I N S I D E F R A N K I E S T I E N

LEARNING OBJECTIVES:

1) The student will develop an understanding of the interdependence and interaction between different cells, tissues, organs, and systems of the body.

2) The student will develop an initial understanding of the major functions of the different body systems.

NOTE :

This program is not self-explanatory. It is highly recommended that an adult play through and explain the following instructions before the child uses this program independently.

FOR CLASSROOM USE the teacher is recommended to first go through "A TOUR INSIDE FRANKIE STIEN" with the class. After this, it is suggested that the teacher play the game one or two times in front of the entire class. Reproduce the OPERATING INSTRUCTIONS and LEVEL CONTROL CHART (included with this documentation package), and give copies to students. As you play the simulation, encourage students to use the LEVEL CONTROL CHART and OPERATING INSTRUCTIONS to suggest remedies for situations occurring during the simulation. Let different students take turns controlling the keyboard during the game while other students call on volunteers who have answers to the simulation's problems.
After an introduction to the class as a whole, students should be encouraged to use the simulation, in small groups or independently.

INTRODUCTION :

INSIDE FRANKIE STIEN is a two-part program which simulates the interaction and interdependence between the different cells, tissues, organs, and systems of the body. Part 1 serves as a general introduction to the body's systems. In Part 1, Frankie's body is constructed on your monitor screen, one system at a time. A TOUR - INSIDE FRANKIE STIEN, (part of this documentation package), provides a brief description of each system as it is displayed. (Future programs in INTELLESTAR's Life Science Series will deal with each of the body's systems in depth.)
It is recommended that the player read and follow all instructions in A TOUR - INSIDE FRANKIE STIEN before playing the simulation.

The second part of the program begins once the body is set up. This is the simulation. The object of the simulation is to keep Frankie 'alive' as long as possible. To accomplish this, the player uses information displayed on the monitor screen to decide which body systems to control. The player must decide whether to stimulate or suppress body systems to keep the body 'in-balance' and healthy. Score is measured by how long the player can keep Frankie alive (Frankie's age).

A TOUR - - INSIDE FRANKIE STIEN

I want you to meet a friend of mine - - Frankie Stien. Frankie's body has many of the major parts of a human body, but he's missing a few important things. Lucky for Frankie you're here. You can help Frankie

live a long life by helping him control the systems of his body. Keep the systems running properly and Frankie will live to a ripe old age. But if the systems fail to do their jobs, then poor Frankie's "time will be up". Little Frankie's life is in your hands, so before you load the program and bring Frankie to life, let's make sure you know how to keep him alive.
As Frankie's body is constructed on your monitor screen, you will be able to experiment with some of the different cells and systems of the body. The following 'tour' of Frankie's body is meant to be read while viewing the first part of the program (INSIDE FRANKIE STIEN). After loading and running the program, (see LOADING INSTRUCTIONS), DO NOT press any keys until told to do so in these instructions.

Now LOAD and RUN the program. When you see the word "START" on the monitor screen, begin reading the following 'tour' of Frankie Stien.

* * * START * * *

* * * PRESS ANY KEY TO CONTINUE * * *

1) The Brain -(which Frankie has little of) is the major organ of the nervous system. The brain (1) monitors and controls the body.

* * * PRESS ANY KEY TO CONTINUE * * *

2) The Sensory System - is the part of the nervous system that brings information to the brain. Frankie has only the sense of sight, (as illustrated by his eye (2)). He is missing the senses of touch, taste, smell, and hearing.

* * * PRESS ANY KEY TO CONTINUE * * *

3) Nerve Cells - Nerve cells (3) are strung, end-to-end, throughout the body like electrical wires. Nerve cells pass electrical signals from one nerve cell to the next, carrying information from the senses to the brain. For example, the optic nerve is a string of nerve cells which carry coded electrical signals from your eye to your brain. Nerve cells also pass messages from the brain to the different parts of the body the brain controls.

* * PRESS 1 TO STIMULATE THE NERVE CELL OR 2 TO CONTINUE * *

4) Muscle Cells - Muscle cells (4) contract (shorten) when they receive an electrical signal from the nerve cells. Many muscles are connected to bones. Contracting muscles pulling on bones cause you to move. Muscles also help you breathe.

* * * PRESS ANY KEY TO CONTINUE * * *

5) Bone Cells - The bones of the skeletal system have 3 main functions:
   a) Bones support, shape and protect the body.
   b) Muscles are attached to bones. When muscle cells contract, they pull on bones, causing the body to move.
   c) In the center of some of the bones is the bone marrow. The bone marrow (5) is a spongy area where red blood cells (RBC) are formed. Bone marrow is the only place RBC is produced. You will use the bone marrow in Frankie's skeletal system to control the amount of RBC in the blood.

* * PRESS 1 TO STIMULATE BONE MARROW OR 2 TO CONTINUE * *

6) The Respiratory System - The lungs are the main organ of the respiratory system. The lungs are full of little 'air sacs' called alveoli (6). Capillaries run next to the alveoli, (like the one on the screen (6)). Gases, like oxygen (02) and carbon dioxide (C02), pass through the wall between the alveolus and the capillary. Liquids, like blood, will not pass through the wall. This allows us to bring 02 into the blood where the RBC absorb it and carry it to all the cells of the body.

* * * PRESS 1 TO BREATHE OR 2 TO CONTINUE * * *

7) The Excretory System - The kidneys are the main organ of the excretory system. The kidneys are full of structures called glomerulus (7). The glomerulus are full of capillaries. As the blood flows through the glomerulus, waste products, like urea and dead RBC are filtered out of the blood and removed from the body. Water and substances the body needs are returned to the blood. Stimulating Frankie's excretory system, will raise the levels of H2O and lower levels of urea in the blood. Suppressing the excretory system lowers H2O and raises urea levels in the blood.

* * * PRESS ANY KEY TO CONTINUE * * *

8) The Digestive System - The stomach and intestines are the major organs of the digestive system. The digestive system changes the food we eat into the type of food our body's cells can eat. The intestines are lined with finger-like structures called villi (8). Inside the villi are capillaries which absorb digested food from the intestines into the blood stream for transport to the cells. As with the respiratory system (6) and excretory system (7), the digestive system (8) does its' work in the capillaries.
Cells use a type of sugar called glucose as their main food. The computer will monitor glucose levels in Frankie's blood as an indication of how Frankie's digestive system is functioning. Stimulating the digestive system (8) will increase glucose levels. Suppressing the digestive system will lower the glucose levels.

* * * PRESS ANY KEY TO CONTINUE * * *

The Circulatory System -
On the screen are 3 types of blood vessels. Blood vessels are pipeline-like tubes through which blood flows to all parts of the body. We can see the blood vessels are made of cells.

On the right side of the screen is an artery. Arteries are blood vessels which carry blood away from the heart, to the capillaries.
On the left is a vein. Veins carry blood from the capillaries, back to the heart.
Running across the middle of the screen, connecting artery to vein, is a capillary. Capillaries carry blood between arteries and veins. The capillaries bring blood close to every cell in the body.

Frankie's blood is about 55% plasma, a watery fluid carrying digested food to the cells of the body and dissolved wastes from the cell for removal from the body. Plasma also serves to 'flush' the blood cells through the blood vessels.
The other 45% of the blood is made up of blood cells.
Red blood cells (RBC) make up more than 90% of the blood cells. The RBC are round, disk-shaped cells which pick-up oxygen (O2) from the alveoli in the lungs and then return to the heart to be pumped through the arteries to the capillaries. Notice that the RBC in the arteries (right side of screen) are bright red. These RBC are full of oxygen (O2) which gives them this color.

* * * PRESS ANY KEY TO CONTINUE * * *

The RBC goes from the arteries into the capillaries. Here the RBC turns darker in color, as it releases its' O2 through the capillary wall and into the extracellular fluid for use by the body's cells.

* * * PRESS ANY KEY TO CONTINUE * * *

As the RBC move from the capillaries into the veins (left side of screen), they become even darker because they are so low on O2. The RBC flow through the veins to the heart, to the lungs and then back through the body, serving as a "delivery truck as it drives" (or floats) through the blood vessels delivering O2 to all the cells of the body.
The computer will monitor the percent of Frankie's blood which is RBC.
Having too few RBC is a condition known as Anemia. Anemia is dangerous because too few RBC will leave the cells with too little O2.

Polycythemia is the condition of having too many RBC in the blood. This can clog the blood vessels. You will have to stimulate or suppress the bone marrow (5) to keep the RBC count at the right level.

* * * PRESS ANY KEY TO CONTINUE * * *

White Blood Cells (WBC) - WBC make up less than 1% of the blood cells in blood. The WBC destroy germs that invade the body. Unlike the RBC, the WBC can move through the cells of the blood vessel walls to attack germs in the tissue. During the game, if the screen shows : "WBC ACTIVATED", this means that germs have invaded the body. You will need to look closely at the screen to find the moving germ. Then use the arrow keys (E,D,X,S) to move the activated WBC toward the germ. You will have to look closely at all of the WBC (the oddly shaped, light colored cells) to see which is activated. The activated WBC will be black in color to make it easier to see. (NOTE: The WBC may be off the bottom of the screen. If you cannot find it try using the up arrow (E) to bring it up onto the screen.) Moving the WBC over the germ will destroy the germ.
Leukemia is a disease where the blood has too few WBC. If Frankie runs out of WBC he will probably die if invaded by germs. WBC levels cannot be controlled by the player.

* * * PRESS ANY KEY TO CONTINUE * * *

One-way valves are found in the veins but not in the arteries. Blood in the veins, being further from the heart's pumping action, is kept flowing toward the heart by these one-way valves. Blood may flow forward but is kept from flowing backward between heartbeats by the one-way valves. Although you will not see the heart on your monitor screen, the opening and closing of the valves will indicate the heartbeat (or pulse).

This completes the tour of Frankie's body. The OPERATING INSTRUCTIONS and LEVEL CONTROL CHART will tell you how to maintain the proper levels in Frankie's body. The chart will also explain the proper ranges for each monitored item.

Good Luck- And remember that little Frankie's life is in your hands.

* * PRESS ANY KEY TO BRING FRANKIE TO LIFE * *

GENERAL OPERATING INSTRUCTIONS AND EXAMPLES :

The object of the game is to Keep Frankie alive as long as possible. To do this you will have to stimulate and suppress some of the body's systems to Keep the body 'in balance'. Frankie's body will run automatically, but he needs your help to Keep things running correctly. Closely monitor the changing levels of : Oxygen, Water, Urea, Glucose, and Red Blood Cells. Watch for levels which become too low or too high. Five bar graphs are shown on the screen reflecting the levels of five bodily systems (top to bottom: oxygen, water, urea, glucose and red blood cells). The level indicator is shown by use of a black "I", which moves back and forth along the graph throughout the game according to the level present. Red areas on the bar graph indicate critical zones, while blue areas show acceptable levels. The graphs assume a range of 1-100%. Use the LEVEL CONTROL CHART to find proper levels of each monitored item. When a level becomes too high or too low, press the Keys indicated under "Sequence of Operation" on the LEVEL CONTROL CHART.

The following are examples of action to be taken to Keep Frankie alive under conditions which may arise during Frankie's life time.

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INDICATOR LEVELS	CORRECTIVE PROCEDURE
EXAMPLE 1	Too many RBC leading to Polycythemia
OXYGEN =92%	1) Press 5 to activate bone marrow
WATER =65%	2) Press 2 to suppress bone marrow
UREA =50%	production of RBC
GLUCOSE =70%	
+ RBC =58%	
EXAMPLE 2	Low Oxygen (02) level
- OXYGEN =60%	1) Press 6 to activate respiratory
WATER =69%	system
UREA =55%	2) Press 1 to stimulate respiration
GLUCOSE =85%	
RBC =45%	
EXAMPLE 3	Excretory System failing
OXYGEN =80%	1) Press 7 to activate excretory
- WATER =60%	system
+ UREA =70%	2) Press 1 to stimulate excretory
GLUCOSE =80%	system
RBC =40%	

* * * DANGER !!! WATCH OUT FOR INVASION OF GERMS !!! * * *
The Computer will control production of WBC. When the screen shows: WBC ACTIVATED
- Quickly use the arrow keys (E,D,X,S) to move a WBC into the tissue to destroy the invading germ. The longer it takes the WBC to catch the germ, the more damage will be done. A tone will sound when the germ is destroyed. If Frankie runs out of WBC (develops Leukemia), he will die if invaded by a germ.

Press 'Q' to end game.

LEVEL CONTROL CHART
for
FRANKIE STIEN

MONITORED ITEM	MAINTAINING PROPER LEVELS	SEQUENCE OF OPERATION
Oxygen (02)	Levels must not fall below 55%. Stimulate the respiratory system to increase the level of 02.	6,1
Water (H20)	Stimulate the excretory system to keep H20 levels above 50%.	7,1
	Suppress the excretory system to keep H20 levels below 90%.	7,2
Urea	Stimulate the excretory system to keep urea levels below 85%.	7,1
Glucose	Stimulate the digestive system to keep glucose levels above 30%.	8,1
	Suppress the digestive system to keep glucose below 90%. High glucose levels could make Frankie overweight and increase his risk of heart disease.	8,2
RBC	Stimulate bone marrow to prevent Anemia by keeping RBC levels above 20%.	5,1
	Suppress bone marrow to prevent Polycythemia by keeping RBC levels below 70%.	5,2

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NOTE: You will need to press down on the keys until the program displays that the system has been made ready. The program keeps the computer very busy and you may need to press down for a few seconds to get a result. In learning to play the game,try pressing the keys listed under Sequence of Operation, above, 1 at a time (waiting to see them display SYSTEM ACTIVATED) and note the effect on chemical levels. Learn by experimenting, Frankie won't mind.

INTELLESTAR

1) BRAIN - NERVOUS SYSTEM

2) EYE - SENSORY SYSTEM

3) NEURONS (NERVE CELLS) - NERVOUS SYSTEM

4) MUSCLE CELLS - MUSCULAR SYSTEM

5) BONE CELLS (BONE MARROW) - SKELETAL SYSTEM

6) ALVEOLUS (AIR SAC) - RESPIRATORY SYSTEM

7) KIDNEY - EXCRETORY SYSTEM

8) INTESTINES - DIGESTIVE SYSTEM

RED BLOOD CELLS (RBC) - CIRCULATORY SYSTEM

WHITE BLOOD CELLS

ARTERIES - CIRCULATORY SYSTEM

CAPILLARY - CIRCULATORY SYSTEM

VEINS - CIRCULATORY SYSTEM

VALVES