S.T.A.I.R.

General problem solving strategy that can be applied to a range of problems.
Goals

- Identify the key problem(s)
- Identify tools to assist in solving the problem
- Develop problem solving strategies
- Use your tools and strategy to solve the problem
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The Challenge of Computers

- Nature of computers - more universal in nature, not single tasked.
- Changing pace of technology
- Challenge of software diversity
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Confronting the Challenge of Computers

- Skilled computer users:
  - Have a strong general knowledge about how computers work and what they can and can’t do.
  - Know the main types of applications that are used.
  - Know what features they can expect to find within an application.
  - Skilled computer users have little fear of technology.
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Confronting the Challenge of Computers

- Becoming a skilled computer user
  - Make educated guesses to determine how things work. Don't worry if their guesses are sometimes incorrect. *They learn from their mistakes by trial and error.*
  - They rely on their ability to solve new problems and find answers independently than on previous knowledge of the commands of an application program.

- *The most universal characteristic of skilled computer users are that they are skilled problem solvers.*
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- Problem-solving can be seen as more of an art than a science.
- Each person has different ways of approaching problems.
- My intention is not to limit your problem-solving processes to our way of thinking, but to give you a framework you can fall back on when you are stuck.
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State the problem
Tools for the job
Algorithm development
Implementation of the algorithm
Refinement
S.T.A.I.R.

State the Problem

- This step seems obvious enough, but it is often the one people skip.
- We frequently start solving problems before we really think carefully about what problem we are trying to solve.
  - The result is confusion and wasted time.
- Take the time to describe carefully to yourself what you are trying to accomplish.
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State the Problem

- Avoid the temptation to phrase the problem in technical terms.
- Use whatever you need to make sure you have a firm understanding of what you want to accomplish.
  - Write down the problem
  - Make a diagram or flowchart
  - Draw a sketch
- If you don't know where you are trying to go, how will you know when you get there?
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Tools for the Job

- A tool could be anything
  - Command
  - Button on a toolbar
  - Selection on a drop-down menu
  - Strategy
  - Program
  - Anything that can help you depending on the kind of job you are trying to do and the context in which you are working.

- Most of the time, there is more than one tool available to do a job.
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_Tools for the Job_

- List the available tools and write them down.

- As you gain experience, you will constantly be adding new tools of all kinds to your repertoire.
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Algorithm Development

- An algorithm is a computer science term for a strategy or plan of action.
- Part of developing an algorithm is choosing an appropriate tool or set of tools from the previous step and determine how those tools will be used to solve the problem.
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Algorithm Development

- Algorithms can vary widely in the type and complexity of the strategy you will use.

- With less complex problems, your algorithm may be as simple as saying "I'm going to try pressing this particular button on the menu bar." A more complex problem will likely require a more complex algorithm and for you to write it down.
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Implementation of the Algorithm

- Thus far, none of the previous steps required the use of a computer.
- This step is the actual process of translating our human thought into something the computer can understand.
- With simple problems an algorithm may be implementing a command or two and all you have to do "just do it".
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Implementation of the Algorithm

- Programmers think of the implementation step as translating the algorithm into some type of computer programming language.
- The process is the same regardless of the complexity of the problem.
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Refinement

- We like to think if we learn a skill and prepare ourselves properly, we can solve a problem on the first attempt. Experience shows us this is not usually the case.

- A skilled problem solver will analyze what happened, review the other steps, and try again.

- Each unsuccessful attempt should bring you closer to an understanding of the problem and its solution. Use the process of elimination.

- As Sherlock Holmes said - Eliminate all other factors, and the one which remains must be the truth (solution).
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Refinement

- Refinement usually means going back and looking at the previous steps critically.
  - Ask yourself if you really defined the problem properly?
  - Have you used all the possible tools at your disposal? Are there any tools you overlooked?
  - Did you choose the best algorithm for the job?
  - Did you implement the solution properly?

- Practice will make you much more confident at this critical stage of the process.
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Main Concepts

- Computers are universal machines - the same machine can do many different kinds of tasks.
- Learning to use computers effectively requires problem solving ability.
- The STAIR method is one way of organizing the problem solving process.
Main Concepts

**Statement of Problem**: defining with words, sketches, or other means what you want to accomplish.

**Tools**: Identify concepts, commands, menu items, toolbar buttons, programs, or ideas that can help you solve a problem.

**Algorithm**: A strategy for solving a problem.

**Implementation**: The process of translating our human thought into something the computer can understand.

**Refinement**: The process of studying an unsuccessful attempt at problem solving and looking back at earlier steps to approach a solution.
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Example: Drawing Rectangle

**Implementation** – Use S.T.A.I.R. to complete Implementation

- **Statement of Problem**: Nancy needs to draw a rectangle to represent her Aunt's house.

- **Tools**: She spots a button on the toolbar that has a picture of a rectangle! If she doesn't see it there, she knows she can cruise the menus for a likely looking command, or check the on-line help.

- **Algorithm**: She decides: "What the heck. I'll press it and see what happens."

- **Implementation**: She presses the button. The cursor on this screen changes, and when she drags the mouse on the screen, she is able to draw a rectangle. She practices a few times until she has the hang of it.

- **Refinement**: After she knows how to make a rectangle exactly how she wishes, she puts one where her aunt's house should be on the map.