

Fractal like Model for Designing Educational Stories

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Abstract

Stories have existed in the human culture since prehistoric times. They have been used for various purposes, knowledge dissemination being one of them. In the past century there have been various attempts at using stories for communicating knowledge suitable for the modern context. However there seems to be an absence of a systematic method of designing a story for particular educational communication. The existing process is mostly intuitive. In this article we present a model for designing story plots suitable for communicating educational information other than reading, writing, arithmetic and hands on skill development. This can provide tools for educators and learners to develop their own learning stories.

About stories

Although there are many definitions of a story, the most commonly held definition is that it is a sequence of events connected by a cause and effect relationship (Bal, 1997). If we use the term narrative, it includes “the way a story is told”. Story is only about the content. We are currently dealing only with the question of content ie “ What the story is about”.

A story has three basic elements:

1. Character — The main protagonists in the plot on whom the story is based
2. Plot — How the characters interact with each other creating different situations
3. World — The location where story takes place

Story plots have been classified by many scholars. However there is no singular consensus on how many plots

are there. Some common plots are Adventure, Quest, Transformation etc. (Tobias, 1993). However none of the existing plot structures, we have studied seems to be suitable to be used for modern educational content. We are presenting here a generic plot structure out of which a large number of plots can be generated from a single model. This model is open ended with no beginning, middle or end unlike other story plots. The story can be continued by more than one person if they have understood how the model works.

Basis for developing the fractal model of stories:

The story plot/premise designing model that we present is based on four sets of observation. One from the study of N.C.E.R.T. textbook for secondary school. Second, from the world view of structuralism. Third, from our personal observation of the phenomenon of challenge and fourth from Jean Piaget’s philosophy of learning called constructivism.

1. We observed from N.C.E.R.T. textbook of class fifth to eighth, that every piece of information is based on something previously known. A very common statement in N.C.E.R.T. books at the beginning of every chapter is that “as you have studied in your previous classes ...” Pointing to the previously known information. Whenever a new situation arises where a previously held knowledge or belief is unable to provide sufficient answers, then people are compelled to find a new way of resolving the new situation. In that process, new knowledge comes into being. This also happens to be the process followed in scientific research where a gap in existing literature is searched and new answers are found to fill that gap. Let us say for example, before the earth was discovered

to be a sphere, it was believed that earth was flat. Before the wave nature of light was discovered, it was believed that light is a particle. One can measure the area of a rectangle with a particular formula, but the same cannot be used when the shape in question is a sphere, a new formula needs to be created. Or before democracy came into being, empires across the world were ruled by aristocracy. One cannot understand democracy without contrasting it with aristocracy.

2. The second piece of observation on which our model is based is the binary opposition principle of structuralism. According to the structuralist view of the world, entities exist in paired relationship. One entity does not stand on its own, it is in relation to something that it is opposed to. Forming simple units to complex structures in a unified system (Hawkes, 1978). Levi-Strauss has shown in his structure of mythology, the idea of binary opposition as the central concept on which ancient myths are built. (Strauss, 1983)

3. The third piece of observation comes from our personal observation of the phenomenon of challenge. We found out that challenge as a phenomenon has an important role to play in developing compelling story plots. New ideas challenge old ones. One philosophy challenges the other. An organization confronts the other and in the process a better knowledge or better service or product is created. This observation has its root in Charles Darwin's survival of the fittest view of nature.

4. The fourth observation is the philosophical view of how intelligence develops in children by Jean Piaget. This view relates intelligence to the act of adaptation. The child forms a schema of the world. Which forms his current knowledge. A situation arises which does not fit into the existing schema. In this case, the child is compelled to reorganize the existing schema to accommodate the new situation. This happens essentially at the point of failure. When a particular

situation violates an expected notion of a phenomenon; then readjustment takes place and the new situation is understood. This is also a way of adjusting or adapting an existing thought process to a new situation. This process of learning is termed as constructivism. (Piaget, 1953)

Combining these four set of observations, we have come up with a model for designing stories with specific educational purpose. These stories show the distinction between two sets of concepts. In order to explain one concept, a contrasting concept is shown in challenge against the old one. By this process a clear distinction is created leading to better comprehension of the subject matter. The fractal model for designing story plot is given in the following figure:

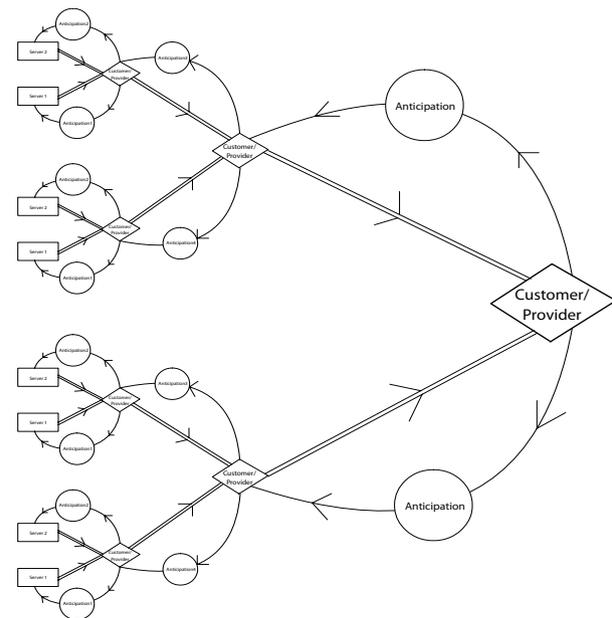


Figure 1: Story plot designing model

This is a branched structure with self similar units repeating at different levels. To understand this modal we look at the simplest unit.

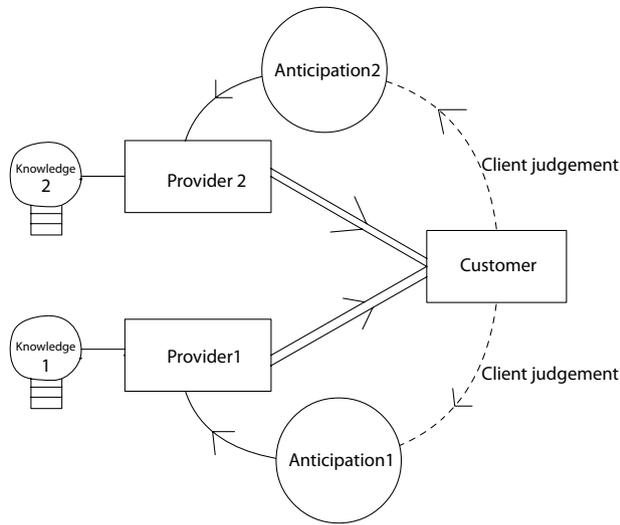


Figure 2: Basic unit of story plot model

It has five components:

1. Provider
2. Customer
3. Served entity
4. Server Anticipation
5. Client judgment

For the time being we will deal with this simple unit. The fractal nature of the model will be explained briefly later.

Provider: It can be a single person, group of people, a community or an organization who gives something to the client. For example a laborer giving his services to a civil engineer. A doctor giving services to his patient. A politician giving services to the citizens, A researcher proposes his ideas to the scientific community. In this case, the laborer, the doctor, the politicians and the researcher are servers..

Customer: Someone who receives a service. For example the civil engineer, a patient, a citizen, a scientific community

in above cases. Customer can also be a provider for another person or itself.

Provider 1 and 2: Providers are the mutually challenging forces in the plot. Each provider, in order to make the customer happy, improves the quality of what he is providing or does whatever actions needed in order to win the attention of the customer. Providers may indulge in unhealthy challenge. This is also an important part of the plot development. The winning provider is the one who instead of indulging in unhealthy challenge and trying to lure the customer is honest to his trade and works only for the betterment of the entity he wants to provide the customer. His challenge is self improvement. The loosing provider sees challenge as a competition. His main focus is defeating the opponent than providing a better service to the customer.

Anticipation: These are the arguments and internal thought processes that articulate the gap between what the customer needs and what the provider has at the moment. The anticipation is where the gap is reduced. Anticipation could be a wise person, or a manager of a company, anybody who provides a reflective element on a failed attempt. For example, a provider served something that the customer rejected or the customer chose from provider 2 other than provider 1. This will start the anticipation process where the customer will be compelled to think what went wrong in their effort. For example, arguments among politicians after loosing the election and planning the next strategy or for example the internal dialogue of a researcher after his theory is rejected by the scientific community. It is in the act of rejection that one is compelled to seek new answers. In case of renaissance and the dark ages, the new scientific spirit competed against the old religious belief system. In the process there is clarity achieved when one sees the right and the wrong concepts in contrast to each other. The better idea or the party with a better idea prevails.

Customer Judgment: This is the choice that the customer makes in the end about which provider it wants to choose as most appropriate in a given situation. This could be an outside person or an internal dialogue to clarify whether the concept at hand is workable or useful for a given situation. Served entity: This is the thing that provider is giving to the customer. It can be a theory that a scientist wants to propose to the scientific community. It could be a policy that a minister wants to introduce for the public. It could be a product that a company wants to sell to the buyer. This story model does not have a concept of a protagonist or antagonist. The forces challenging each other are old knowledge against new proposition. This model helps in defining the basic plot of the story. How the story is constructed into a narrative depends entirely upon the personal creativity of the story maker. Story Sample:

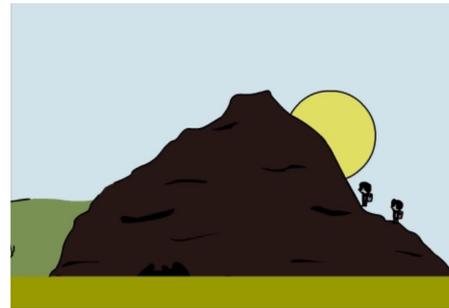
Here is an example of a story plot of an animation film based on the proposed story model to explain the difference between measuring the area of a rectangular shape and an irregular shape:



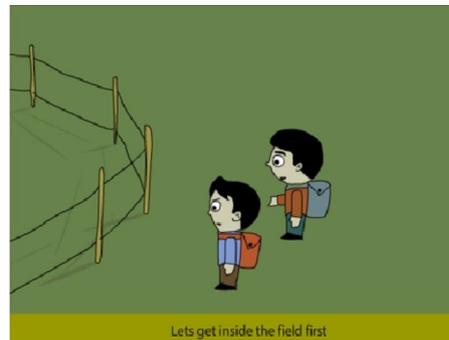
A father is worried because he has lost money in business and wants to sell his ancestral land to raise money for starting a new business



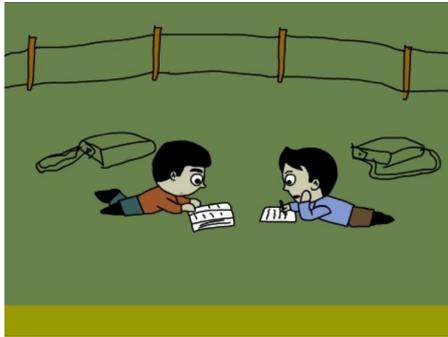
He calls his two sons; Rahul and Raj to go and find out the measure of their land and promises to treat them with sweets upon their return before sunset



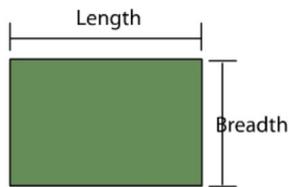
Rahul and Raj leave home to measure the area of their ancestral land



Upon reaching the field, they are puzzled about how to measure the area of the field



They consult their textbook

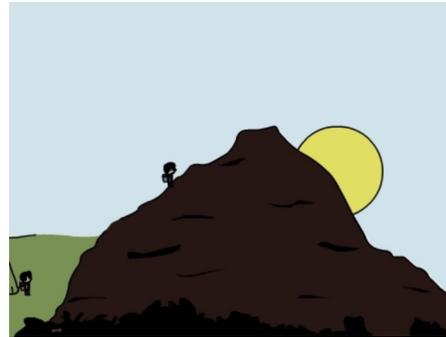


$$\text{Length} \times \text{Breadth} = \text{Area}$$

Which gives them the formula for measuring the area of a rectangle



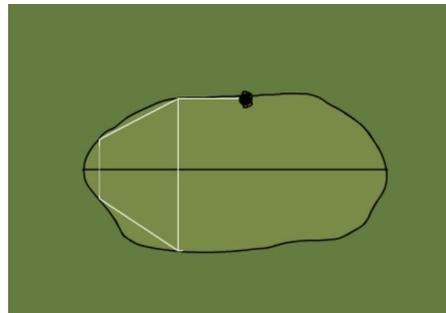
Raj points out that it is not the right solution as the field they are measuring is irregular in shape



Rahul sticks to the textbook solution and returns home claiming that he has found the area of the field



Raj is still not satisfied with Rahul's solution and tries to investigate a little more



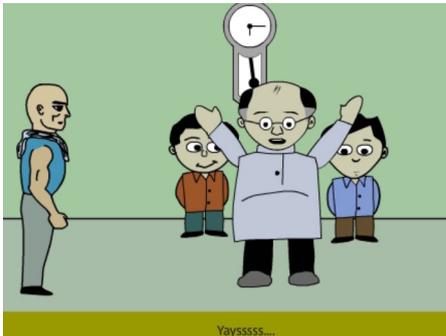
Finally, he comes up with the idea of dividing the field into known shapes like rectangles, quadrilaterals and trapiziums And finds out the actual area of the field is much bigger than what Rahul measured



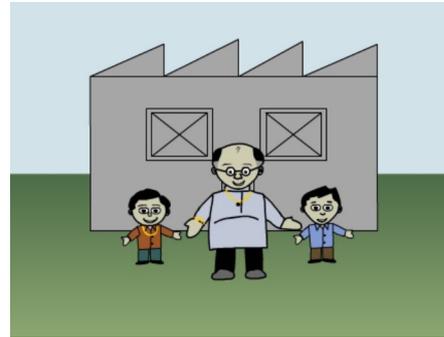
Meanwhile Father meets the dealer to fix the price of land and is sad as the land may not fetch him enough



Raj reaches on time to stop the deal and explains that the measure of their land is much bigger than what Rahul presented



After a little investigation, it is confirmed that Raj's method of measurement was right



With the extra money earned in the deal, Father starts a new business successfully and they live happily ever after.

Customer: Is a father who has lost money in business and wants to sell his ancestral land to raise some money to start a new business.

Provider 1: Raj, his first son whose help father has sought to help him get the measure of his land.

Provider 2: Rahul, Who has also been asked by father to help him get the measure of land. Provider 1 and 2 ideas challenging each other: Rahul uses the knowledge of measuring the area of a rectangle while Raj recognizes that the same formula is not applicable in this situation as the field is of irregular shape. Rahul clings to the old knowledge and returns back with a wrong solution while raj persists till he finds the right answer to the problem.

Anticipation of Raj: He argues that since the field is irregular in shape, it cannot be measured from the same formula used for measuring the area of a rectangle. Here Raj is working for himself as the client. He is serving the situation rather than making his father happy.

Anticipation of Rahul: The only thing he is concerned with is how to get back fast and win a reward from father.

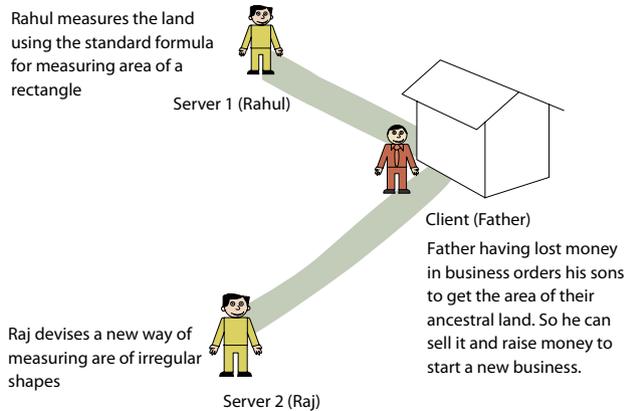


Figure 3: Plot representing story of Rahul and Raj

The diagrammatic representation of the story can be seen in figure 3.

Note: The above sample is only a story plot; the actual narrative is in the form of an animation film with dialogues. The story must be judged based on how the plot is structured to explain the concept.

Fractal nature of the story model

What we have shown is only one basic unit of the model. This unit can branch out into more complex story plots. This happens when we make the client as server, connected to another unit (see figure 4).

Another aspect of the model is that one can create complex stories with many concepts explained simultaneously. Such stories are about products or services. For example the story of fluorescent bulb. In this story one can explain the concept of a filament, elements, good and bad conductors of electricity, current, heat and light emitting charged ions by creating two competing bulb manufacturers as the main protagonists of the story. Both manufacturers want to give a better choice to the user, the customer whose concern is reducing her

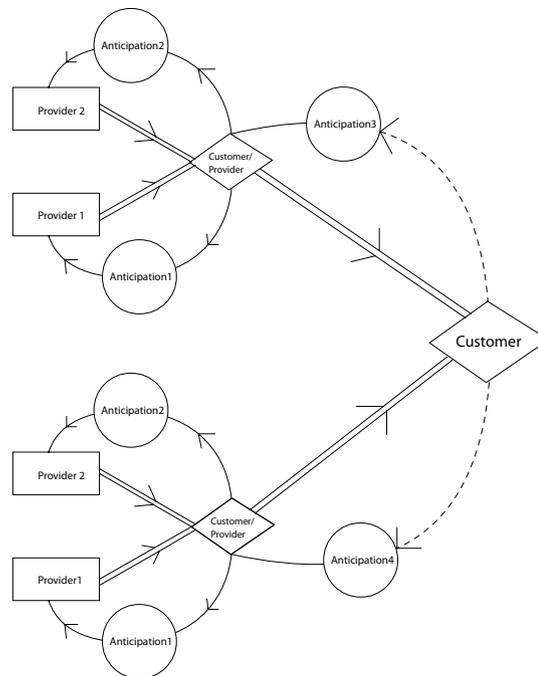


Figure 4: Branching of Multiple plots

electricity bill. This way we have a chain of customer who become providers for the next customer in the chain. And in order to compete and stay at an upper hand, they find specific limitations of the existing product or element and find a new and better product, (a low electricity consuming bulb for example). By knowing what is different in the new entity, contrasting from the old one, knowledge at various level of the given subject gets transferred (see figure 5). It is not necessary that the story will begin at the same point. The same story can begin in a different way based on the narrator's choice. For example the story of fluorescent bulb may begin where researcher one has observed light emitting qualities of certain charged ions. He may have to challenge the existing belief of producing light through heat and electric resistance. His success is in showing that his discovery works.

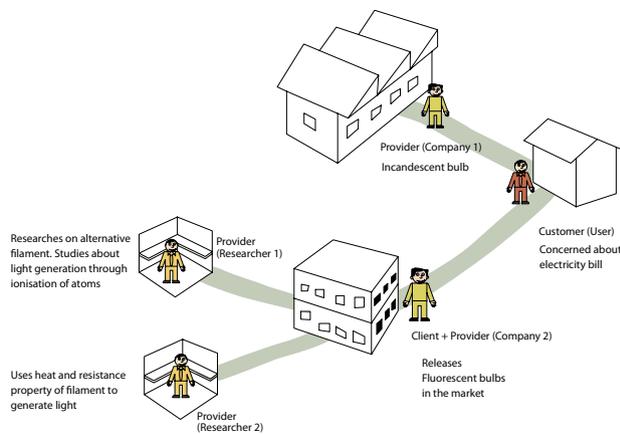


Figure 5: Fractal Plot representing story of incandescent bulb

The bulb manufacturer in turn who is able to produce low power consuming bulb, wins in the end. Researcher 1 and company 2 are winners as they create new knowledge and a new product.

We call this model fractal like because we see self similar pattern of challenge repeating at various levels. The branching can have any number of possibilities, but the basic structural unit remains the same. Fractals are actually mathematical models that generate imagery that has repeated self similar patterns. We are using the word fractal only to borrow the self similarity part from it.

Relevance of the story designing methodology: Knowledge sharing as a story

The significance of this model is that, using this model, students and teachers above secondary school level can design their own educational stories and present them in a manner they like. If they can identify the distinction between a particular piece of knowledge and what existed before that, a new story can be built. When the story is presented, it can be corrected by the peer group, if some information is left out. Here learning happens in the course of designing the

story, more than watching it passively. The student needs to research about a concept in order to build a story around it. Even if a story is bad from literary point of view, the act of making the story will lead to a proper understanding and retention of the concept.

Testing and validation of the model

The validity of this model still needs to be tested among students and teachers about the quality of educational stories they are able to build using this model. The testing needs to be of two variables: comprehension and retention of the concept explained through the story.

Conclusion

The way educational content is organized in textbooks, may be the cause that students are compelled to memorize things without understanding. These stories provide a way by which educational content can be also communicate the belief that a piece of knowledge is ever evolving, one leading to another.

References

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