

Thinking with Art: Incorporating Probability and Statistics into a Graphic Arts Curriculum

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NARRATIVE

Blending Probability and Statistics with Art Projects

Middle School students are exposed to probability and statistical methods and procedures in their mathematics class. Their only other obvious exposure to these methods is what they see in general test questions through the yearly state exams.

One may find the use of probability or statistics tools employed occasionally, as an introductory transferred skills, which assist the process of teaching a history or a science class. However, it is rare to find a probability or statistics unit to commonly exist outside a math class.

Frankly, it would be outstanding to see more art teachers employ these skills because they fit well with the fine arts efforts to develop students' *creative, cognitive and reflective skills*. Students can only benefit from increased experiences and opportunities of practicing higher math concepts and thinking skills. Why not try mixing these together with art?

Presently, there is little or no instructional material available for the integration of probability and statistics into the graphic arts or art programs at the middle school level. My aim is to integrate a unit of probability and statistics practices for an art or graphic arts classroom. I intend to demonstrate practical applications that incorporate higher level thinking skills, art study and math procedures to enhance a student's understanding of these tools while incorporating them with fine art skills.

This project will supply graphic arts teachers with a unit in probability and statistics, including various tools, terminology, definitions, lesson plans, objectives and references. This will provide teachers another way to show students how math can be employed in the creating of art designs and art solutions.

Benefits

Following is a list of advantages for graphic art and art teachers:

- Ease of implementation
- TAAS compliance
- multiple-intelligence learning strategies

- Increased understanding of the relationship that math has to fine arts study
- Standard materials used
- Fun!

PERSONAL NARRATIVE

I teach at Sharpstown Middle School, in the Magnet Program for Graphic Arts and Architectural Design. I teach computer graphic art classes that are comprised of students recruited from all parts of town. They come for our special magnet classes to experience and consider the types of careers that engage art or architecture. I also teach fine art classes as part of traditional art department electives offered for students that are not in the magnet program.

I've met with many new challenges in the past three years. Even in our magnet program, I find that language barriers play a big part in the success of my students. The criteria for entering into the magnet program is passing TAAS scores and stable scores of 75 or better. This *does allow* for any creative student with mid range scores or better to get in a good program that can challenge his/her energies and interest.

On the whole, our student population demands a lot of attention and preparedness from their teachers. At Sharpstown Middle we have a large mixture of students with socioeconomic challenges, ethnic differences and nationalities. We have a diverse community of students from Latin America, Vietnam, Africa, China and from other nations.

Currently, my school has the largest number of ESL classes in our district. We have 11 ESL classrooms this year and probably will increase next year. Our current population of ESL students is 35%. Due to this blend of foreign speaking students, our teachers are faced with a variety of difficult problems to tackle.

Most of these obstacles are obvious. For many of these students the lack of understanding between the cultures, teacher/student communication breakdowns, parent/teacher language gaps and lower student skills in English, reading, or math are enormous barriers to overcome. Due to the lack of exposure or practices in their former schools and in some cases no formal schooling at all, teachers are faced with teaching at multiple skill levels to overcome many of these barriers.

We must not forget that on top of all these hurdles, any middle school child goes through the regular physical changes that happen to all 6th, 7th and 8th graders. How the student handles his/her hormone changes play an extremely important role in the success of any English-speaking student! It is just one more thing to add to the mix of stress that a non-English speaking student deals within the temperamental middle school years.

You may be asking by now; “Why does she go on about the problems of her students’ condition?” “How does it compare with my teaching conditions or practices?” What has prompted me to prepare this art unit is *twofold*.

My intent primarily was to create better art lessons for all my students, with or without language barriers. I wanted to include higher thinking math skills that would also comply with essential knowledge and skills directives. Secondly, I’ve felt the necessity to prepare sufficient math related practices in my lessons. These prompted my unit choice. Ultimately, my hopes are that it is my students who will profit the most from my research.

I suspect that I am not alone when it comes to implementing higher order math skills with art. Like many other art teachers that would like to integrate math in their classes, they don’t feel comfortable about using statistics or probability as “the” math method choice. Many art teachers, I might add, do not have the time to develop their own art units while making sure to include a variety of mathematics. For myself, it has been much easier to organize lessons having to do with incorporating writing and reading skills.

These lessons are being published in hopes to encourage the use of probability and statistics in an art environment, and to share with other art, graphic art, or math teachers who are seeking alternative ways to teach their subject matter.

We all have similarities and we all have differences in the conditions of our students’ abilities, personal stress, and levels of skills. What we really do have in *common*, as teachers, is that we care to *seek and prepare* where we can, in order to function better for our students’ sake. These lessons have been prepared with the desire to expand a child’s mind towards the development of his or her cognitive and creative skills.

Charles Kettering, U.S. engineer and famous inventor wrote about why one should research:

Research is a high-hat word that scares a lot of people. It needn’t. It’s rather simple. Essentially research is nothing but a state of mind... a friendly, welcoming attitude toward change...going out to look for change instead of waiting for it to come.

Research is an effort to do things better and not to be caught asleep at the switch. It is the problem-solving mind as contrasted with the let-well-enough-alone mind. It is the tomorrow mind instead of the yesterday mind. (Critical Friends, 1)

Teaching Strategy:

What the unit seeks to teach:

Although the use of probability or statistic tools are useful as transfer skills such as in history or science, aside from a traditional math class, rarely does one find a statistics or probability lessons explored at the middle school level.

The use of probability or statistics tools is beneficial in any class when the instructor sees how he can implement it. My unit seeks to teach alternative ways of presenting statistics and probability. These skills become extension tools for problem solving and do become an integral instrument used in our adult lives. It can shape adult's reasoning abilities, apt to be better at deciding, comparing, predicting, and inevitably affects their own belief systems. I have no doubt that it would be an advantage for middle school students to have numerous opportunities to develop these skills earlier.

Curiously, in my research for a variety of ways that I could use to express the words; *creative, cognitive and reflective*, I encountered a new awareness from *Roget's II, The New Thesaurus Third Edition*. To my astonishment, I found an instant relationship between *art, statistics or probability*! The word: **cognitive** has the suggested choices: *awareness, discernment, insight, knowledge, perception, and thought*. In expressing the word **creative**, listed are the choices: *able, adept, clever, cunning, discriminating, imaginative, intelligent inventive, originate, and skillful*. Finally, when looking up the word **reflective** the choices given are: *analytical, contemplative, pensive, pondering, rational, reasoning, and thinking*. Don't all these words sound like what creative skills through fine art promotes or math thinking skills supply especially when we operate in statistics and probability functions?

Through these lessons, constructed to promote and build good habits of using higher thinking skills, by the exploration of statistics or the use of probability, the art student will apply and create new ways of learning. I hope to provoke openness to this subject matter by intermixing it with a friendlier subject matter called fine art.

The arts should be used as a tool of thinking. While students need plenty of chances to create final, polished artworks, the Arts should be regularly employed as tools for the exploration of ideas, without being pushed to final, edited, and exhibited forms.
(Best Practices, 165)

All middle school students need to know what their objectives are in any given lesson or project. They also need to understand and develop the kind of quality work that is expected from them. They need to see what those instructions are and what they are to aim for. The best way I have found to help my students to achieve their goals is to have

plenty of *great student samples to see*, employ as many *varied multiple intelligence strategies* at hand, have most of *steps (rubrics) of the project written out having a comprehensive outcome* established for them.

Further, many arts activities involve tactile, active learning that can connect with the many children for the old, sit-in-your-seat-and listen style of teaching is ineffective. We now have ample body of research and documentation of multiple learning styles and intelligences (Gardner 1983) that explain why kids would score higher in basic skills, and why whole schools might even get off probation lists, with the help more intensive arts programming. Indeed the failure of schools to teach in such multiple modalities, to offer invitations to students of different cognitive styles, actually deprives many children of their right to learn basic academic skills. (Best Practices, 162)

Why it is important to intermix and teach:

In the combining of statistics, probability and art study, I hope to carefully prepare a set of lessons that imparts information, practice, conjecture and a vehicle in which to express questions, answers and solve problems. One may think that the use of statistics and probability seem unnatural to blend with art or graphics. In working with young adults, art is a perfect, versatile vehicle to mix with other subject matter. Integrating probability and statistics is yet, another flexible tool that can enhance the fine art's or graphic art's curriculum.

In secondary schools, the arts seem to have the same capacity to enhance academic skills, engaging students and integrating the curriculum. A recent University of California at Los Angeles study of twenty-five thousand middle and high school students showed strong correlation between the arts and a number of important outcomes (Catterall 1997)

Students with more intensive arts involvement during their adolescent years have significantly better school grades; achieve higher standardized test scores in reading, writing, and mathematics; have higher levels of persistence in school; report less boredom in school; are more likely to be involved in community service work and rate it as important; have greater self-esteem and confidence; and make time for their artistic and community interest by watching less TV than their classmates. (Best Practices, 162)

When you read about famous artists, you'll find that their artworks have always been interwoven with something to imply, say or question; presenting their statements to the

“viewer” in the intent to make an impact, ask a question, provoke thinking on the part of their audience. Having something to express, other than pure emotions, requires thinking and processing thought. Modern artists, are known especially for choosing to express themselves very differently from past styles. They paint, draw or sculpt subject matter that influences their lives as well as others. Where do they get these ideas? Current events, situations in their lives or surroundings, society, science, math, history, language arts, political or religious beliefs, can and do influence artists to respond from ideas steered by these occurrences for their art designs.

How to convey Statistics and Probability to the students:

The use of statistics can be a major part of how we deduce or solve problems on a daily basis. When we get to be adults, our decisions are swayed by what society provides as accountable information through statistics. The individual’s ability to think, digest and form judgments and make clear decisions depends on skills that we do not get a chance to practice much when we are young.

Chance, probability and statistics are skills that we deal casually with the everyday. We decide and prepare our day when we hear the daily weather reports. Spontaneously, we are part of it while playing the lotto. We analyze and conclude as we hear about the latest results in medical studies. We participate when we vote in any survey. We include ourselves as a statistic when we give information to the census. We decide and invest when we study in detail stock investment information, etc.

As adults, the probability of having cancer, or stroke, diabetes, heart attack, etc. increases with declining health factors. We may have to face war, or storms that endanger our families, or car accidents, divorce, bankruptcy, loss of a child and many other possibilities. Sometimes in our lives we face some big decisions that require the use of statistics and probability skills. Life is full of uncertainties and risks. These are the stuff that can impact persons, societies or nations.

Statistics deals with complex situations involving uncertainty.
We are exposed daily to information from surveys and scientific studies concerning our health, behavior, attitudes, and beliefs, or revealing scientific and technological breakthroughs.
(Seeing Through Statistics, preface)

Our students face many uncertainties and risks from minor to very serious ones. The obvious, daily types of casual risks are very similar to daily adult issues. Will it rain? Do I need a sweater tonight? Should I depend on my friend’s memory to bring his camera for the field trip? Will I win this contest? What’s the chance that I’ll talk to that cute boy at lunch today? Should I let him kiss me? What are my chances of winning the race or contest? These questions seem ordinary and not so important to adults. Yet, these

are what middle school students discern as daily decision making and deem important questions in their daily lives.

Then, there are the dire apprehensive problems they really need to resolve with all of their immature experience. What would I do, if I knew that another student brought a gun to school? How do I avoid the bullies when I go home today? What would happen if I joined a gang? My friends are smoking. Should I start too? and so on. When these types of questions come up, how do they deal with them? What affects their decisions?

Currently students of middle school years live more complicated lives. Their world extends beyond the school and playgrounds. Their futures are being calculated and manipulated by other unsavory factors. Will they join a gang? Will they drop out? Use drugs? Get raped? Get in a gang fight? Die young? These are the topics that in reality do affect them and are more suitable to begin the process of learning how to use statistics and probability.

It is important to stress the significance of the individual's ability to live cooperatively in his society. The ability cannot be developed unless the child learns to assume responsibility for the things he is doing, is able to face his own actions, and by doing so identifies with others. Creative activities provide an excellent means for taking this important step.
(Creative and Mental Growth, 31)

Thought provoking situations like these questions are what I plan to bring as a precursor for the first lesson. The students will be introduced to some classic ways one uses personal probability thinking skills. These examples will attempt to show how values cause different results in decision making. The introduction to personal probability terms like "The Certainty Effect," "The Pseudocertainty Effect," "The Availability Heuristic," and "Anchoring" will introduce students about some ways that we process facts or probable choices. Allotted time will be provided for a small activity and discussion to think about the concepts presented. (Seeing through Statistics, 281)

Another step will check the student's understanding of the vocabulary conveyed. These new words, terms, and concepts will demand some time to assimilate. Samples of these types of personal probability terms will be lead by a question much like the ones mentioned before.

Personal probabilities, remember are values assigned by individuals based on how likely they think events are to occur. By their very definition, personal probabilities do not have a single correct value. However, they should still follow the rules of probability, which we outline in Chapter 15; otherwise, decisions based on them can be contradictory. For example, if you believe there is a very high probability that you will be killed in an automobile accident before you reach a certain age, but also

believe there is a very high probability that you will live to be 100, then you will be conflicted over how well to protect your health. Your two personal probabilities are not consistent with each other and will lead to contradictory decisions. (Seeing Through Statistics, 280)

A presentation of various works of art will be shown to explain that some artist have as subject matter, chosen the topic of human tragedy and uncertainty. Their manner of expressing these is all quite different and deserves time to explore. A review of how artists use art elements or principles to communicate will be brief. After discussion, students will engage in exploring a topic chosen to problem solve and resolve how they feel. This will be a quick preliminary sketch of the directed topic.

Once back in class, in the next session, a review of what was seen, vocabulary and the topic discussed will be reviewed. We will examine the same topic but change the conditions. An explanation of what an artist does to converse in the language of non-verbal communication is through the use of elements and the applications of the principles of design. Again, the same topic will be employed but resolved in a different way. Due to the parameters given each time, the students should come out with 5 different thumbnail sketches. Each sketch will be shown as one other possible outcome.

Concurrently, similar topics of the human condition can be found addressed, expressed and rendered by numerous famous artists in his/her artwork from the past and present. In reviewing what the Industrial Revolution of the 1700 did for the artist, and brought about changes in artist's freedom to choose their subject matter, the book *Understanding and Creating Art* states:

Because of this freedom to choose their own subject matter and to Live and think as they wished, artists were also free to make statements about the world around them. Sometimes they made fun of human frailties and follies. Sometimes they spoke out against cruelty and war. They could also bring power to public events. They could make paintings that moved people for various causes. Their paintings could expose social injustice, and perhaps inspire change. (254)

Artists have always been known to be higher level thinkers. They have always been able to motivate us to think by responding to their artwork. They respond to their society's state or condition, express their insights and engender the "viewer" to react. They propose small or large questions to the "viewer." In the last 100 years, modern artists regularly question, provoke and ask hard questions with their art expressions.

What has influenced them in their time? For instance, why did artist Andy Warhol choose commercial objects or famous people to be his subjects? Why did he paint the way he did? What influenced him to do his artwork in such strange, different and commercial style? No one was using screen-printing as an art medium at the time.

What are the probable causes in his work and ideas? What do you think they are? The suggested Warhol's art piece is titled *100 Campbell's Soup Cans*, 1962. This is an example of the many ways artists provoke thinking from the viewer. These are the kind questions that can prompt interaction and discussion.

If one is familiar with Andy Warhol, they would know that he was part of the Pop Art movement of the 60s. Artist at this time, were observing and reflecting on the alarming growth of commercialism in our American society. Our cities and towns were being invaded and immersed in signs, logos, icons, billboards, or other ways to promote commercial sales of sorts. Questions rose up about the quest for beauty. What was happening to our surroundings? Does the public care? Are they becoming desensitized to nature? Is cement going to cover our nation? What's the probability that our grandsons and granddaughters won't know a tree or play in a park?

What is happening to the individual? Do we have a voice? Or are we like those Campbell's soup cans, cranked out by the millions? Looking just the same on the exterior? The interjecting thought that Warhol wanted us to discover, was that in his multiple silk-screened cans there are different types of soups inside. Are we all becoming emulsified and is the individual becoming diluted? Do we have a choice? The topic can bring out many interesting points of view.

A presentation of various works that expresses similar themes will be shown. Art works related to uncertain situations in life for example: war, hunger or sickness can provide the dialogue in which to discuss how decisions cause certain results. The visual expressions of the anxiety, sorrow or despair in the artworks shown, I anticipate, will influence an expanded dialogue about personal probability. By having choices in life, or making educated guesses, perhaps in observing the results from the lack of choices that one may not get, students can observe, compare and decide what their goals are and how they can start molding their lives by the decisions they make.

Finding the right subject matter and questions that the middle school student does relate to will create the beginning interest *hook* in learning these skills. It also brings the "personal" up front. This unit will review some of common ways that a person obtains information and goes about the business of reasoning before the decision is made. These "personal probabilities" can be influenced by some psychological factors. Good reasoning skills are important to self-preservation. Being able to discuss important questions they face commonly, supports the fact that students' interest level will increase when statistics and probability skills are presented by addressing their own interests.

Reasoning is fundamental to knowing and doing mathematics. Students must come to believe that mathematics makes sense, that it is not just a set of rules and procedures to be memorized. Therefore, they need experiences in explaining, justifying, and refining their own thinking, not merely repeating statements from a textbook. They need to make and

defend their own conjectures by applying various reasoning processes and drawing logical conclusions. (Best Practices, 92)

Usually, if the answer is not blatantly out there to guess or see, middle school students do not know how to go about problem-solving or giving educated guesses. The result that I am after, primarily, is to have the student grasp the awareness that he or she *needs* to have thinking skills beyond being able to read a plot, chart, graphs or interpret picture. The use of probability and statistics skills can assist them in finding these answers. These art and math exercises will allow the students to conclude that they need to *add* these higher order skills to become better thinkers and communicators.

Art projects, probability or statistics games and activities will give the students a chance to practice the ideas presented in the lesson. Thought provoking questions, rubrics for student progress, projects involving single and interactive group activities and various types of assessments will keep the student focused as well as interested. I'm after massaging the muscles of their brains in several ways. For instance, various collected data put into measured information is a skill learned in math through the creation of graphs, pictographs, plots, etc. Generally, the interpretation and practice of these skills of discernment are not applied to "real life" statistics. There is great value in applying the skills of interpretation when real life situations are presented.

Illustrated artwork also can be seen as collected data with measured information. Some artists are influenced by "real life" statistics and convey it their artwork. Of course, it is what the particular artist thinks or how he or she wants to convey it that always makes it unique and interesting to the viewer.

Mathematics is not a set of isolated topics, but rather an integrated whole. Mathematics is the science of patterns and relationships. Realizing, understanding, and using these patterns are a major part of mathematical power. Students need to see connections among concepts and applications of general principles to several areas. As they relate mathematical ideas to everyday experiences and real-world situations, students come to realize that these ideas are useful and powerful. Students' mathematical knowledge increases as they see and understand various representations (e.g. physical, verbal, numerical, pictorial, and graphical) are interrelated; to do so, they need experiences with each and with how they are connected. (Best Practices, 91)

Various classic skills found in probability courses include the process of predicting results through a controlled sample. The use of dice throws, flipping of a coin, color spinner, or other chance choices is commonly employed. The results of coin toss, dice throws or color spinners are recorded or graphed to measure probability outcomes.

Symmetry can be introduced as a probability chance game. Choice of color can be designated to numbers. If red is the color for the number 6 and the dice stops on 6, then that is the color in which the student would chart using graph paper filling the corresponding square. Coins can have heads/tails-color reversals programs also. Color spinners are already designed for these purposes.

A commonly used principal in art is the use of *symmetry or asymmetry*. These principals refer to an art composition that is perceived to have equilibrium or balance but may or may not have equal weighted shapes or forms if one were to split the picture on either side of a vertical axis. (Art Fundamentals, Theory and Practice, 24)

This design principal could be explored through the charting and testing of probable coin-toss, dice-throw or color spinner methods. Predicting outcomes of color/chance results could make for an interesting game. Probability predictions on whether you would obtain a more symmetrically shaded, asymmetrical or inconstant color-fill combination by predicting and charting would give the students another way to test their logic and prediction skills. The use of chance spins or throws would foster another manner of using classic probability skills. Through the process of probability games, and controlled experiments like these, will involve the student in the practice of understanding chance and predicting outcomes. From an art perspective, the student can affirm his or her understanding of what the terms symmetry and asymmetry means.

An overview of the unit

The art topics and examples I chose are open ended in the sense that if one cannot find the exact picture suggested, one can find others by looking for artwork with similar themes. I have prepared the lessons to integrate and include various uses of probability and statistics as well as art terms, concepts and the chance in which to express what is being learned.

With each lesson, art and math terms or concepts will allow the students to build upon their former lesson, adding to a new or expanded awareness of how statistics and probability affects us even in art. Through the emphasis of discovery, discussion, and comprehension of new vocabulary, this unit will provide opportunities for the student to practice using both art and math terms. The progression of these exercises will either encourage time to experiment in pairs, discuss in-groups or express individual ideas of their own designs to internalize what new concepts are being covered.

These lessons are designed to supply teachers that would like to combine introductory statistics, probability skills and blend them with art. The activities and discussions will provide appropriate lessons for 6th, 7th and 8th grades. Along with its content, student's various style of learning, (multiple intelligence techniques) have been included.

Thought provoking questions, rubrics, activities and assessments have been prepared to check for student progress and understanding.

To begin, I'd like to present to our students an introduction to decision making from their own perspective. A written questionnaire will be issued as the preliminary function to start a discussion about probability choices and risks in their lives. An introduction to the vocabulary, concepts, objectives will follow. While giving them acknowledgment of their cognitive efforts, I'd like to extend their awareness of more complex problems that adults face daily. This will introduce the middle school student to an awareness of how adults are influenced by polls, statistics, surveys, trends, and the use of probability to make judgments in our daily lives.

Progressively, an introduction to artists that have use *uncertainty* as similar topics extrapolated from statistics or probability, are important to show to students so that they can see how artist come up with their ideas. Their art is due to his or her daily concerns of their surroundings, the problems of their society or other concerns in which they have found a need to point out to the viewer. The artists have a need to produce insight and thought provoking subjects to express.

The need to find solutions and point out to the world the risk factors in our society's condition and other interesting information, prompts these artists to create on similar themes. Good art examples can be found on the web or art book in the library from Pablo Picasso, Francisco Goya, Edouard Manet, Andy Warhol, or Mark Rothko that cognates how similar themes of hunger, war, despair, social injustices or other lack of choices in current society.

It is important to mention that my lessons are written for a 90-minute period. If you are utilizing the ideas from this lesson but have a 45 or 60 minute class session, shorten or stretch the lessons accordingly.

Introduction: Math + Art = Creative Thinking

Do you know that there is more to thinking that meets the eye?

Do you know that artists have always been great thinkers?

Do you realize that there are more thinking skills to learn and practice from now on, in order to be wiser or more intelligent? Did you know you could gain them through pursuing math and art skills?

LESSON PLAN ONE:

Objectives:

Students will:

- ❑ *Identify* personal probabilities that affect them and their peers.
- ❑ *Indicate* in writing, what are some serious or difficult *personal* probabilities they confront as teenagers.
- ❑ *Recognize* which probability terms are being discussed and compared through class talk or art examples. The student will be able to *contrast* and *find* examples of the terms; “the certain effect”, “pseudocertainty effect”, “availability heuristic” effect or anchoring.
- ❑ *Tabulate* and *deduce* from the survey activity, what are the most dangerous peer pressure dilemmas or from the myth or fact questionnaire.
- ❑ *Evaluate, infer, and relate* art work shown through discussion
- ❑ *Derive* and *extrapolate* from the probability terms introduced and famous art pieces studied, an idea and *render* a preliminary sketch of their own demonstrating a personal probability choice one can make as a child or adult during a difficult time.

Materials needed:

Overhead projector or chalkboard, notebook paper or forms provided. slides, posters of choice or suggested art references that can be found from the suggested web sites. Drawing paper, ruler and pencil.

Pre-Lesson:

The students will need a basic knowledge of what probability and statistics mean. Examples of how we as adults encounter and use statistics and probability skills in our lives will start the process of understanding the terms.

Voting for your candidate, investing due to studying statistics of stock issues, becoming a statistic when submitting information to the census, or as simple as choosing what to wear due to chance probability in a weather report, shows various ways adults use these thinking skills.

Briefly, samples of what the students encounter as simple probability or statistical decisions should be mentioned. Will it rain? What are the chances of winning the contest? Etc.

The discussion then should be directed to the more serious side of *personal probabilities*, such as war, storms that endanger our families, car accidents, divorce, bankruptcy, etc.

The term, *personal probabilities* will be introduced. Personal probabilities are the values assigned by the individuals based on how likely they think events are to occur.

Students will then be asked to write sample conditions on how statistics and probability affects them personally and seriously in the teenage years.

Lesson:

Students will be introduced to ways of thinking that are psychologically influenced that can lead to incoherent clear thinking.

New terms and vocabulary:	The certainty effect	Pop Art
	Pseudocertainty Effect	Medium
	Availability Heuristic	“Viewer”
	Anchoring	Pattern
		Repetition

- 1) Samples of these concepts are discussed and a questionnaire is presented about the uncertainties of life. Time is allotted for the completion of the form. Time to discuss is allotted.
- 2) Show of various art works with similar themes about war, despair, sickness, and other social injustices. Students are given time to reflect or discuss art examples.
- 3) Ask students to look for and identify any probability term discussed in the lesson and apply it to incoherent thinking on the part of adult’s situations or student situations written in their questionnaire or survey.
- 4) After discussing works by Andy Warhol, the student will expound on any social injustice issue.
- 5) Students will take one of their chosen uncertainties in life choices and render a thumbnail sketch to be continued in the next class time.

Suggested Artists:

Son hechos para algo, drawing by Francisco Goya: (social injustice)
Guernica, painting by Pablo Picasso: (war in Spain)
100 Campbell’s Soup Cans silkscreen by Andy Warhol: (social commentary)
Girl before a mirror painting by Pablo Picasso.
The Dead Torreador painting by Edouard Manet.

When trying to make decisions, it's important to consider the probable risks involved. Often our first thought is about the risk of physical harm, but there are several other types of uncertainties or probabilities that are not thought out before acting out. In the exercise below, in the personal probability or risk column, list 4 topics of personal probability or risk. Remember these are serious topics that a teenager like you may encounter. Which of these risks is the greatest? Write your opinion as to the degree of risk that you feel applies if this were to happen to you. Also, score the degree of risk by adding "H" for high degree, "M" for medium degree, or "L" for low degree.

Personal Probabilities or Uncertainties in Life Situations

PERSONAL PROBABILITY OR RISK	RISK OF FRIEND'S DISSAPPROVAL	RISK OF LOSING SELF RESPECT	RISK OF PARENT'S DISAPPROVAL	RISK OF ILLNESS OR INJURY
SAMPLE: DECISION TO JOIN A GANG				

Name _____

Period _____

Artist Study Sheet

Directions: Please record your observations as you examine works of art from the artist shown in this presentation. Write full sentences for your responses.

1 Artist name: _____

2 Title of artwork: _____

3 What other information can you find or did you hear about the artwork?

4 Briefly describe the artwork. What do you see?

5 In your opinion, what art elements are emphasized?

6 In your opinion, what principle(s) of design play an important part in the work?

7 Is there anything else that might have prompted the artist to create this art piece?

8 In your opinion, what is the artist trying to say to viewers of this work?

9 Give two reasons why you like or dislike the work.

10 If you could change one thing about the work, what would it be and why?

LESSON PLAN TWO

This is a student-centered, cooperative activity. The class is broken into groups of two or three. The purpose for this assignment is to have students continue with prior lesson in probability. The new lesson builds from prior information. This lesson allows time to practice the new concepts and terms, discuss more about “real life” probabilities and how to express them. Producing various solutions or different ways to communicate through art is what I’d like the students to achieve. The student should explore and try to articulate what they are thinking through the implementation of the principles of design

Objectives:

The students will be:

- ❑ Able to participate in their group discussions in finding 5 different solutions to the drawing problem.
- ❑ Employing the principals of design to come up with changes in their designs.
- ❑ Work cooperatively with group members to resolve, share and compare idea/solutions.
- ❑ Engage in using the vocabulary and terms that revolve around probability, statistics, or art terms

Materials Needed:

Art slides, posters or other form of art samples to explain the principles of design.
Drawing paper, ruler and pencil.

Vocabulary:

Principles of Design:

Repetition
Pattern
Contrast
Foreshortening
Balance
Unity
Rhythm
Emphasis
Value

Lesson:

A presentation of art works involving: *personal probability* are used. Different artist's works will be shown. Examples of how the same theme has been handled and drawn by several artists, all with different solutions and ways to express their feelings.

The principles of design will be reviewed and discussed during the presentation of these works. This will be a time for the students to analyze and discuss with the teacher what they are seeing. The principles of design are choices that are available for the artist in order to communicate better with the viewer. These principles assist the artist to express clearly how he wants to manipulate the elements chosen.

The groups of students will then, take their original thumbnail (sketched from the previous class time) and with the help of group discussion come up with 5 different solutions to express the same subject matter. Students are encouraged to employ some of the principals of design skills to come up with different composition possibilities.

LESSON PLAN THREE

This lesson plan presents the classic forms of probability and statistics skills used in the classroom, blending them in practice with a fun way to create and learn about symmetry and asymmetry.

Objective:

The Student will be able to:

- ❑ Record or chart results from a specific repeated task result
- ❑ In a group, estimate or predict the probability that a certain number will be repeatedly acquired by the role of a die, spin of a color spindle, or flip of a coin after 20 tries, after 40?
- ❑ Interpret data and project , at various stops in the game, if the graph will have a symmetrical , asymmetrical or a variable outcome when charting and shading of colors have been finished

Materials Needed:

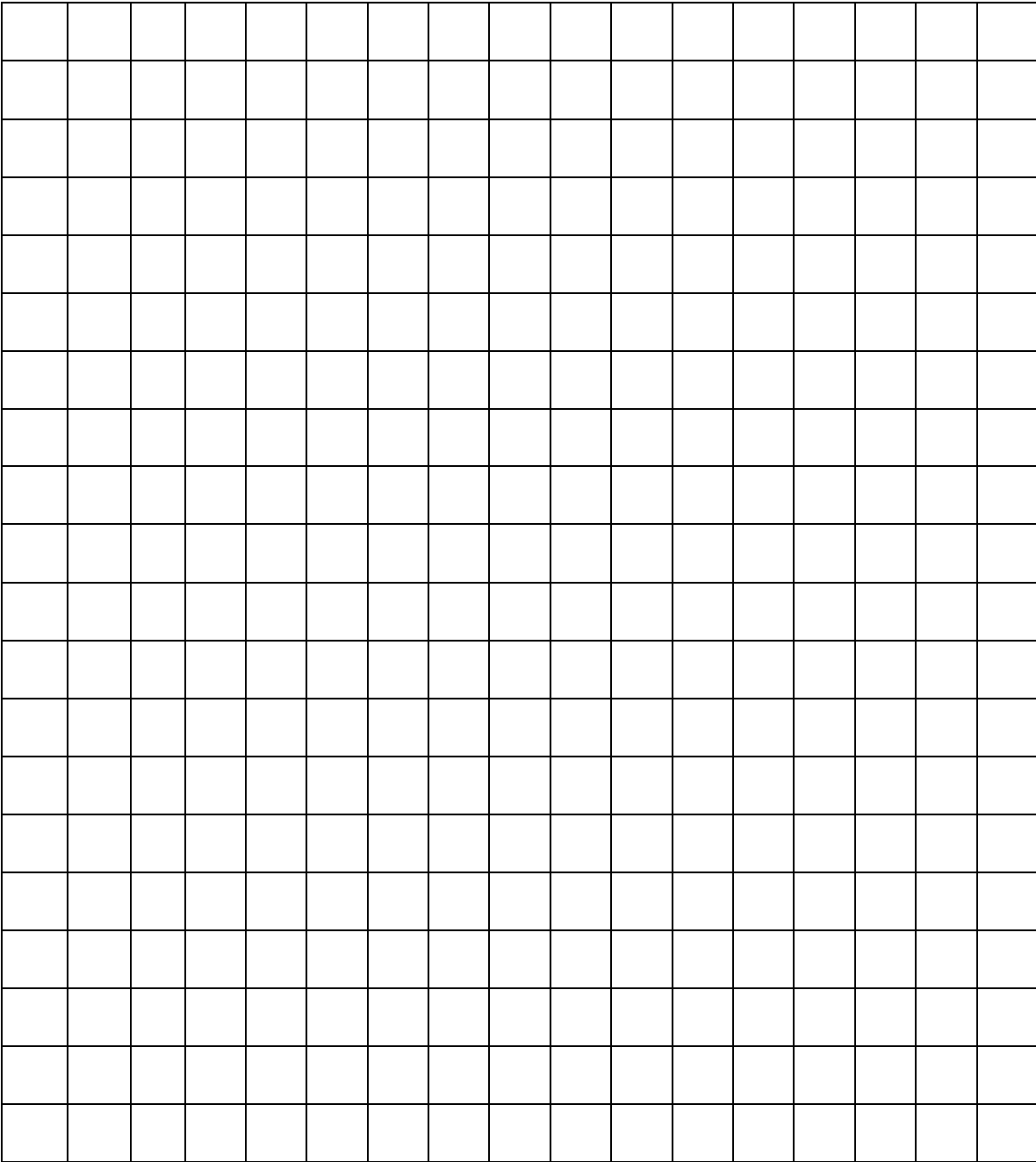
Math manipulative choice; whether dices or color spindles, or coins. Graph paper designed with at least 20 rows in length for ample recording of results. Crayons , colored pencils or markers.

Lesson:

This is a group or single project, that students should be able to complete on a flat surface. Time will vary with each group's projected outcome.

Predictions and recordings must be totally accurate. The problem proposed will reveal that the use of prediction such as the probability of a color showing up more often than others will be a true sample test. It is like heads and tails in coins.. the brain twister will be trying to find the probability factors of a repetition of spins, coin flips and or dice throws that not only would predict a color coming up more often or that in the charting of these results(each time) will generate symmetrical shadings, asymmetrical shadings, or random color shades throughout the graph.

Symmetry or Asymmetry
What's the outcome?



Suggested Rubrics and Assessment

Checklist of how you are going to be graded for the Probability and Statistics unit

___ Follow-through (6th, 7th, 8th)

Are you keeping up and finishing each step of the projects

___ Homework (7th, 8th)

Have you brought a magazine or newspaper with a sample of statistic that show personal probability or adult use of statistics.

___ Vocabulary

Are you using the vocabulary of this unit in the classroom. Are you implementing it in conversations.

___ Plan

Is your 5 thumbnails complete? Can one tell you used different principles of design?

___ Assistance

Are you helping others, or asking others for assistance in your plans making sure you are solving the problems in at least 5 ways. Can you tell that they are the same subject matter?

___ Materials

Are you making sure that your are following directions in order for your project to be successful?

___ Clean-up

Are you making sure that all is put away in your area before leaving the classroom?

___ Results

Could you tell me how the knowledge of probability and statistics skills can help you?

Can you name several ways? Could you tell me how artists are influenced by these math concepts?

Can you name some of the ways your thinking skills can fool you? Can you name the principles of design?

ANNOTATED BIBLIOGRAPHY

Readings and materials for the Teacher

Involvement in the Arts and Success in Secondary School, Catterall (The UCLA Imagination Project, 1997)

UCLA Imagination Project workshop materials and articles created for the use in their 1997 project initiative to increase art programs in secondary school curriculum.

Frames of Mind: The Theory of Multiple Intelligences. Gardner, Howard (Basic Books, 1983)

Mathematics, a Chronicle of Human Endeavor, Gross, Herbert I.; Miller, Frank L. (Holt, Rinehart and Winston, Inc. 1971)

An inspiring book that explains why math is an awesome subject to learn. Explanations of how the past theories and ideas have come about.

Why Teacher Research? Houston Critical Friends Group, Annenberg Challenge, Coaches & Principals Seminars, Research Workshop, July 2000.

Article encouraging teachers to become researchers of their own subject matter. Presenting the need to research and why schools should foster teachers to push themselves and keep their skills of literacy honed.

Math on Call, A Mathematics Handbook, Kaplan, Andrew; Petroni-McMullen, Ann (Great Source Education Group, Inc. 1998)

A peer recommended publication. Covers most units taught in sixth grade from numeration to probability and statistics. Supplies the teacher with a teacher's edition and assessments. Provides the student with a workbook.

Comparing and Scaling, a Teacher's Guide, Lappan, Glenda; Fey, James T.; Fitzgerald, William F.; Fried, Susan N; Phillips, Elizabeth Difanis (Dale Seymour Publications, 1998)

Math workbook unit, concise and most imaginative to assist in creating strength in visualization, comparisons and measuring.

Problem Solving in Mathematics, Lane County Mathematics Project (Dale Seymour Publications, 1991)

A conglomerate of teaching methods from Lane County math teachers in the state of Oregon. The publication assists the math teacher with active projects that enhance all parts of the math curriculum. It has done a particularly good job presenting ideas to work with statistics and probability at the middle school levels.

Learning Resources, Lincolnshire, IL. (Probability Kits, 1987)

Math manipulative kit specifically made to explore probability at the middle school level.

What are the Odds? Chance in Everyday Life, by Mike Orkin
(W H Freeman and Co., NY 1999)

Art Fundamentals, Theory and Practice, Fourth Edition. Ocvirk, Otto G., Bone, Robert O., Stinson, Robert E., Wigg, Phillip R. (William C. Brown Company Publishers 1968.)

My Bible. I have used this book countless times. Constant and informative, this fundamental book of art theory and terms covers it all.

Patterns & Functions with Rainbow Cubes, Ann Roper (Creative Publications, 1996)

Fun and interesting workbook created to improve numeracy, prediction, unit knowledge, and introduction to probability problems.

Seeing through Statistics, Jessica M Utts (Duxbury Press, 1995)

Concise, clear, a jewel of a book for teachers that are not familiar with the use of probability and statistics. After reading this book, it makes one feel at ease to present any of these theories with confidence. Math explained in layman's terms. Worth its' weight.

TAAS Study Guide, A Student and Family Guide to the Exit Level, Texas Assessment of Academic Skills, TEKS-Based TAAS, (Texas Education Agency, 2000)

Each year the Texas Education Agency supplies these guides to suggest the importance of certain parts of the TAAS test. It covers the main and gives importance to certain areas of study in order to assist teachers and parents in helping the student be ready for the examination

Best Practice, New Standard for Teaching and Learning in America's Schools.
Zemelman, Steven, Daniels, Harvey and Hyde (Arthur Heinemann Press, 1998.)

Comprehensive discussion by the authors about needs to be in each curriculum to make each subject matter successful. Various samples of teaching styles are discussed or validated. The book covers reading, writing, mathematics, science, social studies and the arts.

STUDENT BIBLIOGRAPHY

Readings and Materials for the Students

Learning Resources, Lincolnshire, IL. (Probability Kits, 1987)

Math on Call, A Mathematics Handbook, Kaplan, Andrew; Petroni-McMullen, Ann (Great Source Education Group, Inc.1998)

Patterns & Functions with Rainbow Cubes, Ann Roper (Creative Publications, 1996)

Problem Solving in Mathematics, Lane County Mathematics Project (Dale Seymour Publications, 1991)

TAAS Study Guide, A Student and Family Guide to the Exit Level, Texas Assessment of Academic Skills, TEKS-Based TAAS, (Texas Education Agency, 2000)

INTERNET RESOURCES

100 Campbell's Soup Cans, Andy Warhol, 1962.

www.allposters.com

Art works can be chosen to fit your interest or knowledge for discussion
Purposes through these various web sites:

www.allposters.com

www.artcyclopedia.com

www.artgallery.com

www.artmuseum.net

www.whitney.artmuseum.net

www.whitney.org