ideas and concepts. Consequently, your
chances of coming up with novel solutions is greater
than if you had high associative barriers that would
cause you to limit the scope of possible solutions.

**Tips for Instructors**
Encourage students to look for real problems and not fall prey to copying something that already exists. When a student does imitate an existing solution, they find out rather quickly because someone in the class will call them on it.

Depending on the course in which you’re using this exercise, you can choose to focus the scope of problems on social entrepreneurship problems, problems that involve technology solutions, problems related to students or some other group, or problems faced by small businesses.

If you have a large class, perhaps take volunteers to present in front of the inventor or, as suggested earlier, you can scan the assignments ahead of class to choose the most interesting. The rest of the students can present after the inventor leaves. Asking an inventor to listen to 35 inventions is probably not reasonable. If you don’t want 35 presentations, you can simply take volunteers or ask students to put a video of their 2 minute presentation on a platform like YouSeeU or in Blackboard.

After a student presentation, ask the class to critique or comment on whether the solution presented qualifies as an invention or perhaps an innovation. This can be done in a constructive way, often with humor.

**Grading the assignment:** As with all assignments, a portion of the grade should be for following the instructions. Beyond that, the following should be considered:

- Did the student demonstrate sufficient critical thinking in identifying a problem? Was it a compelling problem that could, if commercialized, impact a significant number of people?
- Did the solution demonstrate that the student inventor was aware of existing solutions?
- Was the solution novel and not obvious?

## Questions for Discussion Post Presentations

1. **What are the key distinctions between an invention and an innovation?**
   1. An invention is an original creation that may or may not qualify for intellectual property protection via a patent. In general terms, it is a useful device or process that has not existed previously. An invention may or may not be commercialized; that is, the vast majority of inventions never become products or processes in the marketplace.

2. **Are we seeing more inventions or incremental innovations today?**
   1. In general, we are seeing more incremental innovations or improvements on existing technologies because it’s easier and quicker than inventing something from scratch.

3. **What will you take away from this experience with invention?**
   1. This is an open-ended question designed to have students reflect on what the assignment meant to them.

### Appendix:

**da Vinci Exercise: Introduction for Students**

This exercise is very different from most that you will undertake this semester because it asks you to use your critical thinking and creative skills in a very unusual way. You are going to put yourself into the mind of an inventor and create something that has not existed previously. Keep in mind that much of what you’re seeing today is incremental innovation, which builds on something that already exists. The iPad was a singular improvement on the Apple Newton. It was not an invention. It was an innovation, which is a novel idea that has commercial value.

Keep in mind when you’re thinking about invention that exceptional inventions have two critical aspects:

1. They are unique – new to the world.
2. They have an impact (the bigger the better).
Clearly, these two metrics are relative and difficult to measure, but your goal should be to come up with something that goes beyond the obvious and could potentially benefit a lot of people. Why? Because inventions take a lot of time and money to build and take to market, so spending your creation time on something that will help a lot of people makes sense. At the same time, stay away from huge, complex problems like traffic that likely require multiple inventions and the cooperation of several entities.

**Assignment Instructions**

1. Choose a meaningful problem that an entrepreneur could solve, that affects a significant number of people and that requires an inventive solution. The solution should not be obvious.

2. In **one page**, do the following:
   1. Briefly describe the problem and the solution.
   2. Briefly describe the process you went through to come up with both. This is a reflection piece, not simply listing the things you did. Why did you do them?

3. On the **second page**, you may sketch out a picture of your solution or you may do a primitive prototype and put a picture of that on the second page. If you do have a physical prototype, please plan to bring it when you make your presentation. We are not expecting perfection, just a demonstration of your creative thinking process.

4. Submit ONE FILE containing both pages to Blackboard (or to another assignment platform you are using).

5. Come to class prepared to do a two-minute presentation and answer questions.