

Modeling Your Future

A STELLA II MODEL FOR USE IN THE CLASSROOM

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Modeling Your Future — Teacher Directions

Introduction If I get a job right after high school, will I be able to afford the car I want? If I go to a community college to get job training, how much am I likely to be earning in that job when I'm 40? These are the kinds of questions you and your students can answer by using the Modeling Your Future model. Students will make choices regarding the number of years of education they think they need beyond the tenth grade. Within the range of occupations allowed by that amount of education, they have some choices regarding types of jobs and corresponding salaries. After taking a look at their lifetime projections for yearly income based on this choice, they will next have an opportunity to explore the budget implications. If I am making \$23,500 a year, what car payments can I afford? How much can I spend on rent or a mortgage? How much can I save toward a vacation in Hawaii?

The stimulus for this model came from a game called “ODDS ON YOU”, which was developed by an Oregon teacher, Alice Kaseberg, for the EQUALS program. This game takes a look at some important turning points in a student's career development, showing them the connection between these decisions and the number of choices they have for work as an adult. All the decisions in the game are made by chance, but the probabilities were based on statistics from the U.S. Department of Labor. Playing this game with students makes an effective introduction to the ideas used in the model. However, it is not necessary for use with Modeling Your Future. The statistics on incomes which are the ending point of the ODDS ON YOU game are the starting point of this model. (It should be noted that the game was written several years ago and the data for it came from 1987. For this model we have updated the

information.) The directions for the game can be obtained from Northwest EQUALS (see bibliography).

**Overview of
Classroom
Activities**

1. Class discussion about different types of occupations, amounts of training or education necessary for them, salary possibilities.
2. Open up the STELLA model **Modeling Your Future**. You can do this with a whole class, using a projection panel, with small groups taking turns working at one computer, or with pairs of students working in a lab.
3. Students input their choices regarding years of education.
4. Students are directed to a Job Category (type I, II, or III) based on their education. They choose a job and starting salary from the category, entering the starting salary into the model.
5. The students run the model and look at the graph which shows them their annual income for each year of their working life. At this point they have the option to print this graph. There are questions to focus their attention on what their graph shows. They can also run graphs for other salary projections with other educational requirements.. A comparative graph allows these salary projections to be shown together.
6. The next step will be to make choices of monthly car payments, house mortgages, and living expenses. It is suggested that some time be taken between steps 5 and 6 to allow the students to do some research using the newspaper, possibly interviewing car and real estate sales people, for information on the cost of different kinds of cars and homes.
7. When the students enter their decisions, the computer calculates income and expenses. These expenses automatically grow at 2% due to inflation. If there is money left over, it will be put in a savings account with 5% interest. If they choose expenses greater than their income, they will automatically be given a loan and charged 15% interest. All of these categories (income, expenses, bank balance) will be tracked in a table when

the student runs the model. Students have the option of printing the table.

8. There are additional questions for the students to answer when they look at the results of all their choices. They are also directed to try varying the options to explore the effects and to try to maximize their income, savings, and lifestyle.
9. There are many possibilities for extensions and further exploration. For example, students could do some research regarding the effects of gender or ethnic bias in salaries. They can either make modifications to the model or use the information in class discussions or a report of their work with the model. In addition, a second version of the model, **Modeling Your Future 2** has been included. This version does not include inflation, but pauses every year, to allow students to change expenses each year (for example, after paying off a car, or changing from rent to a mortgage).

Overview This model is a fairly simple model that allows students to see the relationship between lifetime earnings, education level and buying power. Students determine the level of education they intend to complete. A value for starting salary is then selected for their income. The starting salary falls within a certain range for that education level. Students can then research expenses: mortgage or rent, car payments, or living expenses. These are determined by the lifestyle they chose. Students in grades 7-12 should be able to develop an understanding of the effects of income on sustainable spending patterns through results shown in graph or table form. This model is intended for use in any mathematics, business, or living class, though it could be used in various other places as well in both the middle and high school levels.

Purpose This model makes it possible to explore the differences in various education levels and the impact it has on buying power. Students can experiment with the model to try to get the maximum earning-spending potential, then discuss whether choices they made are economically feasible. It also will make obvious, the tradeoffs implicit in the “good life”.

Model Explanation

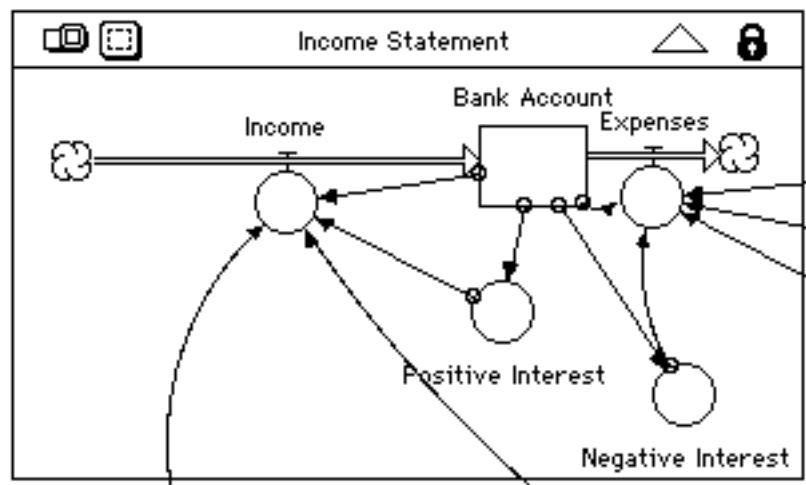


Figure 1. Income Statement Sector

The figure above, the **Income Statement** sector card, depicts the connections between income, expenses, and interest on

the money earned. The **STOCK** "Bank Account" accumulates over the lifetime of the worker. The flow "Income" continues to add income to the bank account while the "Expenses" flow out. Whatever remains after spending is complete for the year will earn a compound interest rate of 5%. It is assumed that the interest rate will tend to average out at this value over a lifetime. If the bank account assumes a negative value an interest rate of 15% will be assessed on the shortfall. Again the rate is assumed to be an average of interest rates on accounts due over a period of about 50 years.

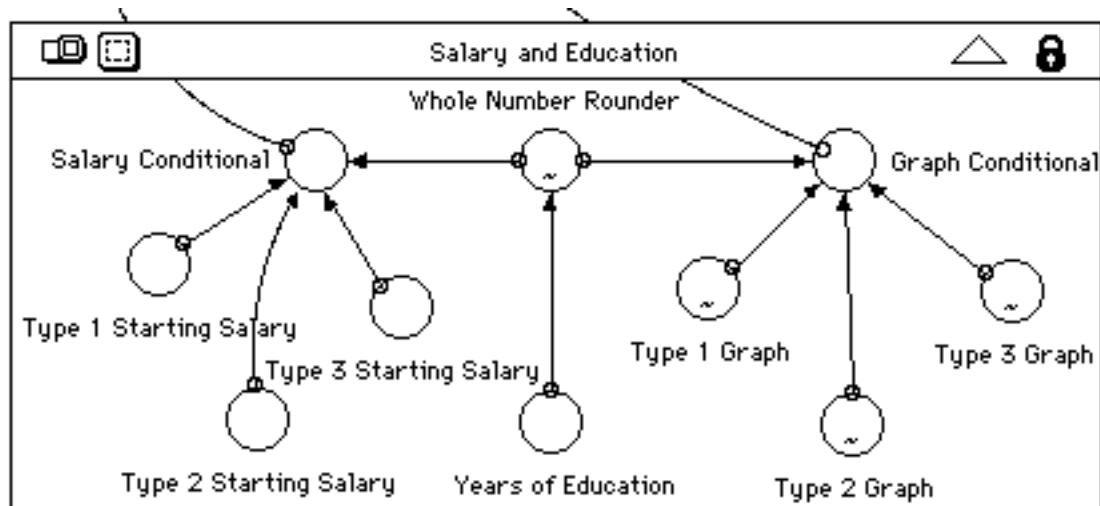


Figure 2. Salary and Education Sector

The figure above, the **Salary and Education** sector card depicts the part of the model which determines what starting salary and what growth pattern will occur as a result of the student's choice of years of education completed. The starting salaries were chosen from statistical data for job types based on years of education. The Type " #" graphs are assumptions based on data as well. The student makes job choices at the upper, or Authoring level by moving the slider on the years of education button (Figure 3) and then following the accompanying information for setting the starting salary (Figure 4.) Once they have set the sliders and **RUN** the model they can scroll down the page and observe a copy of the graph (Figure 5.) based on their choices.

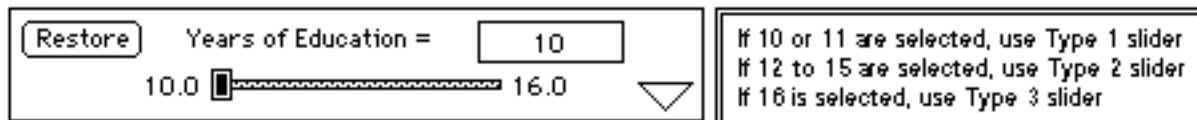


Figure 3. Years of Education Button

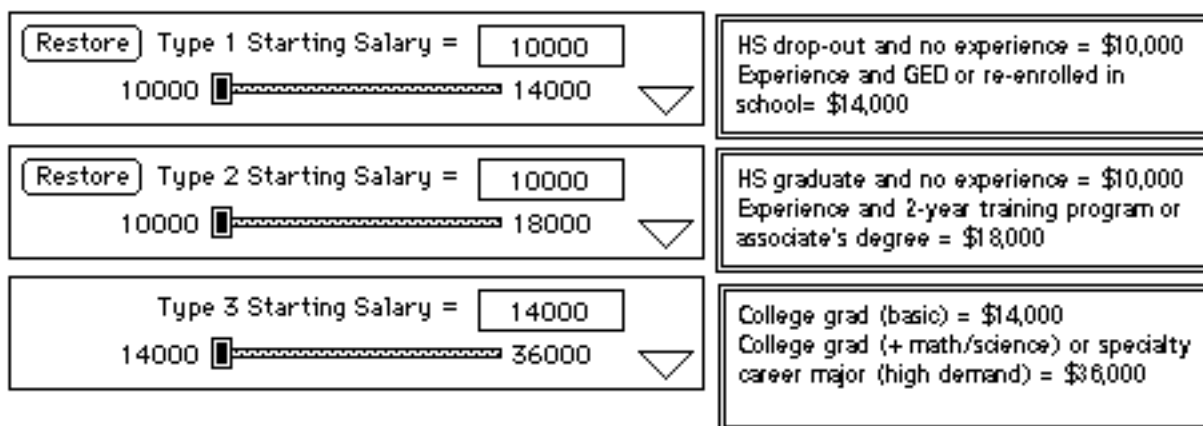


Figure 4. Starting Salary Buttons for level of education chosen

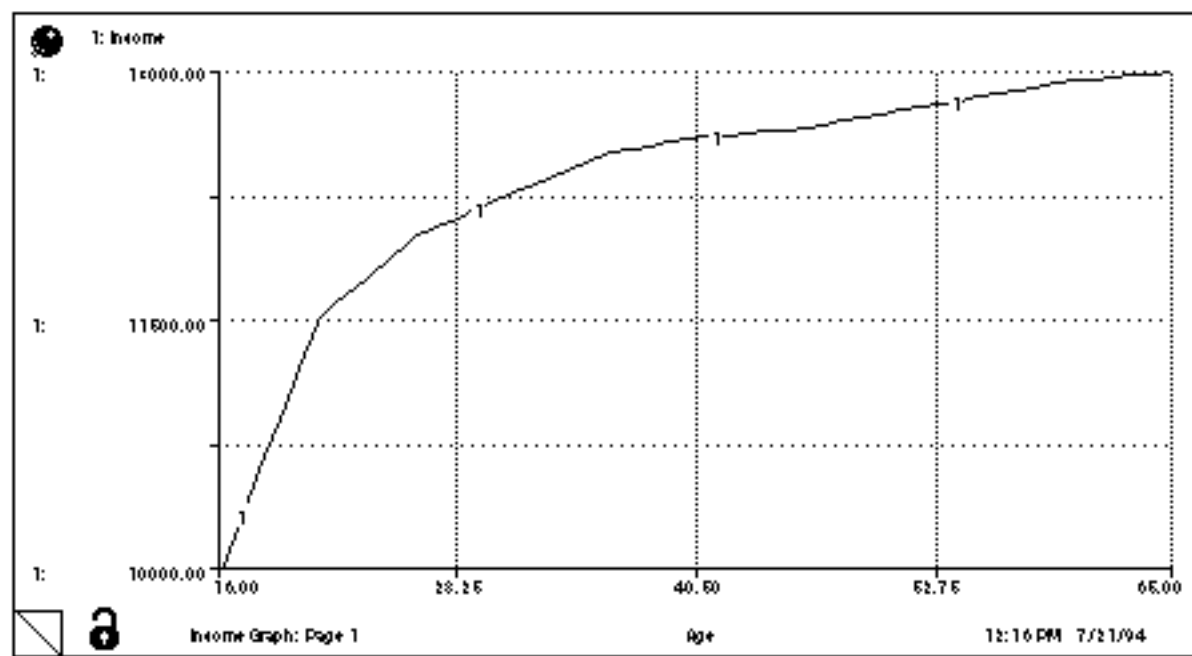


Figure 5. A Type 1 Income accumulation graph.

Students adjust their expenses by moving the sliders shown in Figure 6. The expense sliders indicate the monthly spending. As the program runs, these costs are calculated annually. It is reasonable to assume that inflation will affect these costs. For example, rent can reasonably be expected to increase, as will most living expenses. To accommodate this reality, the sliders set starting costs. Once a student begins to work, the values will increase by 2% each year.

An additional reality factor has also been built in. The model assumes that the students expenses are paid by parents or other sources until they quit school and go to work. As a result, the expense do not begin to accrue until the student leaves school.

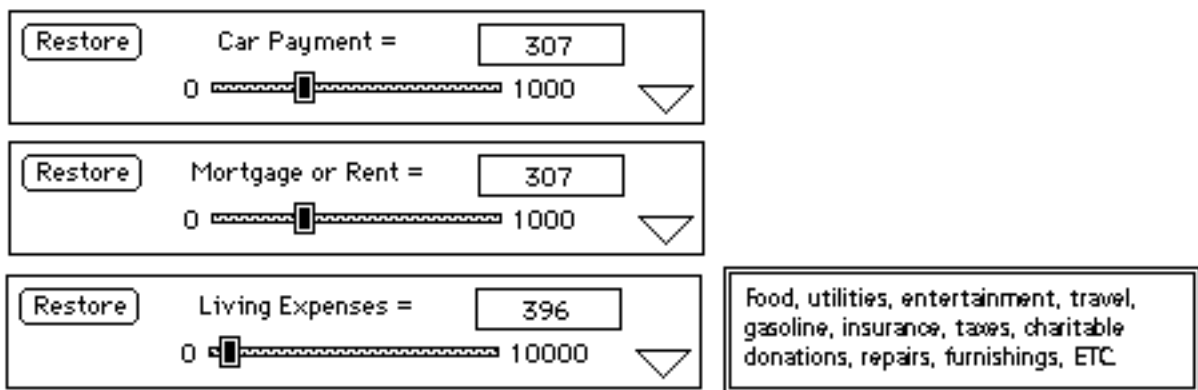


Figure 6. Expenses Buttons

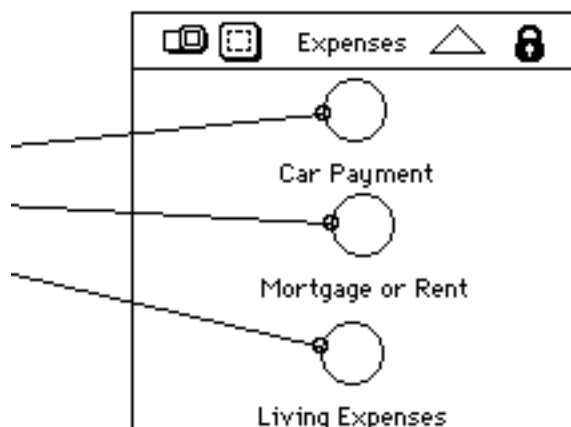


Figure 7. Expenses Sector from the model

The **Expense** sector card is set up to divide expenses between mortgage or rent, car payment, and living expenses. The chosen values are added as spending and subtracted from the bank account total.

A table (Figure 8.) is also provided that keeps track of annual income, expenses, and bank balance for ages 16 to 65. Using the table it is possible to determine when certain expenditures, such as a house, become possible.

| 12:16 PM 7/21/94 Table 1 | | | | |
|--------------------------|-----------|-----------|--------------|--|
| Age | Income | Expenses | Bank Account | |
| 16 | 10,000.00 | 12,120.00 | -2,120.00 | |
| 17 | 10,306.12 | 12,438.00 | -4,251.88 | |
| 18 | 10,612.24 | 12,757.78 | -6,397.41 | |
| 19 | 10,918.37 | 13,079.61 | -8,558.66 | |
| 20 | 11,224.49 | 13,403.80 | -10,737.97 | |
| 21 | 11,510.20 | 13,730.70 | -12,958.46 | |
| | | | | |

Figure 8. Type 1 Table

The salary growth over the lifetime of the individual is a set parameter in this model. It is based upon the following assumptions: TYPE 1-students who dropout of high school may initially start working at minimum wage, but over time the growth will be slow, maximizing at about 1.25 times the initial value around age 37 and then barely keeping up with inflation. TYPE 2- students who complete high school and receive either training, apprenticeship, or an associates degree at the community college level, will start earning wages later, beginning at a salary similar to a TYPE 1, but the rise in wages occurs faster, with the maximum at about 1.5 times the initial salary around age 37. Thereafter, salary increases at the rate of inflation. TYPE 3-students will remain out of the work force longer due to college, but will eventually start at a higher salary. It will increase by a factor of 2 over time, maximizing at approximately age 40 with increases slightly higher than inflation over the remaining work life. The parameters set are depicted on the following graphs, with the data shown in the accompanying table.

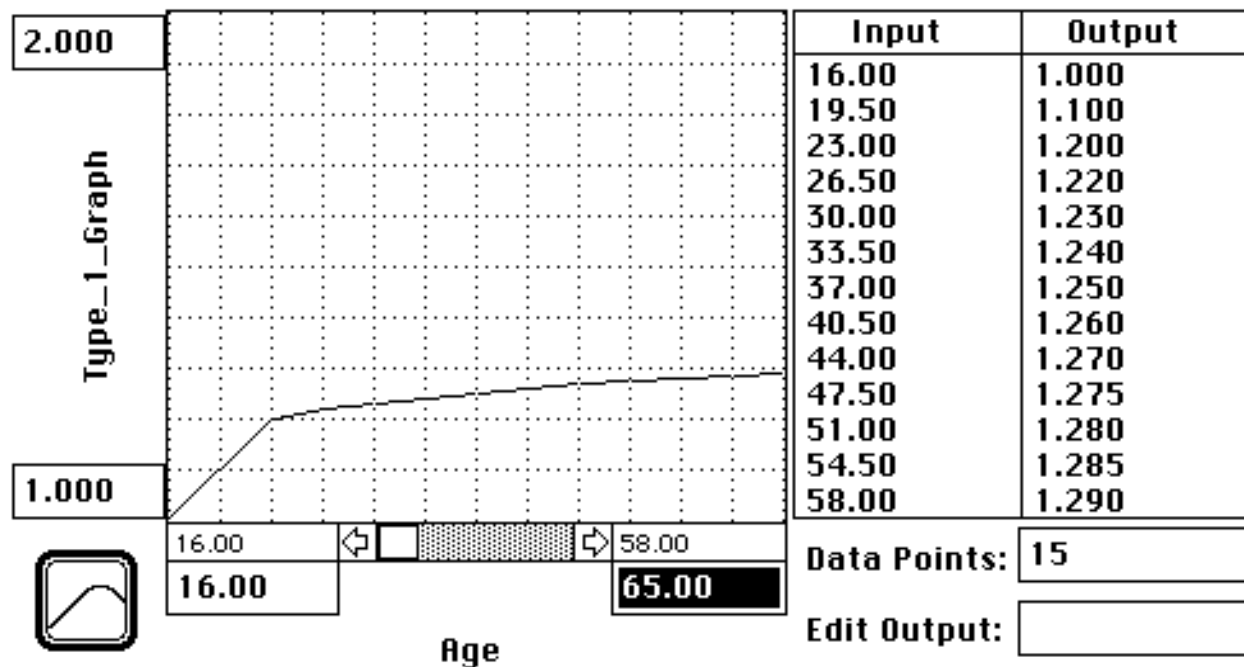


Figure 9. TYPE 1 Graph Parameters

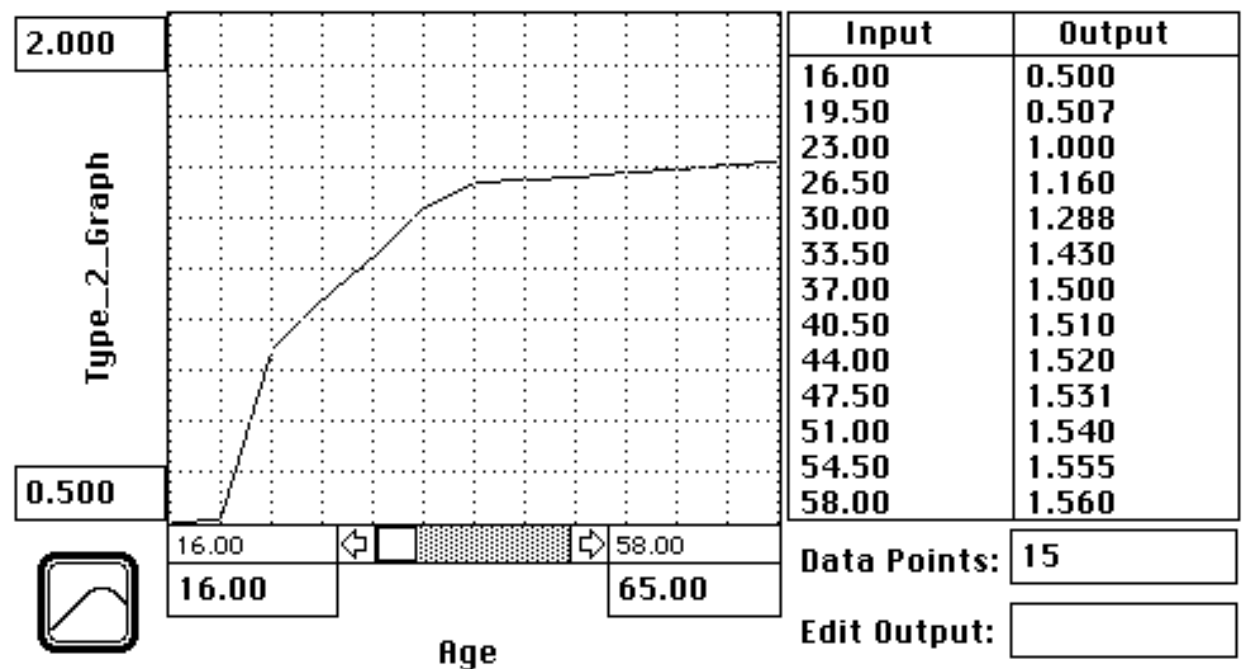


Figure 10. TYPE 2 Graph Parameters

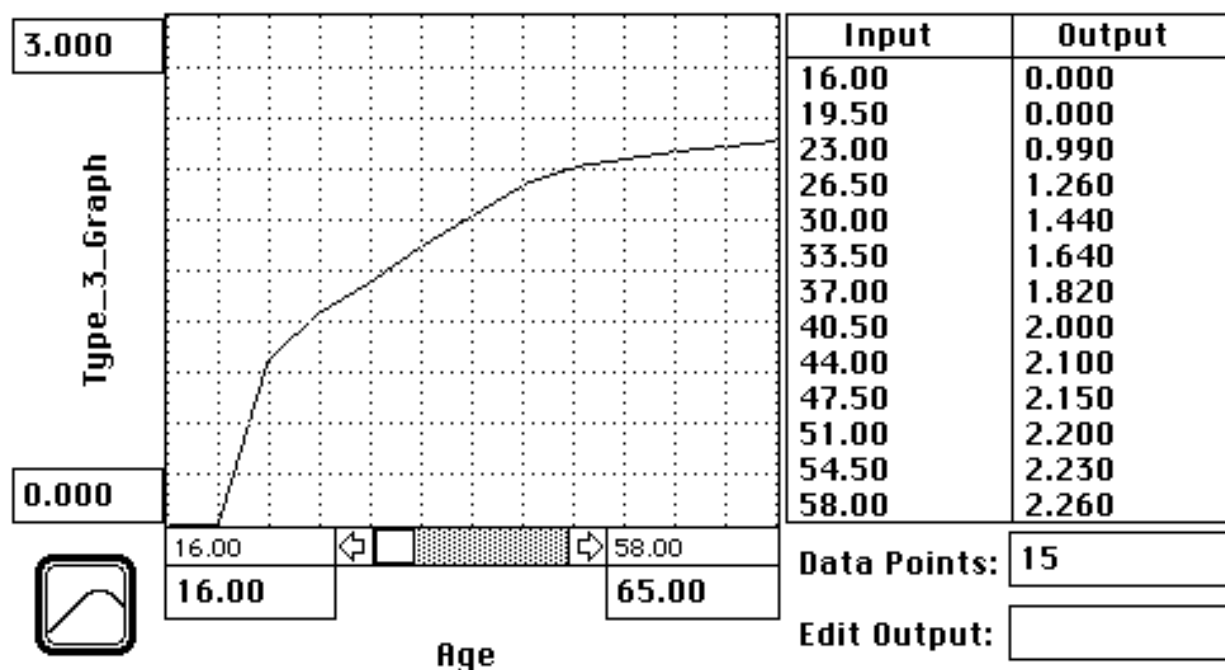
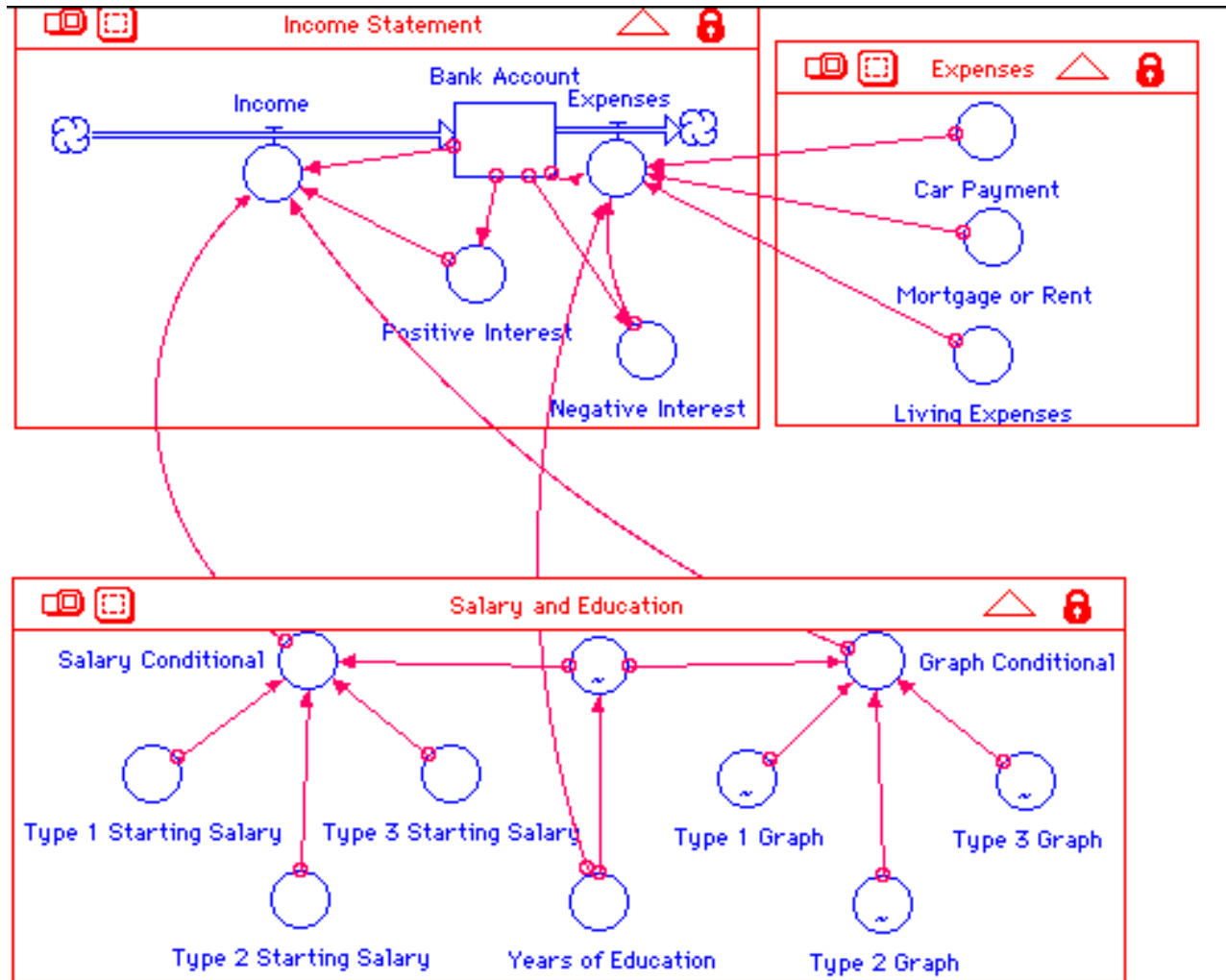


Figure 11. TYPE 3 Graph Parameters

Parameter Settings

It is possible to change any of the default values or the type graphs as data from statistics change. Move into the upper or authoring level and choose **author prefs...** under **FILE** on the menu bar. Click the **FULL USER ACCESS** box and then move to the equation level (symbolized by the x^2). Click on any of the stock, flow or converter icons that you want to change. The graphs can be changed by simply drawing a new graph that depicts the data you want to show, or type the data into the output box after highlighting the proper line. If a graph or table is locked it must be unlocked before it will show data from different trial runs.

Model Diagram



Model Equations

Expenses

☐ $\text{Car_Payment} = 0$

DOCUMENT: This is the converter that will determine the car payment. Students will enter the payment they believe they can afford. It is controlled by the slider on the authoring level.

☐ $\text{Living_Expenses} = 0$

DOCUMENT: This is the converter for living expenses. Categories included in it will be utilities, food, clothes, insurance, entertainment, etc. It is set using a slider on the authoring level.

☐ $\text{Mortgage_or_Rent} = 0$

DOCUMENT: This converter controls the amount of rent or mortgage payment the student chooses. It is set by a slider on the authoring level.


Income Statement

☐ $\text{Bank_Account}(t) = \text{Bank_Account}(t - dt) + (\text{Income} - \text{Expenses}) * dt$

$\text{INIT Bank_Account} = 0$

DOCUMENT: If expenses are less than income, money will accumulate a positive balance here. If expenses exceed income and the balance drops below zero, the negative balance will be considered a loan or debt, and will result in an interest payment being added to the expenses.

INFLOWS:

 $\text{Income} = (\text{Salary_Conditional}) * (\text{Graph_Conditional}) + (\text{Bank_Account} * \text{Positive_Interest})$

DOCUMENT: The flow will be the salary for the year plus any accumulated interest on a positive bank balance.

OUTFLOWS:



Expenses = IF(TIME>(Years_of_Education+6)) THEN
(12*(Car_Payment+Mortgage_or_Rent+Living_Expenses)*(1.02^(TIME-16) +
(Bank_Account*Negative_Interest))ELSE(0)

DOCUMENT: This flow only begins to calculate expenses once a person goes to work. It assumes that while in school, a student's expenses are being covered by other sources. It includes an adjustment in the expenses for inflation (it would be unreasonable to expect that car cost and other expenses would remain flat throughout a person's life. This adjustment is 2%. The adjustment for interest on money owed has a positive sign since it only begins when the balance is negative, applying a negative percentage rate. The net effect of this is to increase expenses.

- Negative_Interest = if Bank_Account < 0 then .15 else 0

DOCUMENT: Interest paid on loans (negative bank balances)

- Positive_Interest = if Bank_Account > 0 then .05 else 0

DOCUMENT: Interest earned on savings balance.

Salary and Education

- Graph_Conditional = If Whole_Number_Rounder = 1 then Type_1_Graph else if Whole_Number_Rounder=2 then Type_2_Graph else Type_3_Graph

DOCUMENT: This converter uses the output from the years of education slider to select the proper income growth pattern. The assumption is that growth in salary over a lifetime will vary with education level; slower growth occurring with less education.

- Salary_Conditional = if Whole_Number_Rounder = 1 then Type_1_Starting_Salary else if Whole_Number_Rounder = 2 then Type_2_Starting_Salary else Type_3_Starting_Salary

DOCUMENT: This converter is used to store and transfer the starting salary. The number of years of education determine which Type # Starting Salary is used. The value is sent to the Income Statement Sector where it is used in computing annual income. The assumption is that starting salary will be commensurate with educational level. The set value was determined from statistical data.

- Type_1_Starting_Salary = 10000

DOCUMENT: This is the converter which controls the starting salary if a student drops out of high school. The actual amount is determined from the table included in the student packet. It is entered using a slider on the authoring level.

- Type_2_Starting_Salary = 10000

DOCUMENT: This is the converter which is used to set the starting salary for a student who completes high school and may have gotten some additional training, up to and including an associate degree. The actual value is obtained from a table included in the student materials and entered with a slider on the authoring level.

- Type_3_Starting_Salary = 14000

DOCUMENT: This is the converter used to input the starting salary for a college graduate. The actual value is chosen from a table in the student packet and entered using a slider on the authoring level.

- Years_of_Education = 10

DOCUMENT: This converter sets the number of years of education a student has, from 10 to 16. It is entered using a slider on the authoring level.

- Type_1_Graph = GRAPH(time)

(16.0, 1.00), (19.5, 1.10), (23.0, 1.20), (26.5, 1.22), (30.0, 1.23), (33.5, 1.24), (37.0, 1.25), (40.5, 1.26), (44.0, 1.27), (47.5, 1.27), (51.0, 1.28), (54.5, 1.28), (58.0, 1.29), (61.5, 1.30), (65.0, 1.30)

DOCUMENT: This graph shows the growth of income for a high school drop out. The assumption is that individual yearly income starts low, rises slowly and maximizes at 1.25 * initial value at approximately age 37 with only a slight rise over the course of the rest of the work years relative to inflation.

- Type_2_Graph = GRAPH(time)

(16.0, 0.00), (19.5, 0.507), (23.0, 0.958), (26.5, 1.25), (30.0, 1.35), (33.5, 1.43), (37.0, 1.47), (40.5, 1.50), (44.0, 1.53), (47.5, 1.54), (51.0, 1.56), (54.5, 1.56), (58.0, 1.57), (61.5, 1.58), (65.0, 1.59)

DOCUMENT: This graph shows the change in income through the working years for a high school graduate. The assumption is that individual yearly income starts low due to training and/or apprenticeship, then rises slowly and maximizes at

1.5*initial value at approximately age 37 with only a slight rise afterwards due to inflation.



Type_3_Graph = GRAPH(time)

(16.0, 0.00), (19.5, 0.00), (23.0, 0.99), (26.5, 1.26), (30.0, 1.44), (33.5, 1.64), (37.0, 1.82), (40.5, 2.00), (44.0, 2.10), (47.5, 2.15), (51.0, 2.20), (54.5, 2.23), (58.0, 2.26), (61.5, 2.28), (65.0, 2.30)

DOCUMENT: This graph shows the growth of a college graduate's income over time. The assumption is that individual yearly income starts low due to college degree program, then rises sharply and maximizes at 2 * initial value at approximately age 40 with following increases due to inflation.



Whole_Number_Rounder = GRAPH(Years_of_Education)

(10.0, 1.00), (11.0, 1.00), (12.0, 2.00), (13.0, 2.00), (14.0, 2.00), (15.0, 3.00), (16.0, 3.00)

DOCUMENT: This converter takes the number of years of education and converts them. All years of education will be converted to whole numbers 1(10 or 11 years), 2 (12-15 years), or 3 (16 years). These values are then used to choose the correct base salary and salary growth graphs for computation.

Name_____

Date_____

MODELING YOUR FUTURE — STUDENT ACTIVITIES

A. Education, Career and Income

1. Decide how many years of education (first grade counts as year 1) you will have. The minimum is 10 years and the maximum, for the purposes of this activity, is 16. Record your choice below and move the slider on the screen to your selection.
2. Look at the next page, which shows a selection of occupations, along with average starting salaries for them. The number of years of education you have chosen will determine whether you are eligible for a Type 1, Type 2, or Type 3 career. Select a career from this list (or another from your own research), record it below, then go to the slider for that Type. On the slider you can either input the exact amount of the salary for a specific occupation or adjust the slider according to the descriptions on the screen.

Education_____years Occupation_____

Starting Salary_____

3. Run the model. To do this, pull down the **Run** menu from the menu bar and click on **Run**.
4. Scroll down to see the graph for the income you have chosen.
5. Print or copy the graph and use it to answer the following questions:

SALARY INFORMATION

FOR USE WITH STELLA MODEL -MODELING YOUR FUTURE

The number of years of education a student selects in using the model determines the category of occupation for which they are eligible. Within that category, they can choose any of the careers listed. The information here came from the Oregon Wage Information 1993 document. In some cases, salaries of similar occupations were averaged (ie. managers). These are beginning or low end yearly salaries for these occupations as reported by various employers in Oregon in 1993. In the case of careers which were not listed in the Oregon document, the Occupation Outlook Handbook was used.

| TYPE 1 | | TYPE 2 | | TYPE 3 | |
|-------------------------------------|-------|-------------------------|-------|---------------|-------|
| Clerk/secretary | 9907 | Broadcast Technician | 9912 | Engineer | 18268 |
| Laborer | 9907 | Technician,chemical | 10529 | Physician | 28618 |
| Manager | 13905 | Court Clerk | 13573 | Scientist | 16576 |
| Helper | 10167 | Building Inspector | 15000 | Lawyer | 27000 |
| Cashier | 9907 | Corrections Officer | 11364 | Architect | 14604 |
| Waiter/waitress | 9907 | Dental Assistant | 9912 | Dentist | 24000 |
| Usher,ticket taker | 10428 | Engineering Technician | 12888 | Pharmacist | 34476 |
| Billing Clerk | 13557 | Nurse (LPN) | 11598 | Teacher | 22000 |
| Childcare worker | 9907 | Paint machine operator | 17107 | Veterinarian | 22200 |
| Agriculture, fisheries, forestry | 9907 | Firefighting supervisor | 17544 | Social worker | 9912 |

The vertical axis shows _____ and the range is _____

The horizontal axis shows _____ and the range is _____

Describe the shape of the graph and explain why it is shaped like that.

What is your approximate income 10 years from now?

What is your approximate income when you are 40 years old?

What is your approximate income at retirement age?

Are there any places on the graph where the line levels off for some period of time (roughly horizontal)? Explain where this happens and what causes this leveling off. What implications does it have for your lifestyle choices?

6. The graph on the screen at this point shows the income for the career you have chosen and is labeled at the bottom as Page 1. In the lower left corner you will see a small symbol that looks like the corner of a page lifted up. Click on this symbol to get to another graph called Page 2. This one is called a comparison graph, because it can show the projected income for your selection along with a career in each of the other two Type categories. To do this, change the years of education and salary to a value in another category, then run it. Repeat for the third category. Now answer these questions:

Look for the line which shows your own career income. How are the shapes of the other two lines different from it?

What does this tell you about the earnings potential for each of the three types of jobs?

Discuss these three options with the other members of your group or with some adults at home. Explain the trade-offs involved. What might be some of the reasons a person would choose one category of occupation over another?

B. Monthly Expenses

In this next section of the model you will be taking a look at what you can afford with your level of income. You will be selecting a monthly car payment, a monthly mortgage payment, and an amount of "other" living expenses, described on the screen. If there is money left over from your total expenses for a given month, it will go into a savings account for you. If you spend more than you have in income, you will be given a loan and the amount will be deducted from your bank account.

To prepare for making these spending decisions, do some research to find out what kind of car you would like and what would be the average payments for it. Take a look at some homes in a neighborhood in which you would like to live. Find out the cost and what a typical payment would be for such a home. (Car dealers and real estate sales people are good sources for such information, as well as the newspaper.)

1. Scroll down from your income graph until you see some new sliders. Input your car and housing payments and the amount you plan to have available for living expenses in a month.
2. Run the model again. Scrolling down, you will see a table which shows the Income, Expenses, and Bank Account balance for each year of your working career. Only a portion of the table can be shown at one time, so you will need to use the table scroll bar to move through the years. You can print or copy the table to see the whole thing.

If your bank account went negative, what caused it and how long did it take you to get out of debt?

What could you change the next time you run the model to avoid going into debt?

4. Knowing what you want is only half of what will get you there. What specific goals do you need to set now based on what you have learned in this activity? Set realistic goals, including three ways you will achieve them.

BIBLIOGRAPHY

Sources Used in This Model

Oregon Wage Information 1993

Oregon Employment Department
Workforce Analysis Section, Salem, Oregon
(800) 237-3710

Portions of this document are included here.

Occupation Outlook Handbook 1994-5 Edition

U.S. Department of Labor
Bureau of Labor Statistics
April 1994

Describes approximately 250 occupations with
information describing working conditions, earnings,
training, etc.

Additional Resources for Employment and Income Data

Oregon Occupations 1993-4

Oregon Career Information System
University of Oregon
Eugene, Oregon 97403-1244
(503) 346-3872

Description of 33 occupations in Oregon with wages,
outlook, preparation, work setting, etc.
Is updated yearly

American Almanac of Jobs and Salaries

John Wright
Avon Books
1992

American Salaries and Wages Survey

Marlita Reddy
Gale Research Inc.
1993

Extensive listing of occupations with low, medium
and high salaries reported for each, along with
location.

Numerous other sources of information available at
Multnomah County Library
U.S. Government Printing Office Bookstore
Portland State University Library

To get directions for the ODDS ON YOU game and other career information:

Northwest EQUALS
School of Extended Studies
P.O. Box 1491
Portland, Or. 97207-1491
(503) 725-3045 or
(800) 547-8887 ext. 3045