

SIMULATING HAMLET IN THE CLASSROOM¹

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During a STELLA workshop sponsored by the Catalina Foothills School District in Tucson, Arizona, a group of teachers working with Steve Peterson developed a STELLA model that analyzes the motivation of Shakespeare's Hamlet to avenge the death of his father.¹ Plot events lead Hamlet to believe that his uncle, Claudius, has become king by murdering Hamlet's father and marrying his mother, thereby depriving Hamlet of family and throne. The model is designed to expose the effect that plot events have on Hamlet's willingness to kill Claudius. It permits the examination of the impact of each event as it occurs and as Hamlet continues to contemplate the situation.

This note describes the model and its use in high school classes and suggests further directions for simulation to support instruction in literature.

STUDENT POPULATION

The Hamlet model was used with my students at Desert View High School in Tucson, Arizona. Teaching Shakespearean drama has traditionally been difficult in the Sunnyside District. The complexities of Shakespeare seem to get lost in the demanding daily life of teenagers in this area of Tucson. Tucson is itself a high crime area with 400,000 residents and 51,542 serious crimes in 1989. While our campus has been declared neutral by the Crips and the Bloods, gang and drug related activities are ever-present in the community. In addition, many of our students are members of dysfunctional families, generally with only one natural parent present. Quite often the household has been extended to include several related families. Sunnyside District is within 75 miles of the Mexican border, and

¹ System Dynamics Review 8 (no. 1, Winter 1992): 91-98. ISSN 0883-7066.

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many of the students are first- and second-generation residents. This often creates language and cultural barriers that are difficult to ease quickly.

Our district has two high schools, each with approximately 1,400 students. Ethnicity is about the same at both schools: the distribution at Desert View is Hispanic, 67%; Anglo, 23%; American Indian, 6%; Afro-American, 3%; and Asian, 1%. A total of 29 % of these students participate in the free and reduced price lunch program. While this cultural diversity offers a certain richness to our campus, there are many associated problems. The lower socioeconomic level of the students further complicates the issue. Many of the high school students are distracted by financial difficulties and are so tired from working part-time that attention to their academic studies lags. It is not surprising that Shakespeare fails to draw their attention.

PRESENTATION PROCEDURE

Using a Macintosh SE and the Kodak Datashow, I displayed the model shown in Figure 1 on the A-V screen for my general studies junior literature classes (see the Appendix for equations). I explained the model's components to the students, and they explained the relationship of the components to me by examining the model in light of their knowledge of Hamlet. I explained, in about five minutes, that stocks (rectangles) were accumulations; that flows (double lines with an arrow at one end) were pathways for information or material quantities into or out of the stocks; that converters (circles) convert inputs of either the information or material quantities into outputs; and that the wires (thin lines with a circle at one end and arrow at the other) were connectors that reflect the causal linkages between the flows and stocks (they depict the assumptions about "what causes or depends on what" in the model). I defined each item of the model as it related to Hamlet without indicating very much of the model creation process. It was my intent to have the students use a systems thinking approach in understanding Hamlet so that they could examine human nature and the interaction between events in one's life and one's personality. Therefore, I did not teach them how to use the computer to create a model, although I hope to incorporate model building as a tool for examining literature into the curriculum in the future.

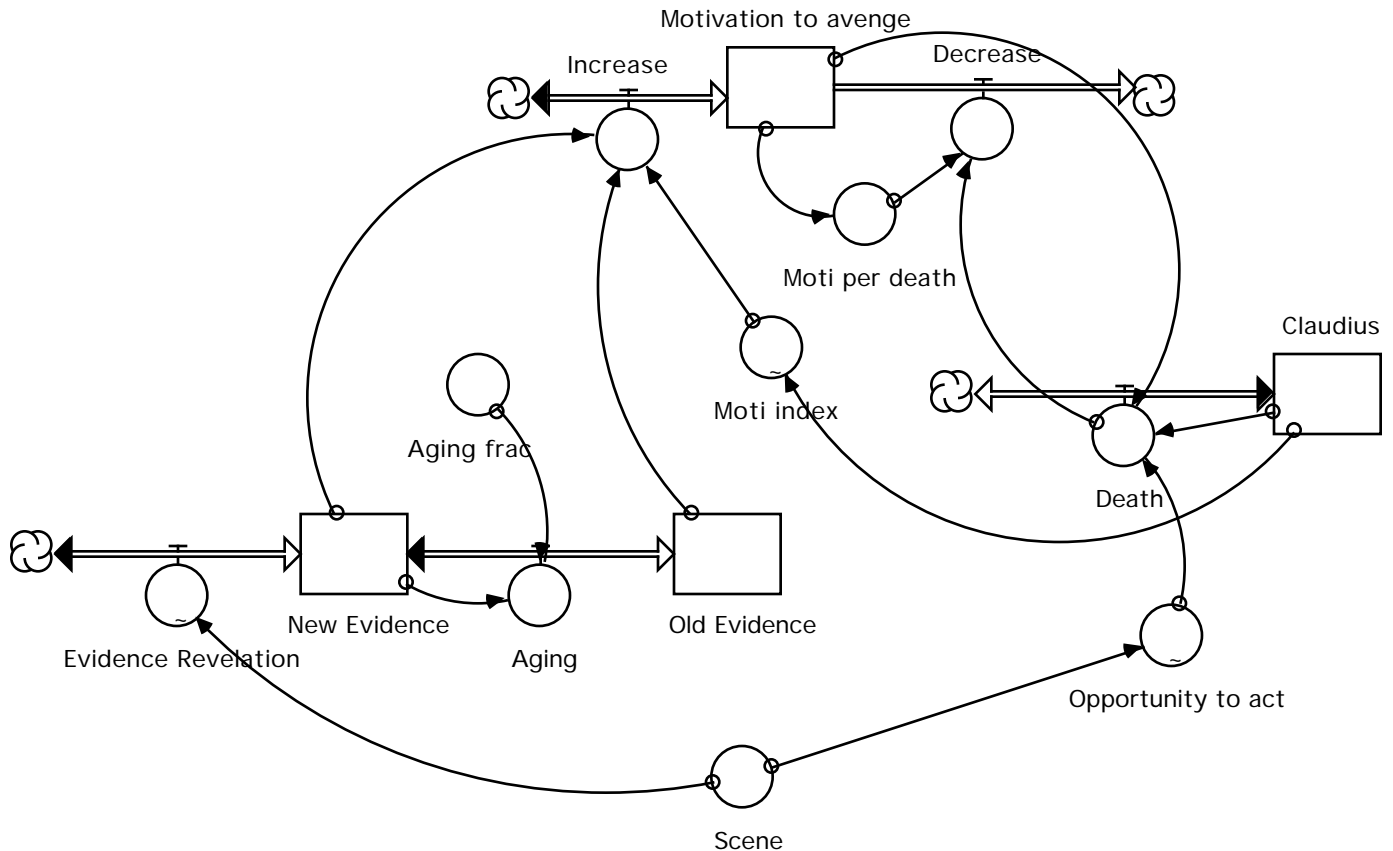


Figure 1:
Diagram of the Hamlet model, focusing on the accumulation of evidence in plot events that increase Hamlet's motivation to avenge the death of his father and kill Claudius.

Fig. 2. STELLA window for the “revelation of evidence” flow variable, showing a portion of a typical scene-by-scene-development, suggested by the students, of evidence that would motivate Hamlet to kill Claudius.

When the students indicated a basic understanding of the Hamlet motivation model, I opened the window into the "revelation of evidence" flow variable to assign values to the plot events (see Figure 2). As a group, the students examined Act 1. scene 1. for events that would influence Hamlet's actions. The students discussed the effect that each event would have on Hamlet's desire to kill Claudius as he became aware of the information. and they assigned accordingly each event a value on a scale of impact from one to ten. We continued analyzing Act I as a group. Then the students broke into small groups of three, with two groups taking each of the remaining acts. As each group presented its "impact study," other

students evaluated, and often challenged, values. I entered the data into the STELLA model as the students debated the issues related to each event. Upon completion of the discussion, we ran the model with the numbers derived from the students' discussion. We examined both the model and the graph functions in the STELLA program.

RESULTS

The students were engrossed throughout the process. It was necessary for me to mediate near-hostilities on two occasions within the same class. The amazing thing was that the discussion was completely student-dominated. For the first time in the semester, I was not the focal point of the class. I did not have to filter the information from one student back to the rest of the class. They were talking directly to each other about the plot events and about the human responses being simulated. They talked to each other about how they would have reacted and how the normal person would react. They discussed how previous events and specific personality characteristics would affect the response to each piece of news, and they strove for precision in the values they assigned for the power of each event. My function became that of listening to their viewpoints and entering their decisions into the computer. It was wonderful! It was as though the use of precise numbers to talk about psychological motives and human responses had given them power, had given them a system to communicate with. It had given them something they could handle, something that turned thin air into solid ground. Instead of my having to force them to keep their attention on the task, they directed and were in control of the learning. Through the systems thinking approach and STELLA, the students guided themselves to a position of understanding. Their value assessments were building understanding with each plot event. I did not have to prompt them at all. They were in complete control of the process. It was what the utopian curriculum lodged in every teacher's dream demands as an outcome.

I simulated the model showing the diagram with stocks and flows animated, and the students murmured foreknowledge when Claudius' life stock emptied into the death converter. I simulated the model showing graphs (Figures 3 and 4 show typical examples), and students spontaneously called out key events when changes occurred. A spike on the graph—"Yeah, there's the climax. Claudius just ran out of the room!" Their creation held their interest completely! They asked to see the model run over and over. Almost immediately, they began changing values. Several

students wanted to see the difference in the run if "their" values for the impact of events had been used.

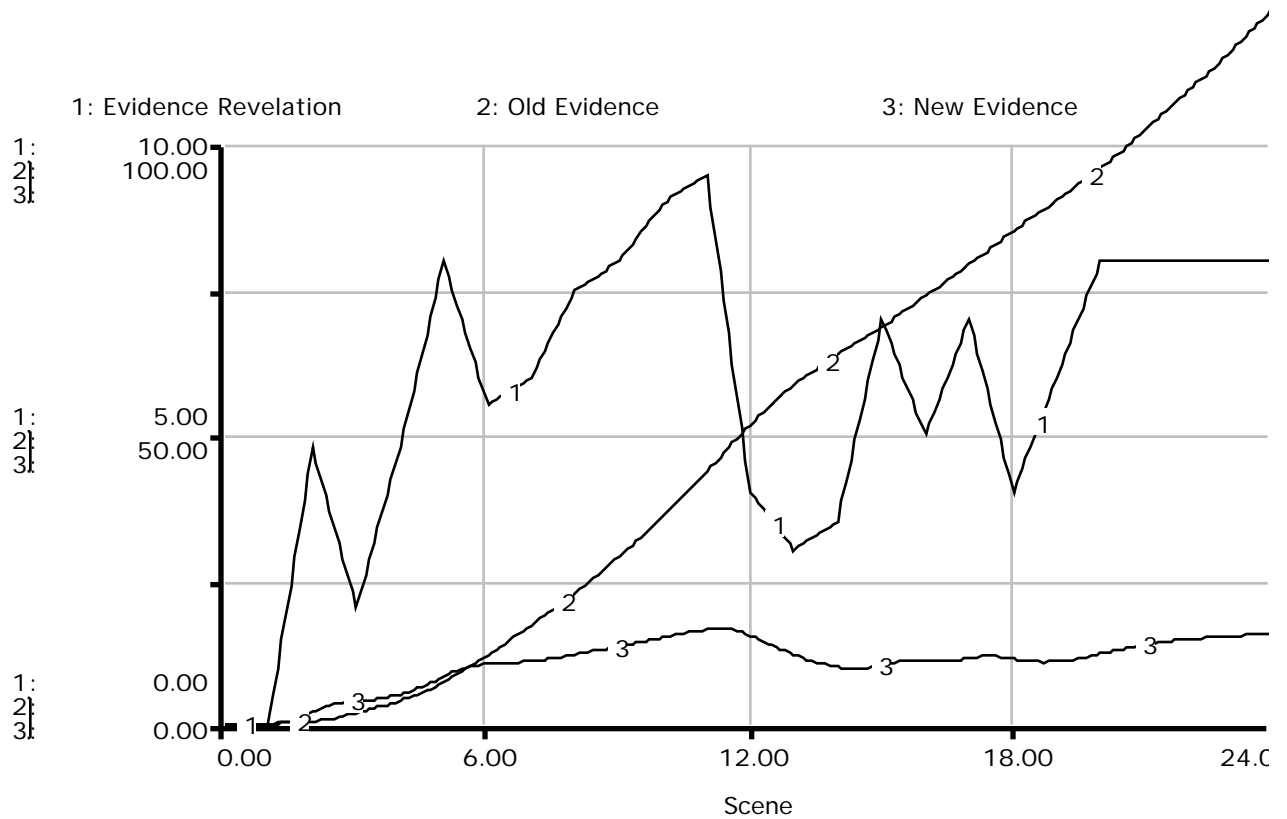


Figure 3

Typical behavior of the Hamlet model showing the revelation and accumulation of evidence that motivates Hamlet to avenge his father's death.

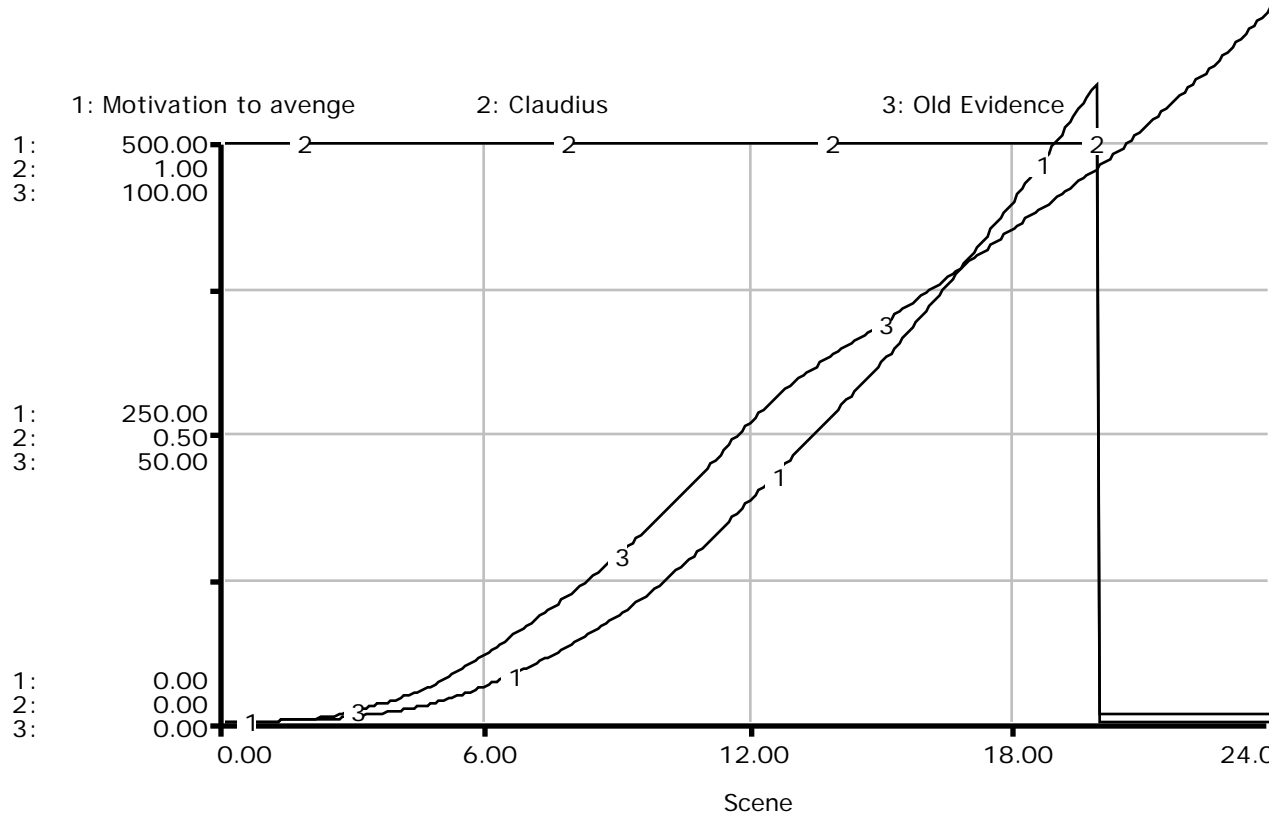


Figure 4

Other variables from the simulation in Figure 3, showing the accumulation of damaging evidence, Hamlet's growing motivation to avenge his father's death, and Claudius's "life line", which drops to zero at his death.

As the class ended, students moved slowly out the door. Several glanced back at the still running model, waiting to see Claudius die again. Several were still arguing over how much impact just seeing the ghost of a father would have on the ability to make "good" decisions (another aspect in need of modeling). But the crowning moment came when Pete "too cool to participate" Trejo yelled back at me, "Let's try this again Monday with Laertes as our subject."

An examination of the grades for these two classes of juniors indicated the increased level of involvement that the students had in the Hamlet unit. The class average went up 10 percent in one class and 10.3 percent in the other. The first class went from having only 3 of 16 students passing to having 10 of 16 passing. One student even achieved a 100 percent mastery for the unit. In the second class, four students who had been failing joined the ranks of the passing. The most dramatic improvement in this class was in obtaining A's and B's. Before studying

Hamlet with STELLA, only one student in the second class had an A. and there had been no B's. The Hamlet unit had three students with A's and five students with B's. Another indicator of student involvement can be found in what followed work with the model. Three students working independently designed activities to extend the unit. two considering Hamlet and one using STELLA to study Amadeus.

VARIATIONS

The model, as simplistic as it currently is, offers a variety of options for classroom activities while studying Hamlet. The discussion that occurs during the simulation process is an ideal delivery system for vocabulary study. In addition, one effective activity, developed by a student, has succeeded in tying Hamlet into the rest of the literature curriculum, thereby validating the entire curriculum. Before beginning the drama unit, we studied six literary traditions (the Puritan Age, the Age of Reason, Transcendentalism, the Romantic Age, Realism, and Naturalism). After studying Hamlet. the students created a persona from each tradition. Each persona then participated in a discussion of some issue concerning the play. Students had their six characters discuss such topics as Hamlet's sanity and his right to be king. This activity allows the students to integrate what they have learned earlier in the course into the analysis of new material. It goes a long way toward completing the circle.

One student became so involved in the model that he wanted to rewrite the end of the play so that Hamlet survived. Hamlet then would face a tribunal, or a jury, to determine if he were guilty of murder (premeditated?) and if he should be king. This activity would permit careful examination of the evidence presented throughout the play. The students could assume the roles of prosecutor, defense attorney, judge, and jury. Some students could become characters from the play and testify, in character. at the proceedings. (The personas from the previously discussed activity could be included.) Such an activity would develop student awareness of courtroom procedures and the legal system. It would also create an opportunity for students to use critical thinking skills as the detectives and legal counsel worked to "solve the case" and to practice decision-making skills by reaching a verdict. Another advantage would be that students would look deeply into the personality of characters as they prepared to play a character at the trial, increasing their understanding of human nature. I loved the student's idea and plan to try it.

In addition, simulating Hamlet permits close consideration of

- A variety of possible responses to the same events
- The effect of rearrangement of the time sequence of events
- The effect of contemplation

With further development, this model could be used

- To manipulate the characteristics of Hamlet to alter his responses to, and the impact of, plot events
- To compare the way other characters would have responded to the same events (Laertes and Fortinbras also had fathers who were killed)
- To manipulate the plot events while maintaining characteristics to examine alterations in response
- To create subplots or additional story lines (maybe a story about another event in Hamlet's life) while maintaining the original story

MORE MODELS FOR LITERATURE

The success my students experienced with my first attempt at using STELLA to model literature has made me aware of other models that could contribute ~o units in the English curriculum. The following ideas could be developed:

1. Understanding a short story/play.
 - a. Manipulate personality of a character in published story.
 - b. Maintain personality of a character: manipulate plot.
 - c. Introduce a new character; maintain all other characters: watch plot change.
 - d. Alter setting: focus on plot and character effects.
 - e. Substitute a character from one story/play for one in another story/play (Romeo as Hamlet; Montressor as Hamlet: Hamlet as Romeo.
 - f. Incorporate a character from one story/play into another story/play (Romeo into Hamlet).
2. Writing a short story/play.

Use the model to help writers focus on the development of plot, the impact of setting, and the consistency of characterization. Many of the possibilities listed in (1) could be used.

3. Literary analysis. Use the model to focus on thematic concepts and points of character.

- a. *Julius Caesar*—ambition. self-sacrifice for the state.
- b. *Romeo and Juliet*—communication, coincidence, fate, youth, the generation gap, tradition.
- c. *Macbeth*—ambition. spousal relationships, appearance versus reality.
- d. "The Most Dangerous Game"—empathy.
- e. "The Cask of Amontillado"—revenge.
- f. "To Build a Fire"—decision making.
- g. *Animal Farm*—progression of human faults.

APPENDIX: Equations for Hamlet's motivation-to-avenge model

Claudius - Claudius + dt * (-Death)

INIT(Claudius) = 1

Death = IF (Motivation_to_avenge >= 95) and (Opportunity_to_act >= .95)
then Claudius/dt else 0

Motivation_to_avenge = Motivation_to_avenge

INIT(Motivation_to_avenge) = 0

Increase = (New_evidence*Moti_index)+(Old_evidence*Moti_index*.5)

Decrease = Death*Moti_per_death

New_evidence = New_evidence + dt * (Evidence_revelation - Aging)

INIT(New_evidence) = 0

Evidence_revelation = graph(Scene)

(0.0,0.0),(1.00,0.0),(2.00,4.80),(3.00,2.00),(4.00,4.50),(5.00,8.00),

(6.00,5.50),(7.00,6.00),(8.00,7.50),(9.00,8.00),(10.00,9.00),

(11.00,9.50),(12.00,4.00),(13.00,3.00),(14.00,3.50),(15.00,7.00),

(16.00,5.00),(17.00,7.00),(18.00,4.00),(19.00,6.00),(20.00,8.00)

Aging = New_evidence*Aging_frac

Old_evidence = Old_evidence + dt * (Aging)

INIT(Old_evidence) = 0

Aging_frac = .5

Moti_per_death = Motivation_to_avenge

Scene = time

Moti_index = graph(Claudius)

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( 0.0, 0.0),(0.0500, 0.0),(0.100,0.950),(0.150,0.950),(0.200,0.950),
0.250,0.950),(0.300,0.950),(0.350,0.950),(0.400,0.950),(0.450,0.950),0.500,0
.950),(0.550,0.950),(0.600,0.950),(0.650,0.950),(0.700,0.950),(0.750,0.950),(
0.800,0.950),(0.850,0.950),(0.900,0.950),(0.950, 0.950), (1.00,0.950)
Opportunity_to_act = graph(Scene)
(0.0,0.720),(1.00,0.670),(2.00,0.650),(3.00,0.620),(4.00,0.525),
(5.00,0.350),(6.00,0.260),(7.00,0.240),(8.00,0.200),(9.00,0.205),
(10.00,0.190),(11.00,0.190),(12.00,0.195),(13.00,0.195),(14.00,0.195),(15.00,
0.195),(16.00,0.200),(17.00,0.595),(18.00,0.595),(19.00,0.610), (20.00,1.00)
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NOTE

1 STELLA—High Performance Systems, Inc., 45 Lyme Rd., Hanover, NH 03755, U.S.A.