



Six factors that contribute to your learning environment

I've always thought of teaching as being a dynamic occupation. Many things change from course to course, and even during a given course. Like most instructors, I've had those *perfect* courses when everyone is highly interested and catches on right away. The first time it happened, I thought to myself, "I've finally found the formula! All I have to do is repeat what I did in this course with the next group of students." But of course, so many things change from course to course, that the magic wasn't repeated in my next course.

While I can't guarantee magic, there are several factors (we name six) that contribute to successful learning. You don't have control of all of them, but at least you should recognize and work on those factors you can control. If you're going to have problems with a group of students, you should also be able to recognize this early on in the course.

Motivation is the most important factor in the learning environment. It should almost go without saying that you should be highly motivated to teach. But you may be forced to work with students that aren't motivated to learn.

Motivation will help students overcome *any* problems they may have with learning. It will help them stick with it until they figure out the topic at hand. On the other hand, students lacking motivation will find it difficult to carry on in a class once they begin having problems. Fortunately, most of the students you face at college level, and especially those coming from local industry, should be highly motivated.

continued pg 2

Instructor Notes is published quarterly by CNC Concepts, Inc. and distributed free of charge to instructors that teach CNC courses. Simply contact us to begin your subscription!

PowerPoint Tips

Editor's note

Microsoft PowerPoint is fast becoming the software product of choice for professional presenters. Each issue of *Instructor Notes* will include PowerPoint Tips to help you improve your slide show development skills.

Let students review on their own

The more complicated your subject matter, the more likely it is that students will not retain all of the information included in your presentation. While you probably begin each session with a review of previously presented information, you may find that a great deal of course time is being allotted for reviews. And students may have more trouble with certain presentations than others. Why not provide students with a way of reviewing important (maybe the most complicated) information on their own?

Since you've gone to the trouble of creating a great slide show (or maybe your using a slide show from one of our curriculums), you already have the basis for review material.

Print Handouts – PowerPoint allows you to print the handouts included in your slide shows (up to nine per page). Under the *File* menu under *Print*, choose *Handouts for Print what*. While I'm not sure just how much students can learn from copies of your slides (especially if you incorporate a lot of animations), this feature of PowerPoint does allow you to easily share your slide shows in a concise manner, and I do see a number of presenters that make the PowerPoint slides part of the student handouts for the courses they teach.

Provide access to slideshows –

Most schools provide an Intranet that students can log on to. If your school does, you can easily include your slide shows on your school's Intranet system. This will allow your students

to view your slide shows in the same manner you present them – including all animations.

To view the slide shows, students must have Microsoft PowerPoint Viewer installed on their computer. Note that PowerPoint Viewer is freely distributed by Microsoft. It is included with your PowerPoint software (you can also download it from Microsoft's Office web page). You may want to place the PowerPoint Viewer installation file on your school's Intranet for those students that don't have it.

Add sound to your slideshows! –

Having the slide show by itself may not help students to any great extent. Again, if your topic is complicated, they may not have been able to absorb all that was presented. The slide show by itself may not improve their ability to understand the given topic to any extent.

To add sound (narration) to your slide shows, you'll need a multimedia computer (with microphone and speakers) and software for creating sound (.wav) files. You can use *Sound Recorder* that comes with Microsoft Windows, or purchase a more elaborate sound file editor such as GoldWave.

Since you are targeting your students, the quality of your narration (audio quality as well as your speaking skills) isn't all that critical. Do note that sound files can chew up a lot of file space, so you'll probably want to sacrifice sound quality to minimize file size.

How to add sound - There are actually two ways to add sound to your PowerPoint slideshows. You can do so in the Slide Transition selection of the Slide Show menu, or you can do so by creating an icon for the sound and adding sound to the icon. If you choose to add sound in Slide Transition, the sound automatically

PowerPoint Tips (continued from pg 1) begins playing as soon as the slide appears. It may be better to use the icon approach. The sound will not start playing until the student clicks the icon. To add sound to an icon, first create the icon. You can choose from the countless graphic files included with PowerPoint or simply place the text "Play Sound" on the slide. I also recommend including a way for the student to stop the sound.

Next, select the icon (or highlight the text) and **right-click** on it. From the menu that pops up, choose *Action Settings*. Click on the box for *Play sound* (this places a checkmark in the box). Scan to the bottom of the attached menu and click on *Other Sound*. From the file browsing menu that comes up, go find your previously recorded sound file and select it. From this point, whenever you click on the icon or text (during the *displaying* of the slide show), the sound will be played.

While at first, you may not feel very comfortable recording a narration, remember that it doesn't have to be perfect. Only your students will hear it. And you only have to make recordings of those points that are most troublesome.

One last point. As stated, the size of your PowerPoint slideshow file will grow when you add narrations. If your students are connected to the Intranet at school and connection speed is very fast, this won't be a problem. But if they're connected from home (with a modem), it will take a long time to download lengthy slideshows. You may want to consider providing the slide shows in a compressed format to minimize file size.

Publicize your school

We maintain a **schools forum** on our website (www.cncci.com). It's free – and it's a great way to let potential students know about your CNC-related courses!

Simply fill in an online form that asks for some general information about your CNC courses, lab equipment, and degree information. About half the schools currently listed are using our CNC curriculums to help them teach CNC courses!

Six factors... (continued from pg 1)

Aptitude will determine how quickly and easily learning will be. The aptitude of the instructor for giving presentations will contribute to determining how quickly and easily students catch on to new material. *Instructors with high aptitude make it easy for students to learn.* In similar fashion, students' aptitude for learning manufacturing related functions and specifically CNC also contribute to how quickly and easily learning takes place. *Students with high aptitude make it easy for the instructor to teach.*

Presentation is at the heart of training. The better an instructor's presentation, the easier it will be for students to learn. Presentation can consist of many things, including lectures, videos, demonstrations, simulations, overhead and projector slides, and anything that helps to convey an idea. Progressive instructors are always finding new ways to improve their presentations.

Concentration allows instructors and students alike to ponder the course subject matter during class and when students are doing lab-work and homework. The classroom determines the potential for concentration. A clean, quiet, well lit room, and comfortable (but not too comfortable) seating contribute to concentration. No interruptions should be allowed during sessions. During lab exercises, distractions should be kept to a minimum.

Repetition will ensure that students retain presented material. Though estimates vary, it is said the students will retain less than 50% of the material they hear for the first time. As session length increases, the percentage of retention decreases. You *must* ensure much better retention, and the only way to do so is through repetition. I recommend spending at least the first ten percent of each session in review. Repeat key principles discussed to the current point in the course.

I like to verbally quiz students during reviews. I'll do most of the talking, reiterating important points made during previous sessions, but every so often, I'll ask a question. Student responses let me confirm that they truly understand the subject matter.

I also find it quite helpful to expand upon

presentations made earlier in the class during reviews. For example, it may be too complicated for students to fully understand the cycle time implications of using constant surface speed the very first time we introduce the feature. I'll skip this presentation, knowing I can easily cover it during an upcoming review.

Practice with reinforcement acts as a gauge to judge the success of training. Well designed practice exercises should be realistic, forcing the student to do things in the same way they must do them when training is completed. Reinforcement must come as the result of the students' practice. If the student demonstrates a firm understanding of the presented information, reinforcement should praise the success. On the other hand, if practice exposes a student's lack of understanding, reinforcement should come in the form of further presentations, review, and more practice.



Teach an Advanced CNC Course!

Maximizing CNC Utilization!

You've probably taught many basic CNC courses. In fact, your school may have conducted *so many* basic courses that you're starting to run out of potential students. With this new curriculum, you'll be drawing from newly trained as well as highly experienced CNC people. You'll be connecting with a whole new target audience!

Eight Modules:

- ☆Basic premises for improving utilization
- ☆Review of basics
- ☆Basic features w/ advanced implications
- ☆Advanced features and concepts
- ☆Parametric programming
- ☆Setup time reduction
- ☆Cycle time reduction
- ☆Spindle probe programming

Each module is self-contained, meaning you can pick and choose those topics you wish to include in your advanced course!

Instructor materials on CD-rom disk: PowerPoint slide presentation (over 3,000 slides!), audio guidance, PowerPoint Viewer, instructors outline, and promotion materials.

Student manual is 650 pages long and supports all modules.

FREE with initial textbook order!

Purchase just 20 sets of student manuals (\$95.00 each, suggested retail: \$120.00) and receive the instructor's materials FREE!

Free samples in our web site:
(www.cncci.com)

Favorite analogies

You can't have enough analogies in your basket of teaching tools. Analogies make it easier for students to understand complex topics by relating them to things that are familiar and easier-to-understand. In these discussions (which will be included in each issue of *Instructor Notes*), We will relate a few favorites. Note that these analogies are commonly incorporated right into the slide shows included with our curriculums.

Helping people understand CNC machine programming

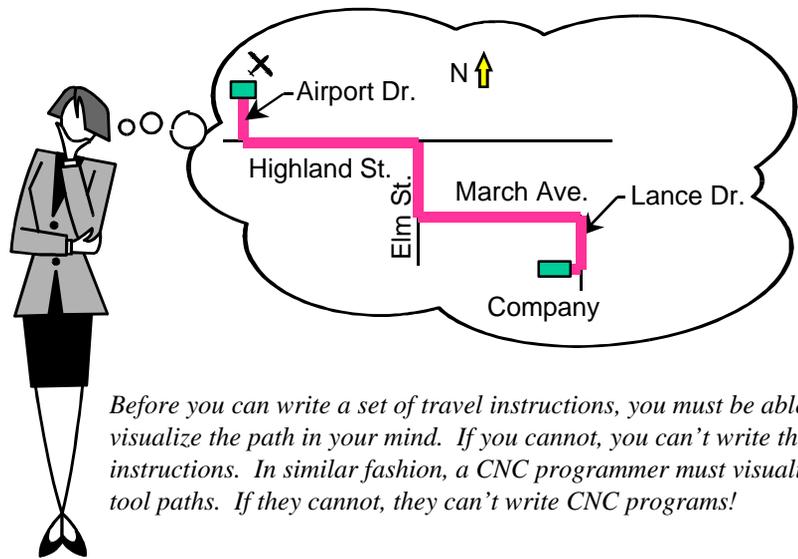
Suggested by Dan Flick of Ivy Tech, Indianapolis, Indiana

CNC programmers must be able to *visualize* the movements of a CNC machine tool cutting a workpiece before they can write a CNC program. This, of course, means they must understand the movements an end mill (or any tool) will make as it machines a workpiece. Not only that, they must "see the operation being performed in their mind" prior to writing the commands that drive the tool in the program.

This can be a tough thing for beginning programmers (even those with a good machining background) to understand. An entry level person won't even know that visualization is an important attribute of a CNC programmer unless you point it out! This analogy helps you illustrate how important it is to be able to visualize a program's motions.

We relate the ability to visualize a CNC program's motions to what is required when a person must develop a set of travel instructions. I'll say something like, "Say you must develop instructions to get a person from the airport to your company. Before you can write these instructions, you must be able to visualize the path from the airport to your company *in your mind*. If you can't visualize the path, you can't write the instructions. Worse, if you *think* you can visualize the correct path, but you're wrong, your instructions will be incorrect and anyone following your instructions will get lost!"

"In similar fashion, a CNC programmer must be able to visualize the movements that each tool will cause the machine to make before they can



Before you can write a set of travel instructions, you must be able to visualize the path in your mind. If you cannot, you can't write the instructions. In similar fashion, a CNC programmer must visualize tool paths. If they cannot, they can't write CNC programs!

write a program. If they can't visualize tool paths, they won't be able to write the program. Worse, if they think they can visualize tool paths, but they can't, they'll write incorrect motion commands."

This analogy helps you go a little further in introducing three other important principles.

First, point out that a CNC machine isn't very smart. It will blindly follow a program's motion commands whether they're right or wrong. Just as a person will get lost if your travel instructions are incorrect, so will a CNC machine tool "get lost" if motion commands are incorrect. In the case of the CNC machine tool, be sure to point out that "getting lost" can have disastrous consequences, especially when rapid motions are involved.

Second, this analogy helps you introduce students to the sequential order by which CNC programs are executed. A person following the set of travel instructions will do so in step-by-step order. First, they'll follow the very first instruction. Then they'll follow the second instruction. And next the third instruction. They'll continue following the travel instructions in sequential order until they reach their destination.

In similar fashion, a CNC machine will execute CNC program commands in sequential order. First the very first command will be executed. Then the control will go on and execute the second command. And then the third. The control will continue in this fashion until it reaches the very last command in the program.

Third (although it may be a little advanced for this early stage in your course), this analogy helps you introduce and explain the CNC control's look-ahead buffer. With complicated travel instructions, it is likely that a person will look over the instructions before they begin following them. It's also likely that as they're following the instructions (doing one of the instructions), they'll *look ahead* to see what's coming up next so they'll be ready when the time comes to follow the next instruction.

Point out that a CNC control also has a *look-ahead function* (commonly called the look-ahead buffer). As the control is executing one command, it's looking ahead into the program to see what's coming up next. Though the size of the look-ahead buffer varies based on control model, let students know that it should be at least three or four commands long.

Also point out that the primary reason for the look ahead buffer is to allow the control to flow through the program without having to stop motion after each command (just as a person looking ahead in the travel instructions is doing so to avoid having to stop the car after each instruction). Another time the look ahead buffer is required is related to cutter radius compensation.

What are your best analogies?

If you'd like to share a favorite analogy, just let us know and we'll publish it in a future issue of *Instructor Notes*!



44 Little Cahill Road
Cary, IL 60013
Ph: (847) 639-8847
Fax: (847) 639-8857

Instructor Notes Newsletter Enclosed!

Tips for teaching CNC courses from CNC Concepts, Inc.

Machining Center Course! →

CNC Instructors!

If you're using one of our proven curriculums to teach CNC machine tool usage, be sure your students know that your course is also available on a reasonably priced CD-rom disk. They'll already have the manual and workbook, so they'll only have to purchase the courseware (\$149.00 for six hour presentation).

As a CNC instructor, *you* may want to make this courseware available for students that miss a lesson or want to review material you present.

Do you feel at all weak in your CNC skills?

With our CNC curriculums, we provide audio guidance for each lesson to help instructors know how to present our courses. This is sufficient for instructors that are quite familiar
see below



New computer based training course! CD-ROM disk: over 6 hours!

CNC Machining Center Programming, Setup, and Operation

Affordable courseware for CNC machining centers!

A very popular CNC machine type!

CNC machining centers are among the most popular types of CNC machine tools. Most companies that have any CNC machines have at least one. Unfortunately, companies are finding it more and more difficult to find and hire qualified CNC people. Many are realizing that they must provide extensive training to new hires and provide at least some continuing training to established employees.

A proven method

This affordable courseware makes it possible to train CNC people from scratch. While we assume the student has some basic machining practice experience, we assume nothing about their previous CNC skills. Using our proven *key concepts approach*, we bring students up to speed gradually – constantly building upon previously presented information – and we stress the reasons *why* things are done as importantly as *how* they're done. Six of the ten key concepts are most related to programming, and four are related to setup and operation.

24 lessons!

We further divide the key concepts into twenty-four lessons. Lessons range from under five minutes to just over twenty minutes in length (total course presentation time is just over six hours on one CD-rom).

The most popular control!

All examples are shown in the format for the most popular control in the industry – the Fanuc control. Note that many control manufacturers claim to be Fanuc-compatible.

What you get!

The CD-rom disk is jam-packed with over six hours of information about CNC machining centers. By itself, it makes formidable training tool. It's price is \$149.00.

When purchased with the workbook answer combination (\$30.00), you'll be able to confirm that you truly understand the material (24 exercises, one for each lesson).

When purchased with the optional student manual (\$60.00), you'll have a way to easily review information after you finish the course.

If all items are purchased (total: \$239.00), we include a one-year subscription to our newsletter, The Optional Stop.



The price for unlimited training? ... \$149.00 (courseware only)

Companion manual: \$60.00, workbook/answer combination: \$30.00

Contact CNC Concepts, Inc. (847-639-8847) to order!



New computer based training course! CD-ROM disk: 5.8 hours!

CNC Turning Center Programming, Setup, and Operation

Affordable courseware for CNC turning centers!

A very popular CNC machine type!

CNC turning centers are among the most popular types of CNC machine tools. Most companies that have any CNC machines have at least one. Unfortunately, companies are finding it more and more difficult to find and hire qualified CNC people. Many are realizing that they must provide extensive training to new hires and provide at least some continuing training to established employees.

A proven method

This affordable courseware makes it possible to train CNC people from scratch. While we assume the student has some basic machining practice experience, we assume nothing about their previous CNC skills. Using our proven *key concepts approach*, we bring students up to speed gradually – constantly building upon previously presented information – and we stress the reasons *why* things are done as importantly as *how* they're done. Six of the ten key concepts are most related to programming, and four are related to setup and operation.

28 lessons!

We further divide the key concepts into twenty-eight lessons. Lessons range from under five minutes to just over twenty minutes in length (total course presentation time is five hours fifty-two minutes on one CD-rom).

The most popular control!

All examples are shown in the format for the most popular control in the industry – the Fanuc control. Note that many control manufacturers claim to be Fanuc-compatible.

What you get!

The CD-rom disk is jam-packed with 5 hours, 52 minutes of information about CNC turning centers. By itself, it makes formidable training tool. It's price is \$149.00.

When purchased with the workbook answer combination (\$30.00), you'll be able to confirm that you truly understand the material (28 exercises, one for each lesson).

When purchased with the optional student manual (\$60.00), you'll have a way to easily review information after you finish the course.

If all items are purchased, we include a one-year subscription to our newsletter, The Optional Stop.



The price for unlimited training? ... \$149.00 (courseware only)

Companion manual: \$60.00, workbook/answer combination: \$30.00

← Turning Center Course!

with CNC. For those instructors that may feel a little weak with their CNC skills, or for those who may be trying to teach a different machine type, these concise courses let you bone up on subject matter as quickly as possible.

Each course follows its companion curriculum to the letter (ten key concepts, number of lessons, presentation method, graphics, etc). In fact, we use the same manual and workbook in the courseware that you use with our curriculums! So if your already using our curriculums, all you need is the courseware.