CNC INSTRUCTORS! The only newsletter aimed at teaching CNC – First issue!

Instructor Notes

Tips for teaching CNC courses from CNC Concepts, Inc.

Issue 1 *Spring 01*

CNC Concepts, Inc. introduces newsletter for CNC instructors!

We've been marketing CNC-related training materials since 1988 and materials specifically directed to CNC instructors (our curriculums) since about 1995. Given our products, we felt that it was time to communicate with CNC instructors on a more regular basis. And we feel the best way to do so is with a technical newsletter. It will be sent *free of charge* to instructors teaching CNC courses.

Much of the content for this newsletter will be aimed at helping you use our CNC curriculums to their fullest advantage. We will, however include information on more general topics about teaching on a regular basis. *PowerPoint Tips*, for example, will be included in every issue and should, over time, help you improve your skills for developing your own presentations.

Your suggestions and comments are encouraged! We'll be looking for your input for improving this newsletter. Your ideas can be submitted by email (lynch@cncci.com) or by mail to CNC Concepts, Inc., 44 Little Cahill Road, Cary, IL 60013.

Thank you for taking the time to read the initial issue. We hope you find this material to be timely and appropriate to your needs. Again, suggestions are welcomed.

Mike Lynch,
President, CNC Concepts, Inc.

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
Each issue of *Instructor Notes* will include PowerPoint Tips to help you improve your skills with Microsoft PowerPoint software.

Getting started with PowerPoint

Microsoft PowerPoint is fast becoming the presentation software product of choice of professional presenters. For this reason, we've chosen PowerPoint to display all visuals included with our curriculums. While we've made it as easy as possible to load and play our presentations (no development is necessary on your part), you'll want to learn more about this powerful – yet easy to use – presentation software program. Here are some of the features we find most helpful. If you're still using PowerPoint Viewer (included free with our curriculums), you'll probably want to buy the actual program after reading this!

Easy navigation
One of the best things about PowerPoint is the ability to move around in lengthy slide shows (and you know how long our slide shows can get – some are over 800 slides!). A simple elevator bar on the right side of the screen lets you quickly move to the slide you want. As you click and move the elevator bar, you'll see the slide number of the slide currently selected. Again, this makes it very easy to get right to the slide you want to view.

It's easy to add your own notes
Our new and updated curriculums for Machining Center Programming & Operation and Maximizing CNC Utilization and include audio narrations (we call guidance) to help you know what you're supposed to be doing and saying at key points of the course (we're currently updating the turning center curriculum slide show – it should be ready in March of 2001). While our guidance may be enough, it's likely that you'll want to add your own notes from time to time. PowerPoint makes it very easy to do this using what Microsoft calls its **Notes Page**. Simply get to the slide at which you want to add your note and click View and then Notes Page. The slide (graphic) will then appear at the top of the page and you'll be allowed to type your note (ample space provided) at the bottom of the page. You can then print this page for storage in your instructor notes manual.

Did you know you can hide slides?
As you know, our presentations are all inclusive. The machining center course, for example stresses the use of both vertical and horizontal machining centers. You may, however want to present a course only for vertical machining centers. In this case, you'll only the slides related to vertical machining centers to be shown. If you delete the slides for horizontal machining centers, they'll be gone forever. Someday you may want to include horizontals in your presentations. Use the **Hide Slide** feature (found in the Slide Show menu) to hide those slides you don't want to display. Getting them back someday will be as simple as reactivating them with the **Show Slide** function (also in the Slide Show menu.

Do you have tips you'd like to share?
PowerPoint tips will be included in every issue of this newsletter. If you have ideas you'd like to share, just let us know!

What makes an effective presentation?

The material you're presenting may be of paramount importance – to you – and it may also be the reason why your students are attending your class. But keep in mind that the *effectiveness* of your presentation may have little to do with the material you're presenting.

Presentation effectiveness affects the level of difficulty students will have understanding the material you're presenting. Are you holding their attention? Are they able to understand what you're saying? Are your visuals appropriate to the material? Are you drawing good analogies for complex topics? Do you have adequate practice exercises? Are you reviewing material regularly? These are all questions related to effectiveness level.

Admittedly, it can be difficult to gauge effectiveness level of your presentations because it is also closely related to the *aptitude level* of the students. You may teach one class in which everyone is catching on right away – and you may think your presentations are highly effective. So you use the same method to teach your next class, yet students aren't nearly as quick to catch on.

My *goal* has always been to make my presentation so effective that *everyone* in the class (regardless of aptitude) will catch on the very first time they experience my presentation. Have I reached this goal? Admittedly, no. But the point is that I'm *striving* to reach it – constantly looking for new techniques, analogies, and presentation methods to improve the presentations I make.

Know your material – of course

Knowing your material is just the first step. It should almost be taken for granted that an instructor knows about the topic being presented. However, this attribute alone does not make for an effective presentation. The more complicated the material to be presented, the more important it is that you concentrate on other attributes.

Did you know?

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!

Prepare – prepare – prepare

A student can spot an ill-prepared instructor a mile away. The better prepared you are to make your presentations, the more likely it is that you'll be able to hold the attention of your for the entire session (and the less likely it will be that students disappear at break time).

How must you prepare? While our curriculums minimize the amount of preparation you must do, they don't eliminate it. Preparation involves *practice*. While you gain experience with each course you teach (in effect, practicing in each course), new instructors should not wait for class to start practicing presentations. If you're using our curriculums, for example, we recommend practicing out loud (I know, you feel like you're talking to yourself) for each lesson until you know it inside and out. Only then will you have the confidence to make the presentation.

Just prior to the presenting the lesson (15-30 minutes before), I like to run through the slides one more time just to get myself in the right frame of mind to teach. No matter how many times I've taught the course, I always seem to think of something new to talk about while doing this.

Your delivery

There is an old adage that all presenters should adhere to: "Tell them what you're going to tell the, tell them, and then tell them what you told them". Within the lessons in our curriculum, we include a lesson plan – the "tell them what you're going to tell them". This should nicely set the stage for what you're going to be doing during the session. Each lesson provides you with ample visuals and analogies to help you make points during your presentation. This is the "tell them" part of your presentation. And finally, we end each lesson with a lesson summary, the "tell them what you told them". Again only practice will help you get comfortable with your delivery.

Review – making your presentation stick!

The only way to guarantee that students have retain the material in your presentation is to *review*. I set aside at least ten percent of each session for reviewing purposes – in some cases, an entire session will be spent reviewing what was done in previous sessions.

Review periods provide another benefit. Many times you won't be able to make all the points you want to the first time through complicated topics. Students may just barely be catching on to your most basic points – and you may be afraid that pushing any further will confuse them more than help. Knowing I'm going to review, I'll often minimize my initial presentation, just providing the basics. During future reviews, I'll add to the topic. Students catch on more easily because they've had time to absorb the basic information, and they've just been through a review of the topic.

Got an idea?

We're looking for ideas to include in the Summer issue. Specifically, we're looking for successful practice exercises and lab work (exercises on the machine).

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 this discussion (which by the way, we'll be including in each issue of *Instructor Notes*), we'll be relating a few of my favorites. Note that these analogies are commonly incorporated right into the slide shows included with our curriculums.

Explaining the rectangular coordinate system

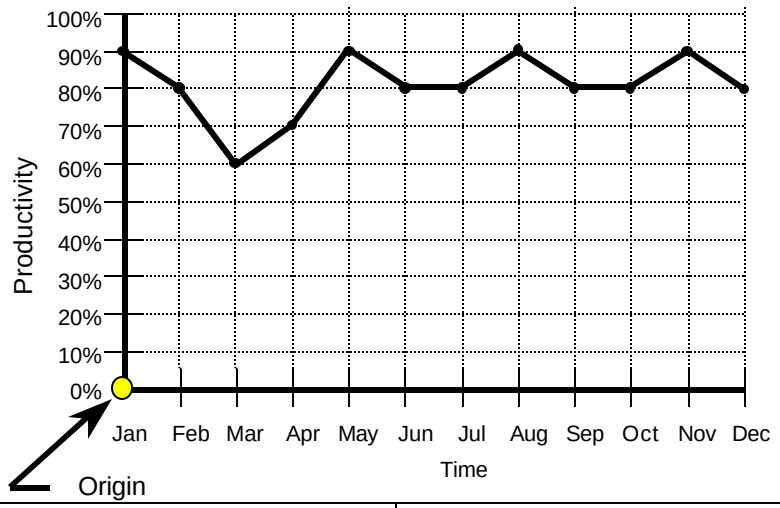
I like to relate the program zero point in a CNC program and the task of developing coordinates needed in a program to making or interpreting a common *line graph*. My explanation goes something like this:

"Consider making a graph that represents last year's productivity. The horizontal base line represents time, and the interval of time will be in months from January through December. The vertical base line will represent productivity from 0% to 100% in ten percent intervals. The point where the vertical and horizontal baselines intersect is called the graph's origin."

"With last year's productivity data in hand, you'll plot a point for each month. In January, say you were 80% productive. You'll plot a point at the intersection of January and 80%. This designation is called the point's coordinates (January and 80%). You'll continue plotting points for February, March, and so on through December. When finished, you can draw a line or curve through these points to provide a simple and visual representation of how the company did last year."

Now I relate what students already know about graphs to the rectangular coordinate system used with all CNC machines. I'll say something like:

"With the XY plane of a CNC machining center, the horizontal baseline represents the X axis. The vertical baseline represents the Y axis. The Z axis is perpendicular to this plane, and we can't see in on this two axis graph. No longer do these baselines reflect conceptual ideas like time and productivity. Instead, they represent physical positions in space through



which the the tool will move. The increment for each baseline is determined by your measurement system of choice – inches in the inch mode or millimeters in the metric mode. The smallest increment in inch is 0.0001 in for most machines. In metric, it's 0.001 mm." I may even mention the finer resolution of the metric mode at this point, but it's not the main objective of this presentation. I'll usually wait for the first review to bring this up.

"Consider how fine a grid you have when working with a CNC machine tool! A ten inch long linear axis will have 100,000 programmable positions if working in the inch mode (254,000 positions if working in the metric mode)."

"Where the baselines intersect can still be called the origin, but most CNC people refer to this point as the program zero point. And as with the graph, all coordinates used in the CNC program will be specified from this point." I'll mention that this is only true if the programmer is working in the absolute mode, but I'll save this discussion for a little later.

"Just as the person developing the graph must choose the graph's origin in a logical manner, so must the CNC programmer wisely choose the program zero point. In the productivity graph example, the developer of the graph chose the origin so that all plotted points are after January and above zero percent productivity. Everything fits nicely on the graph".

"In similar fashion, the CNC programmer will choose the program zero point in a logical manner. We recommend choosing the program zero point based upon how the print is dimensioned. In fact, if program zero is chosen wisely, coordinates needed in the program can often come right from the workpiece drawing!"

The best analogies work at several levels. We could, for example, take this graph analogy one step further to help explain the polarity of coordinates. I'll say something like:

"It wasn't a coincidence that the all points on the productivity graph come after January and above zero percent productivity. The graph's designer wanted it that way. But keep in mind that, with the rectangular coordinate system in a CNC program, points may sometimes fall on the left side of program zero in X – or on the lower side of program zero in Y. Coordinates to the left of program zero in X or below program zero in Y must be specified as negative (minus) values."

I find this to be a great way to explain what the rectangular coordinate system is all about. Since everyone has had to interpret or make a graph at one time or another, the concepts are very easy to relate. Again, draw on what students already know to help them learn about what they don't know!

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!*

CNC INSTRUCTORS! Another ready-made curriculum to help you teach CNC courses

Maximizing CNC Utilization

Everything you need to teach an advanced CNC course including computer generated slide shows (over 3,000 slides!), audio guidance, instructor manual, course outlines, comprehensive student manual, and even promotional materials!

The need for higher level training

You've probably taught many basic CNC courses. Since your students are at entry level, you've likely been a little frustrated at times. Just about the time your students are beginning to catch on to one topic, it's time to move on to another. While you'd like to take your presentations to the next level, there just isn't time – and doing so may confuse students more than help them. When students complete your basic course, they're ready to *begin* working with CNC machine tools – but it's unlikely that they have CNC mastered.

While your past students may not have been experts coming out of your course, at least they did receive formal training. There are many people working with CNC machines that did not. Maybe they're self-taught. Maybe they've learned what they know from others on the job. Maybe they've attended the quickie sessions held by machine tool builders. In any event, neither are they taking full advantage of all their CNC machines can do.

While the sheer productivity of CNC machines often masks inappropriate methods, companies are becoming more and more concerned with their CNC machine tools. Changes in manufacturing including lowered lot sizes, shorter lead times, and heightened quality requirements (among other things) have most CNC-using companies struggling to maintain profit margins. They'll need to improve their methods if they are to remain in business.

The primary objective of this course curriculum is to help instructors relate concepts, techniques, and ideas that will help students make they're CNC machines more productive. Toward this end we offer eight self-contained modules that are jam-packed with information that is not commonly introduced in basic CNC courses.

Since this curriculum is aimed at experienced CNC people (we recommend at least six months) you'll be drawing from an entirely new potential student base. You'll give your CNC program a real shot in the arm. And you'll finally be able to take your presentations to the next level!

Download free samples!

Our internet site (www.cncci.com) includes the complete course outline, samples of the slide shows, instructor manual, student manual, and the recommended presentation time you should allow for each module. Log on and see just how comprehensive this course truly is!

Eight self-contained modules!

✪ #1: **Basic premises** (57 slides)
This short but important module lays the groundwork for what is to come. Included are presentations that acquaint students with important needs of CNC using companies. We discuss application versus utilization and machine utilization versus personnel utilization to help them understand the reasoning behind improving CNC machine utilization. We also introduce the four CNC-using company types and discuss factors making up a company's corporate identity. Finally, we discuss the importance of value added principles in the CNC environment.

✪ #2: **Review of CNC basics** (346 slides)
Since you won't have control of how much previous experience your students have (aside from setting some pretty broad prerequisites), you'll want to make sure that they have a good grasp of basic CNC principles before digging in to more advanced topics. If you're sure students have a good command of the basics, an alternative module is included entitled **Taking Stock Of Current Methods**, which simply skims the most important points and helps you make sure that student's are using appropriate techniques for basic features.

✪ #3: **Advanced implications of basic features** (911 slides)
Many CNC features have multiple uses. But most basic CNC courses introduce only the most important use. Additionally, most basic courses don't show all implications related to how a given feature can be best used to meet the company's specific applications. If it's a basic function, and if it's not commonly addressed in a basic CNC course, it's fair game in this module.
Included in this lengthy module (the longest of the course) are presentations on parameters, N words, G codes, M codes, and other CNC words. We go over each code, one by one, and in numerical order.
We also discuss advanced applications for tool offsets, fixture offsets, and wear offsets. Since we show so many alternative methods of handling basic CNC functions, there's plenty of audio guidance during the slide show to help you prepare to teach this module.

✪ #4: **Advanced CNC features, functions, & concepts** (432 slides)
There are many CNC features that are not addressed in basic courses. Admittedly, many of these features will not be of interest to a given CNC user. However, this module gives you the presentation material you need to discuss features like advanced interpolation types (helical, cylindrical, polar coordinate, and nurbs), scaling, mirror image, coordinate rotation, and three dimensional coordinate conversion. We also include presentations on certain machine accessories like bar feeders, index chucks, U axis, and part catchers. Finally, we provide materials for teaching some important CNC concepts like tool life management, qualifying CNC programs, and appropriate documentation.

✪ #5: **Parametric programming** (556)
We've often said that parametric programming is CNC's best kept secret. There are still many in the industry that don't know what it is, let alone how to take full advantage of it. These materials allow you to dive into parametric programming as deep as you want to go. We stress Fanuc's version of parametric programming – custom macro B (the most popular version).

✪ #6: **Setup time reduction** (295 slides)
All CNC using companies are concerned with how long their machines are down between production runs. This module lets you first present the principles of setup time reduction (that can be applied to any form of production equipment). We then offer specific CNC-related techniques to improving setup time in the same order setups are made (tear down, work holding setup, cutting tools, program zero assignment, program loading, program verification, and first workpiece inspection).

✪ #7: **Cycle time reduction** (411 slides)
All CNC using companies are concerned with how long it takes to complete their production runs. As with setup time reduction, this module lets you first present the principles of cycle time reduction. We then offer specific techniques to reducing cycle time in four areas, workpiece load/unload, program execution time, tool maintenance, and preventive maintenance.

✪ #8: **Spindle probe programming** (519 slides)
Admittedly, most spindle probe uses depend solely on the probing programs supplied by the probe manufacturer. Only a small percentage of probe-using companies develop their own probing programs. Many students may not be very interested in learning how probes are programmed. You may elect to simply introduce basics. But if you do need to teach a full course on spindle probe programming, these materials let you do so. Presentations include introduction to probe programming, applications, how the probe works, calibration, and writing spindle probe programs.

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