Learning To Use HP Calculators

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HP is getting feedback from customers that their machines are hard to learn to use. This raises three questions. (A) Is this true? (B) Why is this thought to be true? (C) What could help the new user learn easier?

Is Learning An HP Calculator Really Hard?

No. An HP low end machine is no difficult to learn than any other calculator. As you increase the complexity of the problems being solved you increase the complexity of the user interface to solve those problems. Perhaps the question implies that HP's advanced calculators are harder to learn. Or does the statement imply that HP's calculators are harder to learn then TI or Casio calculators?

Wlodek Mier-Jedrzejowicz: "We" were taught in technical schools at a time when various other methods of calculation reigned - when calculators came along they made work easier and we rarely think of them as difficult to learn.

HP's current models are in large part difficult because they are complicated. I see no simple and intuitive way to approach CAS on a calculator - say you enter a trig expression and want to do something with it. What?

Solve it,
Change to all cos (or all sin) terms,
Rewrite it in terms of sums of X and Y,
instead of products of sin(X) and sin (Y), or vice-versa.,
Integrate it numerically,
Integrate analytically,
Plot it,
Rewrite in terms of half angles,
Change the unknown variable,
etc, etc...

Each action needs further information.

You can begin with an intelligent menu system that pops up a list of things the user might want to do, once the expression is entered. Still complicated.

As we well know, even RPN has always been considered "difficult". It used to take me 5 minutes to show an intelligent and well taught student that it is not. But an online exercise or tutorial does not work like a teacher sitting next to the student, and itself is considered difficult. We need a new kind of teaching tool - or else an HP-1s first to get the students started!

A vital part of this question is the actual use of the machine. Solving a complex problem once a month is a completely different situation than solving complex problems all day long. The answer to this question is also dependant on your background. See the other sections below for further insight to this question.

Why Are HP Calculators Thought To Be Harder To Use?

Are HP calculators any more difficult to use than other calculators?

Gene Wright: Sometimes, it is said by others "HP calculators are hard to use". What are some of the reasons why people might say this?

Before answering this, it must be understood that if the comment is directed toward HP's high-end graphing models (the HP50g, HP49g+ or HP49g), then those making these statements are correct. These advanced models ARE hard to use. The reason is because they are the most advanced calculators ever made. Because of that, there is a very steep learning curve that must be conquered before they can be used effectively. As an analogy, consider someone who says "my class is hard in school". If that class is numerical algorithms or differential equations, then the statement is understandable.

Same thing with someone using the most advanced calculator ever made. It will be more difficult to use than a 4-function adding machine.

Richard Nelson: Is this because it takes talent far beyond the average to be able to master the subject? Is HP the average? Another analogy is something everyone may relate to. Examine the dash board of the average car. Look at the dashboard of a race car and there are more gages and indicators. Can the average driver drive a race car? Now look at the "dashboard" of a 747 and you are over whelmed. Does the average pilot fly a 747? It takes special talent, time, and training to understand and read the gages and indicators of the advanced state of the art model. It also takes an interest and motivation to attempt it. Still, I believe that the high end graphing machine DOES NOT have to be difficult to use. That is an area where HP may contribute to distinguish themselves.

Gene Wright: However, I believe there is one BIG reason why someone might say "HP calculators are hard to use". I believe this statement is often a substitute for what the person really means.

1) "HP calculators don't work like the Texas Instruments calculators I've seen before"

I believe this is by far what most people are really saying. Let's face it; TI dominates the elementary and high school markets. In almost all cases, people under the age of 40 have used a TI calculator in school. When they then encounter a calculator made by HP, whether in college or in a financial job, they are presented (sometimes) with a calculator that doesn't look like those they saw in high school. It has different functions on the keys, it's not one they've seen before, and they may even be presented with a strange picture: "Where's the equals key?"

Texas Instruments calculators are not "easier to use" than HP calculators. Not at all. But HP calculators are different from them and unless HP decides to produce calculators that are exactly the same as the TI models that will always be a problem.

2) “There isn’t as much material available to show me how to use the HP calculator as there is for the TI”

HP is guilty as charged here. TI has more manuals, more materials online, more printed materials available and more third party materials available than HP has. If that is what the person means by “HP calculators are more difficult to use”, then the solution is for HP to invest some time and money to do something about it. When presented with alternatives to address this shortcoming, there are always barriers.

Printed materials? --- “HP’s cost structure won’t allow internal part numbers for printed extra manuals”

HP Materials printed by third parties --- “The deal didn’t work out”

Richard Nelson: The manual printing issue is a very old issue and the solution is easy, IF someone with budget say so at HP really thought that it was important. Printing manuals in China has to be inexpensive. If HP doesn't want to be in the publishing business they should set someone else up to be in the (HP) publishing business for their manuals, books, lesson plans, etc. This is a solvable problem and it is one that could provide HP significant progress in working their way into the education market.

Gene Wright: Summary

While I believe answer #1 is a big part of the perceived problem, answer #2 is a barrier to someone considering HP over TI.

Consider the position of the HP39g+ calculator. It is superior in almost all respects to the TI83/TI84 competitor. Better graphics, more usable, etc.

BUT, the TI83 and TI84 come with lesson plans already made out. All the teacher has to do is follow the guides TI prints and GIVES to them. Any teacher considering switching their classes to the HP39g+ calculator is on their own.

HP does not have the materials to send them and there is probably little chance HP will commission them.

Richard Nelson: Here is an opportunity for HP to stimulate the few educational followers they have. These people could produce the needed materials and they would do so IF HP just provided a program to inspire and guide their efforts. This idea has been proven effective time and time again. Tap into, and use the energy and enthusiasm of the HP User Community!

Gene Wright: So, rather than wondering “Why ARE HP calculators more difficult to use than the TI models?”, I believe the underlying meaning of the original statement needs to be better understood.

HP calculators are NOT harder to use in and of themselves.

Richard Nelson: I am not sure I agree. List processing is a fantastic capability. Integrating statistics into the list processing "envelope" is also great. This more powerful approach, however, makes it more difficult to input a few data and calculate the mean and standard deviation. The KISS principle is vital for these machines. One solution is to include the classical user interface as well so I don't have to reach for the HP-32SII to do simple statistics. The bottom line calculator-use-measurement guidelines must be efficiency, time, and simplicity. These qualities are vital to the continued life of the handheld calculator.

Jake Schwartz: Has anyone noticed how a large number of the Asians play competitive table tennis (ping pong)? They hold the paddle completely differently (way up on the handle) than most people do around here (which is like gripping the handle more like a tennis racket). Is that harder to use? On the contrary, it is ***different,*** and it could also be argued that it is more efficient (especially when hitting a back-handed shot). Somehow they learned this way and it stuck. I've tried it and after getting used to it, there indeed seems to be an advantage to that way of holding the paddle. Is the issue of calculator entry systems that dissimilar to this, or is it that it's just not important enough to users to matter? I don't know. HP could even use an analogy like this (or perhaps a fork versus chopsticks?) in their promotional materials comparing RPN to algebraic.

Richard Nelson: Here lies the great divide. HP doesn't care which is better. They (like every well run business) care about the system that sells the most calculators. We *know* that RPN is better and perhaps some of the folks at HP *know* this as well. But knowing doesn't sell, believing does. What does the customer believe? Besides, RPN may not be the "best" system in all situations for all models. What is most useful, however, is offering the customer a choice. That is a situation that the other manufacturers have sort of boxed them selves into not being able to do. It would be more difficult for TI or Casio to offer RPN than for HP to offer ALG (which they do and will continue to do).

Jake Schwartz: There are advantages, and if they matter to you (or if the person introducing it to you believes in it), you will opt to go with the more advantageous system.

Richard Nelson: Not necessarily. Part of the issue is change. People want change, yet they are resistant to changes that involve thinking and effort. Changing the way you do a mundane repetitious task is quite difficult. I am willing to bet that most table tennis players would find it difficult to change the way they hold the paddle if they have been playing for very long. The question to ask is, what is the motivation to make the effort to change? Take an example that affects us all, our computer keyboards. If the QUERTY keyboard is what we know and another layout would be 30% more efficient (faster) do you think the public would be willing to re-learn how to type? The issue is a balance of risk, effort, and reward. Is the reward worth it? The converted always think so. Think of it the other way around. Suppose you had to switch over to ALG? Would you resist having to change if you didn't have to? What would the reward have to be to make you learn to use an ALG machine? A free one day (converting from RPN to ALG) training seminar with lunch? A free machine? HP to go out of business?

The critical element in all of this is time. Each person has the same amount of time, it is the decisions we make as to how we use this time that is important to understand. The seller not only wants to have the customer who wants or needs their product to take the time to buy it, but they want anyone who could use the product to do the same.

In the end I believe that HP should offer both RPN and ALG, they should promote RPN, and they should improve ALG. They should promote this "universal" approach in the new product line.

Jake Schwartz: Your discussion regarding teachers preferring the ***inferior*** TI calcs . . .

Richard Nelson: We HP users believe this to be a true statement, but in the end it is a judgment statement. What has to be the reward for the ALG user to convert to RPN? Is this reward so great that HP could never provide it? Perhaps it is better to take the high ground and educate the potential new customer (student or professional) and provide materials showing the various systems and how they compare - objectively. Use objective measures that a scientist would smile at. The bottom line is the selection of the best tool needed to solve problems. Which is the "best" should be up to the customer. Regardless of the complexity or type of machine there should be an HP model that meets the customer's needs. That is one way HP may distinguish them selves and regain the high ground. HP should be viewed as simply the best.

Jake Schwartz continued: because they come with lesson plans reminds me of some of the better shopping web sites: After you select a product, it not only offers you the various retailer prices sorted from lowest to highest, but you may also click a button and it will also sort the prices and vendors when shipping costs are factored in. And undoubtedly, the order of the vendors changes dramatically (since many retailers like to gouge people on the shipping to make up for the rock bottom product price). If HP is serious about entering the education market to any degree, they need to also hold those teachers' hands. I wonder though, how many which are already "in bed" with TI would switch to HP if the teaching materials were every bit as good. Assuming the materials were equal in quality, shouldn't there be something else which would differentiate HP for the teachers? Do the teachers much care which calc brand they recommend, so long as the students receive the training they need? Another issue is peripherals. HP had it right with the 41 system, and then they forgot how to do it. TI started later with the graphing machines, but they never stopped. Now they are way out ahead with overhead devices and data loggers and IR blasters and such. How does one catch up on that front?

Richard Nelson: Two points. Often it is the school Department Head that recommends a "standard" manufacturer and model for everyone to use. This has little to do with what the teachers want. Joseph Horn could tell you first hand horror stores regarding this topic. In the history of American marketing the number two company is seldom able to overtake the number one company. Avis had a famous marketing campaign that tried to capitalize on being number two. Jake is right, it is nearly impossible to do. The issue is that there will always be a "premium" quality product that costs more, is worth more, and actually provides more value. Professionals are far less cost sensitive than "starving" students. Perhaps it makes sense to have the product line divided into two classes. The "TI" like student models, and the more expensive, yet naturally familiar "professional" models.

Naturally having a previous familiarity with an HP machine helps in the learning process of a new or upgraded HP model. This is not always true, however, and a substantial number of the one million HP-41 users did not like the HP-48 series machines with their RPL operating system. Was it the fact that these HP users strongly related to the simplified and exceptions-to-the-rules HP-41 RPN? Certainly RPL is a more pure form of RPN; RPL changed the familiar RCL A keystroke sequence to A RCL. Was it the lack of a familiar step by step programming structure? Was the issue the higher level RPL programming language Vs. simple keystroke like sequential Focal programming?

Obviously the added complexity of RPL and a greatly expanded function set is also an issue. In general terms some of the HP calculator learning issues relates to the basic nature of human learning. Years ago I was the Electronics Department Head of a very large technical school. I had the full authority to decide on the four year high school and two year college electronics course. I selected the text books, the lab experiments, the exam standards, the subjects of study, etc. I was young and I had an incredible

opportunity to contribute because the Director of the 3,000 student school had great faith in me. We both shared the same "hands on" view of education.

One year I decided to try something new. I wondered if it would be better to teach the general concept of a receiver first and then the various types of receivers second. The normal method is to teach the student – in those days – the five tube AM AC/DC Radio receiver. They built their own radio from scratch doing everything from bending the chassis to wiring the parts. They learned how to tune it and how it worked. In later classes they were taught about FM receivers, TV receivers, short waver receivers, etc.

The classical approach was to learn a specific, detailed receiver and then relate all other receivers to what they knew very well. I wanted to teach – in more abstract terms – the general concept of a receiver first and then get into the details of the different kinds of receivers second. I did this for one year and it was a really great experience to learn first hand that most of us learn more easily going from the specific to the general, not the general to the specific. This first hand learning experience reminded me of the old adage, "Yesterday I read a book and I learned nothing. Today I read a book and I learned something."

What makes learning a new calculator difficult? I was discussing this topic a few years ago with one of the creators of RPL, Bill Wickes. He asked, "How do you differentiate between familiar and friendly?" The calculator zealot will have little difficulty with such things, but the average student or young professional is more focused on solving the problem than learning all about calculator theory.

These questions and issues are especially important as HP is being "reborn" in their view of their product line. They have had to relearn some of the important lessons of what the more traditional HP user wants and expects of HP. A recent example is that they had to re-learn the importance of high color contrast for keyboard notations and the critical requirement of keyboard reliability. The "new" HP is more willing to work with and accept the inputs of the HP User Community, HPUC, and we saw this with the contributions the HPUC made to the Advanced User's Reference manual for the HP 49g+ and similar machines as presented at HHC 2005 in Chicago.

Making HP Calculators Easier To Learn

Before we attempt to suggest specific ideas and provide inspiration for HP to think about for future machines it might be useful to review the basic elements of the learning process. Typically there are four elements; often expressed as motivation, retention, reinforcement, and transference.

Motivation: If a calculator user is not motivated to learn the new machine HP's efforts will be wasted. HP can prepare its customers to learn the new machine by providing a friendly and open atmosphere of communication with its customers. HP must provide an appropriate stimulus to the student and young professional to invest in the learning process. Inspiration was provided in the early days of calculators by providing good literature with great high quality images of applications of their products or related technical equipment that the calculator is used with.

Retention: In order to benefit from learning, students must retain information. The amount of retention is directly related to how well a student learns the information initially. Practice is the key to ensuring retention. How easy is it to remember the solution process? Are the illustrations well thought out or was a graphic "thrown in" just because a graphic was needed. Meaningful illustrations and thoughtful use of symbols all contribute to the user's retention of the problem solving process. A critical aspect of the problem solving process is simplicity. Avoiding overly complex and arbitrary methods of interfacing with the machine are important aspects of increasing the user's retention.

Reinforcement: Reinforcement is ensured when HP encourages appropriate thinking and performance in the solution of problems. The use of both positive and negative reinforcement will change behaviors and old practices. In modern high end machines such as the 48, 49, & 50 series there are usually three to five ways a particular task may be done. The HP "teaching method" should include all of these solution paths with an explanation as to which one is preferred over the others in any given situation. One of the best ways HP can provide reinforcement is through the consistent use of terms, ideas, and symbols in every thing they do. This is done by the presentations on the product boxes, on their web site, in any promotional literature, etc.

Transference: Transference describes the ability to transfer or apply learning as a result of studying or training. Transference tends to occur when:

- The users can *associate* the new information with something they already know.
- The users find *similarities* between the new solution method and something they already know.
- The users have a high degree of *original learning.* (Each user is unique).
- The users need to learn this information for a *critical reason***.** (Class, hobby, job, etc.)

It is important to provide a challenge to the prospective user with capabilities and results simply conveyed to the user. In addition to these aspects of the learning experience HP needs to provide feedback and relevance. All of the above are broad generalities that are useful to illustrate the perceived problem – HP's machines are hard to learn.

There are several aspects to making the machine easier to learn but one of the most important is time. No one wants to wait. We live in an "instant" world and we are expected to get answers quickly. Slow and consistent are not readily understood or appreciated in a world where the Internet provides instant visual information to everyone connected.

The issue of easy to learn Vs. easy to use is not new. Bill Wickes addressed this very issue in *HP48 Insights Part I: Principles and Programming* by William C. Wickes, Larken Pubs copyright 1991. Here is a quote from that book.

"1.5 Easy to Use or Easy to Learn?"

"It would be nice if you could pick up the HP48 and use all of its facilities without ever referring to a manual. A common criticism of the HP48 is that it takes a long time to master, particularly by comparison with other recent HP calculator products such as the HP17B and the HP19B, and with some of the simpler function-plotting calculators made by other manufacturers that have become popular in mathematics education at the pre-calculus level. But these calculators obtain their ease of learning by having very limited computational capabilities and flexibility compared to the HP48. If your problem "fits" one of these other calculators then it is easy to use as well as easy to learn. But it you want to do something just a little different, you will find that "easy to learn translates to "impossible to use."

"The HP48 approach is to provide a broad, very flexible set of computational capabilities, many of which have never before been on a handheld calculator. Furthermore, it is expressly designed for "linking" calculations together—the results of one calculation are always ready to be used as input for another, even if you don't know in advance that your work would proceed that way, and even if the calculator designers didn't expect you to make that particular combination of calculations. These ideas are what the HP 48 means by "ease of use."

"Ease-of-learning" is a different story. Unfortunately, the HP 48's rich capability set doesn't leave enough built-in memory to provide "no-manual" learning. And their's no doubt that the HP 48 does work differently from other calculators, even from its RPN calculator predecessors like the HP41. You have no choice but to spend some time reading the manuals and learning new procedures. But learning the basic ideas doesn't take a long time, and once you master them, a wide range of truly easy-to-use calculating capabilities is available to you."

How can HP make their machines easier to learn to use?

Easier HP Calculator Learning Suggestions

Hardware

A. Easy to See. A calculator is used because it is convenient. It is convenient because it is small, light, and portable. Because of these qualities the calculator tends to be wherever the problem is; on the job, in the classroom, or in the field – day or night. The old adage, "By night all cats are gray" certainly applies and all too often the light level, type of light, angle of light, and even the polarization of light is over looked in the design. This easy-to-see aspect relates to the contrast of the colors used for the keyboard. Gene Wright gave a presentation of an objective method of measuring calculator keyboard contrast at HHC 2004. HP took notice and the newer machines are improved in their use of color.

The development and testing of many products requires the device under test to be in a specific environment such as temperature, humidity, pressure, or atmosphere (Argon atmosphere for laser welding, for example). A glove box is often used for this purpose. See figure 1.

Wouldn't it make sense to make a similar light environment viewing area for calculators? Various light sources would surround the viewing area. They would be adjustable in intensity. The working platform of the calculator would be adjustable for viewing angle as well. Of course a sealed environment with gloves would not be needed. The room would have to be like a dark room and all lighting operated from a single control panel.

Fig. 1 – Glove box used to work in a controlled environment. Note the microscope above the gloves in this version.

Tests for visibility must be made for both males and females. Over the years marketing has clouded good engineering principles in the design of HP's calculators. Pastel colors may look good but are they easy to see in all lighting conditions?

Making the calculator easy to see includes the display. New display technology provides greater resolution and there is a strong temptation to try to cram more information (text and symbols) onto the display. One of the reasons the HP-12C is the most popular finance calculator is its large, easy to see, segmented display.

Keyboard notations are just as important. They should be as large as possible for easy seeing under all lighting conditions. The choice of fonts must be made for readability over style under all lighting conditions.

B. Comfortable feel. A plastic machine is very light. A plastic case may have a very smooth and shiny (flashy, cool looking) surface. These traits may seem desirable from a marketing perspective but are they practical? The machine must be handheld and often held and operated with a single hand. The calculator must feel secure in the hand and provide the proper weight and texture, even with rubber grips. These are important design considerations.

Part of the feel of the machine is the way the keys work. HP has made a significant improvement in the new HP49g+ keyboard to improve the way it feels. Pressing a key and not having it register is very confusing from a learning perspective.

A comfortable feel for the machine – maximum convenience –contributes to making the machine easy to learn.

Software and Firmware

A. Consistency. One of the more important aspects of learning something new is consistency. The student is trying and testing new ideas and when the results seem to violate the newly learned rules there is confusion. Functions should always be explained and presented in the same way and soft menus should keep them on the same key if they appear in different menus. If color is used for identification, the same color should be used for every reference.

The use of symbols should be carefully evaluated for consistent appearance in the manual, on the keyboard, and in the display. These issues must be considered at the very beginning of the design phase of a new model.

Marketing considerations include change for change sake. Each new model must be distinguishable from the previous model. This requirement, however, is not always suitable from a problem solving perspective. Imagine the situation of a newspaper printing each edition using a different colored ink? This would be quite distinctive. Why not? If Sunday were brown, Monday red, Tuesday orange, Wednesday yellow, Thursday green, Friday blue, and Saturday violet the identification of the day of the week would follow good engineering practice in the standard of the color for each digit 1 to 7. I am sure, however, that some days would be less popular that other - Wednesday would be especially unpopular.

B. Universality. As electronics devices become more common in their use in the form of cell phones, PDA's, and digital cameras, etc. a familiarity is developing on how a task is best represented and implemented. Being more universal is greatly aided by the fact that mathematics is a universal language, especially in its use of symbols and operators. Following this universal mathematics language makes the calculator easier to learn.

Documentation

A. **Examples**. The first aspect that comes to mind is the one that customers always complain about not having enough of, *examples.* Of course this assumes HP's wiliness and ability to commit to truly useful documentation for the machine. The so called steep learning curve so often mentioned in this regard has to do with time. Users do not want to spend much time learning to use their machine. Examples save time. An important element for examples are multiple solved problems with complete full precision answers (for checking).

B. **How to.** Similar to examples are step by step instructions on how to perform a function or use a feature. Again the critical element is time. The style and formatting of these instructions is very important in order to save the user time. The use of symbols is a critical element here. The use of indented instructions, spacing, and actual keyboard key notations contribute to simplify instructions.

C. **References.** Several parts of the Owner's Manual (User's Guide, Instruction Manual, etc.) fall into a reference category of learning material. A ***multiple tier Index*** is vital. There must be at least three times the number of index entries as pages in the Owner's Manual. Another part of the manual is a ***Glossary of terms***. This is the place a confused user will go to for the correct term or phrase that will allow him or her to navigate the manual. All symbols must be in both the glossary and index. Another aspect of good references is the HP Calculator web site. Article titles may be provided so the manual reader may use the web site for additional or very detailed material. The web site commitment, however, must be to retain these references "forever' since HP's products are very long lasting. A ***Key/function listing*** similar to that found in the *Advanced User's Reference Manual* is helpful for the new user to learn the machine. Related to this is the idea that the machine is explained from the perspective of what the keys do. This technique is more frequently used in the simplified foreign copies of more complex machines. Isn't it nice to be able to be able to press a key and have the owner's Manual describe to you what should happen?

D. **Humor.** Math is dry, dull, and boring to many people who need a math tool. To make the machine easier and more fun to use the manuals should provide humor. Every movie director has to learn the technique of "comic relief" after periods of intense drama.

E. **Applications and Education.** Learning to use a calculator should be as pleasant an experience as possible. The incredible detail involved requires intense attention on the part of the student. Providing additional information than that listed in A-D above makes the chore more interesting and doable. Explaining why and where a function is used helps to maintain the interest of the student.

Why should HP examine the question of its machines being difficult to learn? If this is the accepted notion of the general public the primary HP customer will either be the ignorant one or the rare independent thinker. The normal distribution of the population for ignorant and independent customers is too small a group for HP to thrive. HP must consider the learning aspect of their calculators to not only distinguish themselves in the marketplace but to also insure that the calculator continues to be the best tool at-hand for its intended task.

Conclusion

A common belief among students and young professionals is that HP calculators are overly complex and hard to learn. This collection of thoughts has explored this belief and has attempted to put the issue of learning to use a calculator into perspective. The big four calculator manufacturers each have a different "style" in the way that they solve problems. The powerful and complex high end graphing machines all use the same command line entry system while the scientific machines use either ALG or RPN. A common believe exists that RPN is difficult to learn. While millions of HP customers have demonstrated that this is not true there are new customers coming up through the ranks every year as students. The complexities of the high end models in either the graphing or scientific category do have a steeper learning curve simply because of their extensive computational power and wide range function features. This thought collection, in anticipation of this year's Hewlett-Packard Handheld Conference, also includes ideas and suggestions related to the hardware, software, firmware, and documentation for HP to consider in future models to make them easier to learn to use.

Epilog

This "article" was shared with several people. Palmer Hansen, long time TI calculator newsletter editor and publisher had the following to add. He promises additional comments. All inputs and comments in response to this "article" will be available on the HHC 2006 Conference CD. Eric Smith also had a very recent experience related to this topic. His comments follow Palmer's — on page 12.

1. I don't know whether they still teach My Dear Aunt Sally in elementary school or not. If they do, HP needs to recognize that the algebraic systems start with a leg up. You can go into the educational system and preach that RPN is better using examples such as those in Wlodek's book until you are blue in the face but they won't believe you because IT IS DIFFERENT.

2. It has been nearly twenty years since TI decided to drop the TI-74 and TI-95, move to graphing calculators, and dominate the education market, which they did. The clear example of their success is in the calculator displays at Wal-Mart. I looked at about ten different stores during my last round trip to Florida. They have dropped HP completely, they have dropped the high end Casio's including the Casio graphics, they have dropped the high end TI graphics such as the TI-86 and TI-89 (the current clearance prices at the Brevard NC are $59 for a TI-86 and $75 for a TI-89) and they have added the Durabrand. As to the Durabrand, I don't know whether or not the Chinese will really make improvements or whether they will only make cheap knockoffs. In the old days, we always know that the Japanese would ALWAYS do product improvement.

3.. On making calculators which can do both RPN and algebraic: That is very difficult to do with already crowded keyboards. Look at the hp 33s for example where parentheses and the equal's key are second functions. No serious AOS user will want to use the damn thing. Suppose that TI decided to make a dual use machine and made the ENTER key a second function. Honestly now, what would the RPN community think?

4. All of the high-end machines are difficult to learn, particularly if the learner has not used lower end machines of the same genre. One reason the HP-41 was so acceptable in the HP community was because it followed the HP-65 and HP-67, used the same language, and fixed the deficiencies in those machines.

5. One final comment on RPN/RPL versus AOS/EOS. RPN is truly a Lower Order Language - closer to machine language. AOS and in particular EOS is a Higher Order Language - closer to languages such as BASIC and FORTRAN. Consider the famous Mach Number equation. If you solve it as part of a BASIC or 'FORTRAN program your solution will look extremely similar to an EOS solution. Your solution in BASIC/FORTRAN will not look anything like an RPN solution. I admit that you can solve the Mach Number problem on an AOS machine or in BASIC or FORTRAN just like you would on an RPN machine. In a recent thread in the HP Museum an RPN user did just that with a low-end TI machine because he had trouble doing it in AOS. But, now suppose that you were taking a BASIC or FORTRAN course and you were asked to develop a program which included the Mach Number solution. If you did it as you would in RPN what kind of grade would you get?

6. On readability of the display - how did the decimal point fiasco ever pass any kind of design review at HP? How did some of the small size, nearly illegible printing in the menus of the TI-89 ever pass a design review at TI?

Having a whole class using "the other model" is one sure way to compare how different machines work.

The following is from Eric Smith July 12, 2006.

I am currently taking a Linear Algebra course at a local community college. The college catalog and the course syllabus say that the use of a TI-83, TI-86, or TI-89 is "suggested". The syllabus simply lists those models under equipment, and does not state that they are optional or that other alternatives might be used.

I considered buying one of those calculators in order to "fit in" and be able to use the same key sequences as everyone else. But I tried out the TI-86, and found that I had a great deal of trouble figuring out how to use it, and that it was much less powerful than the HP 49G+, even for the simple linear algebra problems we have in the class. I can perform the required calculations more quickly with my HP 49G+ than anyone else in the class does with their TI, I get fractions in the results rather than a floating point number which must be converted back to fractional approximations, and I can put algebraic expressions in the matrices.

Admittedly, I had to figure out how to do those things from the HP documentation, while in class a few students know how to do things with the TI and teach others. But on multiple occasions the class has devolved into spending 20 minutes while people figure out how to get the TI to solve a particular kind of problem. None of those problems took me any extra effort to solve on the HP 49G+, largely because the logical operation of the HP is more consistent than the TI, and you do not have to get into any special modes to solve particular kinds of problems.

I have found that using the HP 49G+ rather than a TI has been a help rather than a hindrance, even though I am the only student in class using one. If there were other students using the 49G+, I would be happy to help them, and I might learn some new shortcuts from them.

I have also written various small programs on the 49G+ that solve some of the class and homework problems. I could not even figure out how to write programs to do matrix operations on the TI, though I imagine it must be possible.

One could argue that the reason I have been successful with using the HP-49G+ in class is my years of experience with HP calculators. But in order to work linear algebra problems, I do not see any reason why someone without former experience with either the HP or the TI would have a harder time with the HP. Doing matrix operations on the TI does not seem any more intuitive than on the HP, and the HP has a nicer matrix editor.

So far the one limitation of the HP 49G+ that I would like to see lifted in a future high-end HP calculator is the inability to use matrices inside algebraic expressions.

The instructor said that we could use laptop computers in class. I have purchased Mathematica 5.2 for Linux and installed it on my laptop, but so far the HP 49G+ has been more convenient. Perhaps later in the course there might be problems more easily solved with Mathematica?

I also purchased Maple for Linux; it's a long story having to do with Mathematica being incompatible with the processor of my old laptop. Maple has a built-in linear algebra "wizard" that demonstrates simple things like row reduction. But I still find the HP 49G+ to be more handy.

Eric