

*Journal of*

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# **INDUSTRIAL TECHNOLOGY**

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*Volume 22, Number 4 - October 2006 through December 2006*

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## ***Teaching Printing Industry Guidelines and Process Control: The State of the Profession***

*By Dr. Jerry J. Waite*

*Peer-Refereed Article*

**KEYWORD SEARCH**

*Design  
Desktop Publishing  
Graphic Communications  
Printing  
Quality Control  
Visual Communications*

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# Teaching Printing Industry Guidelines and Process Control: The State of the Profession

By Dr. Jerry J. Waite

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## Abstract

As printing company prepress departments downsize, it is increasingly important for designers to submit correct digital files. International associations offer printing guidebooks such as the Specifications for Newsprint Advertising Production (SNAP), General Requirements for Applications in Commercial Offset Lithography (GRACoL), Specifications for Web Offset Publications (SWOP), and Flexographic Image Reproduction Specifications and Tolerances (FIRST)<sup>1</sup>. If utilized, these guidelines can help graphic designers prepare files that will effectively pass through the print production workflow. As printers adopt guidelines, employees will be increasingly called upon to explain them to graphic designers and to shepherd guideline-compliant documents through the print production workflow. So, teachers of graphic design and print<sup>2</sup> must be familiar with industry guidelines and teach accordingly. This study investigates the awareness and implementation of SNAP, GRACoL, SWOP, and FIRST by graphic design and print teachers and provides opportunities for instructional programs, particularly at the university level, to fill the gaps in knowledge that were identified through an online survey.

## Introduction

According to Roy Zucca, since 1990 there has been a trend to downsize

prepress departments in the printing industry. A company may have once employed dozens of technicians to operate process cameras, retouch and duplicate films, operate scanners, assemble film onto flats, and make proofs and plates. Today, that same firm may function with five or six prepress employees who specialize in just a few activities such as preflighting, imposition, trapping, RIPing, proofing, and platesetting (R. Zucca, SWOP Chair, telephone communication, August 19, 2005).

Many of the activities that were once accomplished manually by prepress employees, such as image capture and correction, page layout, and trapping, are now done digitally by graphic designers. Printers assume that designer-created files will be defective in one way or another. To minimize faulty files, printers banded together and formulated guidelines for designers and printing companies. In theory, if the designer and printer follow the guidelines, the final product will be as desired by the customer. These guidelines were gradually introduced and, in many cases, are now demanded by printers. Incoming files that do not meet the specifications may be rejected (see, for example, Time Incorporated, n.d.).

Because of the increasing emphasis on specifications and guidelines, it is vital for teachers of graphic design and print to know and understand the guidelines

<sup>1</sup> SNAP and SWOP are specifications and publishers may strictly enforce their contents. GRACoL and FIRST are guidelines, so compliance by designers and printers is not obligatory. The four documents are grouped together as "guidebooks" in this paper.

<sup>2</sup> The terms "graphic design" and "print" are often grouped together and called "graphic arts." In this paper, the terms will be kept separate to clarify the "creative" or "reproductive" roles, respectively, of each of these types of graphic workers.

and to teach accordingly. Teaching guidelines requires not only knowledge on the part of the instructor but also reference books, equipment, and software. So, in the present study, a web-based survey was used to determine if graphic design and print faculty are equipped and prepared to teach the contents of the printing industry guidelines. The results indicate a wide discrepancy between what teachers *have* and what they *need* in order to effectively teach guideline-compliant graphic design and printing.

### **Purpose of the Research**

The purpose of this study was to determine if high school through university-level graphic design and print educators have the knowledge, equipment, and software to teach guideline-compliant printing processes. A list of 27 items that explored the following research questions was prepared and administered through the use of an on-line survey website.

1. Do graphic design and print faculty know about printing industry guidelines?
2. Do graphic design and print faculty have copies of printing industry guidebooks?
3. To what extent do graphic design and print faculty integrate industry guidelines in their classrooms?
4. Do graphic design and print faculty have access to the tools and software required to teach printing process control consistent with industry guidelines?
5. Do graphic design and print faculty teach the foundational concepts of guideline-compliant process control and, if so, to what extent?

### **Limitations of the Study**

The on-line survey used in this study was announced using the Graphic Comm Central (GCC) listerv as well as the listservs maintained by the International Graphic Arts Education Association (IGAEA). These listservs have a total of 755 subscribers who are members of IGAEA, participants in the 2004 IGAEA Conference, or those interested in the GCC's goal of providing

an "email discussion group for graphic arts educators, industry trainers, and anyone else interested in graphic communication education" (GCC, n.d.). These listservs provided the most comprehensive known list of individuals in the target population: i.e., high school through university-level teachers of graphic design and print. They also provided an inexpensive way to inform potential respondents about the survey.

The survey was not announced to any other listserv and no hard copies of the survey were sent by mail to members of any mailing list. No enticements (prizes or other benefits) were offered to potential survey respondents in order to increase the participation rate. So, the results are skewed toward the responses of those listserv subscribers who were interested enough to participate.

The 85 responses reflect a little more than 20% of the IGAEA membership. However, since the survey was announced to more than one listserv and individuals may or may not belong to more than one of them, the total population of potential respondents is not known. In addition, no attempt was made to contact graphic design and print instructors who are not members of any of the aforementioned listservs. Therefore, neither the real population nor the real response rate is available.

Due to the limited membership of the listservs used by this study vis-à-vis the total population of graphic design and print instructors, the results of this study cannot be generalized across the entire population of graphic design and print programs. However, the stark contrast between what respondents say they have and what guideline-compliant teaching requires is informative.

### **Review of the Literature**

This brief literature review introduces the four printing industry guidebooks and provides an overview of some of the specific topics students of graphic design and print need to learn in order to implement the guidelines. It is not meant to be a complete treatise on the guidebooks. Interested readers should

visit the referenced websites and read the papers mentioned in this review.

The *Specifications for Web Offset Publications* (SWOP) provide "specifications for everyone involved in graphic arts workflow, which includes all forms of magazine advertising and editorial input, whether analog or digital" (SWOP, 2005). For the most part, printers using web offset or gravure to print publications abide by—and expect compliance to—SWOP (see, for example, Time Incorporated, n.d.). SWOP is well-established and popular software programs, including Adobe Photoshop® and InDesign®, implement SWOP standards. SWOP can be obtained at <http://www.swop.org/>

The *Specifications for Newsprint Advertising Production* (SNAP) are intended for "advertisers, advertising agencies, publishers, pre-press managers, material suppliers, and commercial and newspaper printers" (Newspaper Association of America, 2000). These guidelines are applicable to newspapers and advertising inserts printed by offset lithography, direct lithography, letterpress, and flexography. The approximately 100 SNAP Certified newspapers in the United States do not necessarily require designers to comply with SNAP specifications. However, SNAP Certified papers use SNAP to communicate to designers the benefits of compliance. Although SNAP is not yet integrated into graphic design and print software by default, a SNAP ICC Profile is available for use in Photoshop (Michael Brady, e-mail communication, June 1, 2006). SNAP can be obtained at <http://www.naa.org>.

The *Flexographic Image Reproduction Specifications and Tolerances* (FIRST) handbook provides "all participants in the flexographic reproduction process with a common set of guidelines, tutorials and data that can be used as communication and production tools" (Flexographic Technical Association, 1999). FIRST focuses primarily on the production of packaging using the flexographic process on film, corrugated board, paper, and paperboard.

FIRST may be obtained at <http://www.fastore.com>.

The *General Requirements for Applications in Commercial Offset Lithography* (GRACoL) guidebook helps print buyers, designers, and specifiers work more effectively with commercial offset printers. As of summer 2006, most commercial printers had not yet adopted GRACoL and its guidelines had not yet been integrated into graphic software such as Photoshop. However, Don Hutcheson, chair of the GRACoL committee, indicated that an agreement had been reached with Adobe to provide graphic designers with GRACoL-compliant settings in future releases of Photoshop (D. Hutcheson, GRACoL chair, e-mail communication, September 9, 2005). GRACoL can be obtained at <http://www.gracol.org/>

*What to Teach Graphic Design Students About Printing Industry Guidelines* (Waite, 2006a) synthesizes the contents of the four relevant guidelines that are related specifically to graphic design. In particular, the paper covers file format considerations (PDF/X-1a files are recommended by the guidelines), preflighting, color separation settings and calibration, image resolution, fonts and typefaces, bar codes, and trapping.

Students preparing to enter careers in the printing and publishing industry need to consider printing industry guidelines from a different perspective than students of graphic design. Instead of learning how to *prepare* good files, printing firm employees must know how to *edit* guideline-compliant files and to *shepherd* such files through the print workflow.

*Printing Industry Guidelines for Print Students Part One: Guideline Overview and File Format Considerations* (Waite, 2006b) covers handling PDF/X-1a files including preflighting, file repair and intervention, imposition, and trapping.

*Printing Industry Guidelines for Print Students Part Two: Printing Process Control and Color Separation*, (Waite and Hutcheson, submitted) covers

printing process control; color separation; calibration of monitors, image- and platesetters; printing test images; measuring test plates; building compensation curves; imaging corrected films or plates; printing curved test images; analyzing colors on curved test images; providing reliable color separation profiles to graphic designers; and calibrating digital proofing systems.

### **Research Method**

Five fundamental questions were identified. Do high school through university-level graphic design and print teachers: 1) know about printing industry guidebooks; 2) have copies of the guidelines; 3) integrate guidelines into their instruction; 4) have the resources, software, and hardware they need to teach guideline-compliant printing; and 5) teach the fundamental concepts needed to implement SWOP, SNAP, GRACoL and FIRST?

### **Research Design**

To answer these questions, a descriptive research project was devised. A survey of 27 study-related items was prepared and delivered on-line using a web-based survey site. Additional demographic questions were included so that the responses from teachers of varying levels of instruction (high-school through university) as well of those offering programs of varying focus (design, technical, or managerial) could be compared.

Once the responses were received from the survey site, descriptive statistics were calculated and reported in tabular and/or graphic form. Aggregate responses to each question were included in this paper. In addition, the responses were subdivided according to educational level and program focus.

### **Population Sample**

Subscribers to the IGAEA listserv, the IGAEA 2004 Conference listserv, and Graphic Comm Central (GCC) listserv were contacted through e-mail and invited to visit the study's website to complete the survey. These listservs provided an inexpensive way to reach the most comprehensive known list of

high school through university-level teachers of graphic design and print. These listservs included 755 e-mail addresses. However, individuals may or may not belong to more than one of the listservs. So, an unknown number of individuals received an invitation to participate. A total of 85 individuals completed the survey. This represents about 20% of the total IGAEA membership. Kaplowitz, Hadlock, and Levine (2004) found that e-mail-only surveys generate a response rate approximating 20.7%. Therefore, the present study's response rate of 20% seems reasonable.

### **Instrumentation**

A complete list of survey questions can be found at the end of this paper. Once the questions were compiled, they were formatted and uploaded to an online survey site called Web Surveyor (<http://www.websurveyor.com/gateway.asp>) so that a beta test could be conducted. Select college- and university-level members of the IGAEA were e-mailed and asked to participate in the beta test of the survey. Feedback was received from several of these individuals and their input was considered and, in most cases, implemented.

The beta-tested survey was available on-line from December 2, 2005 through January 6, 2006. Practicing graphic design and print teachers were contacted twice through the use of the aforementioned listservs. Recipients were asked to log on to the Web Surveyor site and complete the survey.

### **Data Analysis and Research Findings**

Web Surveyor provided an Excel spreadsheet that contains all of the data collected by the survey. In addition, the site provided pie and/or bar graphs to illustrate the aggregate responses to each question. The site did not supply graphs displaying the responses from each of the demographic subgroups. Those data were extracted from the Excel spreadsheet.

### **Demographic Description of Respon-**

**dents**

A total of 85 individuals responded to the on-line survey. Eighty respondents indicated that they currently teach high school through university-level graphic communications while five individuals said they do not teach graphic communications courses. Only the responses from the 80 self-described graphic communications educators were studied. Not every respondent answered every question. Unanswered items were not included in the tables in this paper.

Most of the respondents teach at the high school level (45%). However, teachers of other educational levels also took part in the survey: community college (21%), institutions offering bachelors and higher degrees (29%), and occupational/training centers (5%). About one-fourth of the respondents indicate that their program’s focus is technical (26%) while another fourth specialize in graphic design (25%). Only 6.3% indicate that they prepare students for careers in operations management, sales, or sales support. The remaining 43% of the respondents prepare students for careers in all the focuses of interest: technical, design, and management.

**Do Graphic Design and Print Faculty Know About Printing Industry Guidelines?**

Most respondents indicated familiarity with SWOP and GRACoL. However, SNAP and FIRST were not as well known. Teachers in occupational/training centers and associate- and bachelor-granting institutions seem to be more familiar with the guidelines than those in high schools. Additionally, faculty who emphasize technical and managerial careers are more likely than graphic design teachers to be familiar with the guidelines. Responses are provided in Table 1. Figure 1 is a graph of the aggregate responses.

**Do Graphic Design and Print Faculty Have Copies of Printing Industry Guidelines?**

Fewer than half of the respondents own a copy of any of the guidelines. Slightly less than half of the respon-

dents have a copy of GRACoL. Slightly fewer have a copy of SWOP. However, one-fourth or fewer have access to SNAP or FIRST. Occupational/training center teachers and college teachers are more likely to have a copy of one or more guidebooks than are high school teachers. Teachers of graphic design are unlikely to have copies of the guide-

lines. But, those teachers who focus on graphic communications management very likely have copies of many or all of the guidebooks. Responses are found in Table 2 and Figure 2 is a graph of the combined responses.

**To What Extent Do Graphic Design**

*Table 1. Responses to “Are you acquainted with the following guidelines for graphic communications.”*

Level/Focus	Sub Category	SWOP		SNAP		GRACoL		FIRST	
		Yes	No	Yes	No	Yes	No	Yes	No
All	All respondents	71.3	28.7	42.5	57.5	60.3	39.7	22.9	77.1
Educational Level	High-School	47.2	52.8	12.5	87.5	33.3	66.7	3.2	96.8
	Community College	88.2	11.8	53.3	46.7	76.5	23.5	21.4	78.6
	Occupational/ Training Centers	100	0	33	67	67	33	0	100
	Bachelors and higher	91.3	8.7	77.3	22.7	87	13	57.1	42.9
Program Focus	Design	35	65	21	79	26.3	73.7	10.5	89.5
	Technical	76.2	23.8	40	60	67	33	22.2	77.8
	Managerial	100	0	75	25	100	0	50	50
	All Focuses	85.3	14.7	44.8	55.2	69.7	30.3	25	75

Note. All data presented in percent of responses by program level and focus.

*Figure 1: Percent of respondents familiar with SWOP, SNAP, GRACoL, and FIRST*



**and Print Faculty Integrate Industry Guidelines in Their Classrooms?**

Respondents were asked, “To what extent do you integrate these guidelines into your classrooms.” Half of the participants responded that they do not integrate *any* of the guidelines into their instruction. SWOP is used by about 50% of the teachers while GRACoL is an integral part of about 46% of the respondents’ instruction. SNAP and FIRST receive very little attention. High-school teachers are the least likely to integrate any of the printing industry guidelines into their instruction while those teaching bachelors-level or higher classes were the most likely to use at least one guideline. Curiously, very few of the participating graphic design teachers make any of the guidelines a central part of their instruction. Conversely, virtually all responding teachers who focus on the managerial aspects of print incorporate SWOP, SNAP, and GRACoL in their instruction (less than half of these respondents use FIRST). Responses are found in Table 3 and Figure 3 is a graph of the combined responses.

**Do Graphic Design and Print Faculty Have Access to the Tools and Software Required to Teach Printing Process Control Consistent with Industry Guidelines?**

Respondents were asked, “Do you have a densitometer for use in your classroom?” and “Do you have a colorimeter or spectrophotometer for use in your classroom?” Overall, the majority of participants have access to a densitometer. However, less than one-third of the responding high-school teachers have such an instrument while nearly all college teachers have one.

Less than one-third of all respondents have access to a spectrophotometer or colorimeter. However, more than two-thirds of the respondents who teach in bachelors or higher institutions have one or both of these tools.

One fourth or fewer of graphic design faculty members have a densitometer, spectrophotometer, or colorimeter. Although it can be argued that graphic

design teachers do not need a densitometer, since such devices are used primarily in press process control, spectrophotometers and/or colorimeters are needed to calibrate monitors and build ColorSync/ICC profiles. It is disturbing that so few graphic design instructors have the tools necessary to teach these tasks. It is also troubling to note that less than one-fourth of

teachers of technically-related print courses have spectrophotometers and/or colorimeters. These tools are essential for creating ColorSync/ICC profiles of equipment and for calibrating monitors—tasks that print technicians *must* be able to do. On the other hand, a super majority of printing management faculty has densitometers, spectrophotometers, and/or colorimeters.

**Table 2. Responses to “Do you have a copy of these guidelines available for your use?”**

Level/Focus	Sub Category	SWOP		SNAP		GRACoL		FIRST	
		Yes	No	Yes	No	Yes	No	Yes	No
All	All respondents	44.3	55.7	25.7	74.3	45.6	54.4	17.6	82.4
Educational Level	High-School	14.3	85.7	0	100	16.7	83.3	0	100
	Community College	65	35	20	80	58.8	41.2	13.3	86.7
	Occupational/ Training Centers	50	50	33	67	67	33	0	100
	Bachelor’s and higher	73.9	26.1	65.2	34.8	78.3	21.7	47.8	52.2
Program Focus	Design	20	80	10	90	15	85	0	100
	Technical	17.6	82.4	10.5	89.5	47.6	52.4	15.8	84.2
	Managerial	100	0	80	20	80	20	60	40
	All Focuses	48.5	51.5	36.7	63.3	59.4	40.6	23.3	76.7

Note. All data presented in percent of responses by program level and focus.

**Figure 2: Percent of respondents who have copies of SWOP, SNAP, GRACoL, or FIRST**



**Table 3. Responses to “To what extent do you integrate these guidelines in your classroom?”**

Level/Focus	Sub Category	SWOP			SNAP			GRACoL			FIRST		
		0	1	2	0	1	2	0	1	2	0	1	2
All	All respondents	50	39.7	10.3	77.3	18.7	4	53.8	28.2	17.9	82.4	13.5	4.1
Educationl Level	High-School	72.2	27.8	0	94.1	5.9	0	75	19.4	5.6	97	3	0
	Community College	35.3	64.7	0	73.3	26.7	0	37.5	43.7	18.8	75	18.8	6.2
	Occupational/Training Centers	75	0	25	100	0	0	67	0	33	100	0	0
	Bachelor’s and higher	22.7	45.5	31.8	52.2	34.8	13	30.4	34.8	34.8	65.2	26.1	8.7
Program Focus	Design	60	40	0	80	20	0	70	25	5	90	10	0
	Technical	50	45	5	95	5	0	50	25	25	77.7	16.7	5.6
	Managerial	0	40	60	20	80	0	20	40	40	60	20	20
	All Focuses	51.5	36.4	12.1	74	16	10	51.6	30.3	18.1	83.9	12.9	3.2

Note. All data presented in percent of responses by program level and focus. “0” refers to “not at all,” “1” means “somewhat,” and “2” signifies “extensively.”

Responses to the survey items related to densitometers, spectrophotometers, and colorimeters are found in Table 4.

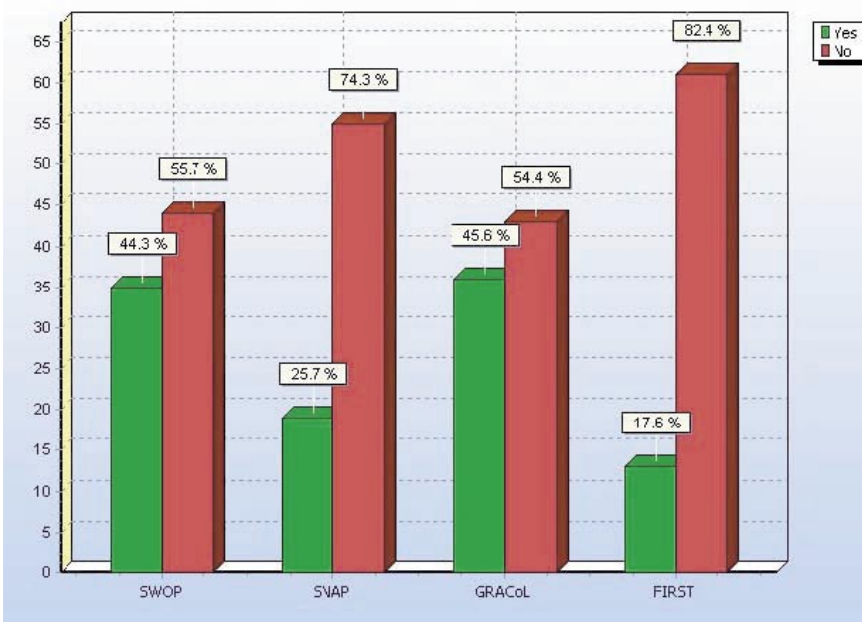
**Do Graphic Design and Print Faculty Teach the Foundational Concepts of Guideline-Compliant Process Control and, if so, to What Extent?**

Participants were asked several questions related to colorimetry/spectrophotometry and calibration to determine how these devices are used in instruction. When asked “To what extent do you integrate the use of a colorimeter or spectrophotometer into your teaching?” 68% responded “somewhat.” Eight percent do not use these tools at all while 24% use them extensively. Only 25 respondents answered this question, so the data was not broken down by educational level or program focus.

Sixty-five responses were received for the question, “For what purpose(s) do you use the colorimeter or spectrophotometer?” Approximately 25% of the respondents use these devices to calibrate/characterize monitors. Twenty percent use them to calibrate/characterize proofing devices, and about 18 percent characterize their printing presses. Interestingly, 14% of the respondents indicated that they use a colorimeter or spectrophotometer on their scanners. This indicates a lack of understanding on the part of those respondents since neither a colorimeter nor a spectrophotometer is used when calibrating scanners.

In response to the question, “Which of

**Figure 3: The extent to which SWOP, SNAP, GRACoL, and FIRST are integrated into respondents’ classrooms**



**Table 4. Responses to “Do you have a densitometer for use in your classroom?” and “Do you have a colorimeter or spectrophotometer for use in your classroom?”**

Level/Focus	Sub Category	Densitometer		Spectrophotometer/Colorimeter	
		Yes	No	Yes	No
All	All respondents	60	40	31.2	68.8
Educational Level	High-School	30.6	69.4	5.6	94.4
	Community College	88.2	11.8	35.3	64.7
	Occupational/Training Centers	50	50	25	75
	Bachelor’s and higher	87	3	69.6	30.4
Program Focus	Design	25	75	15	85
	Technical	52.4	47.6	23.8	76.2
	Managerial	100	0	80	20
	All Focuses	79.4	20.6	38.2	61.8

Note. All data presented in percent of responses by program level and focus.

these methods of monitor calibration do your students use?” only 22.4% use external devices. Forty percent of the respondents use the built-in algorithm in the Macintosh or Windows operating system. The remaining 39% do not use any monitor calibration method. This is especially troubling since color cannot be judged using uncalibrated monitors. Even worse, nearly 90% of the respondents indicated that their students calibrate their monitors only on an occasional basis. Less than 5% require their students to calibrate daily, as is the norm suggested by color management protocols.

**Knowledge of Process Control Concepts**

Participants were also asked to respond to several questions designed to determine their students’ depth of knowledge relating to several key process control concepts critical to the implementation of any of the printing industry’s guidebooks. Questions were phrased in three parts. The first part set up the question: “If one of your average near-to-graduating students was told...” The second part defined the area of knowledge, such as: “the cyan density should be 1.40...” Finally, the third part sought the level of understanding an average student would have: “that student would: a) Require additional instruction; b) Be able to use that information

to make decisions/adjustments; or c) Be able to use that information *and* explain it to others.” Four areas of knowledge were examined (ink density, tonal value increase, creating an output device profile, and using profiles to separate images into CMYK). The second part of each of the four questions included:

1. The cyan density should be 1.40.
2. The tonal value increase (dot gain) is 22%.
3. Profile the ink-jet proofer and use the profile to make a color separation.
4. Separate a digital photograph using the U.S. Web Coated (SWOP) v2 profile.

Responses to these items are found in Table 5. When reviewing Table 5, it is important to note that only 24 participants responded to item 3 (create profile) and only 47 answered item 1 (density). Most participants answered items 2 and 4 (79 and 76 responses each, respectively). Although not explored by the survey, it is possible that not all the participants are familiar with the processes used to profile proofing devices and presses (item 3) or measure printed ink density (item 1).

Based on the responses to the survey items, it appears that density is covered well overall. However, nearly one-half of the near-graduating students in represented high schools and community

colleges would need further instruction before being able to interpret and utilize density number specifications. Over half of the respondents indicate that their near-graduating students would not be familiar with tonal value increase (TVI or dot gain). In particular, 60% of the students in represented graphic design programs would require more instruction before they could answer questions related to TVI. One-half or more of the students in courses taught by the participants would require additional instruction before being able to create color profiles. Nearly two-thirds would need more instruction before they could apply a profile to separate an image into CMYK.

**Knowledge of the PFD/X1-a File Format**

Since the PDF/X-1a file format is becoming an integral part of most printing industry guidelines, participants were asked, “If one of your average near-to-graduating students was evaluated regarding PDF/X-1a files, that student would: (check as many as apply)

1. Be able to create a page layout file that meets PDF/X-1a file format requirements.
2. Be able to create a preflighted and/or certified error-free PDF/X-1a file.
3. Be able to edit supplied PDF/X-1a files.
4. Be able to trap supplied PDF/X-1a

**Table 5. Responses to “If one of your average near-to-graduating students was told...”**

Level/Focus	Sub Category	Density			TVI (Dot Gain)			Create Profile			Use Profile		
		0	1	2	0	1	2	0	1	2	0	1	2
All	All respondents	34	36.2	29.8	57	29.1	13.9	50	20.8	29.2	64.5	30.3	5.3
Educational Level	High-School	45.5	45.5	9	86	14	0	100	0	0	89	8.3	2.7
	Community College	46.7	40	13.3	29.4	58.8	11.8	66.6	16.7	16.7	41.1	52.9	6
	Occupational/Training Centers	0	100	0	67	33	0	0	100	1	67	33	0
	Bachelor’s and higher	20	25	55	30.4	30.4	39.2	33.3	26.7	40	40	50	10
Program Focus	Design	60	40	0	70	30	0	67	33	0	80	20	0
	Technical	27.2	36.4	36.4	57.1	28.6	14.3	80	20	0	61.9	33.3	4.8
	Managerial	20	0	80	20	20	60	25	75	0	25	50	25
	All Focuses	34.6	42.3	23.1	54.5	30.3	15.2	41.7	33.3	25	63.3	30	6.7

Note. All data presented in percent of responses by program level and focus. “0” refers to “Require additional instruction;” “1” means “Be able to use that information to make decisions/adjustments,” and “2” signifies “Be able to use that information and explain it to others.”

- files.
5. Be able to impose supplied PDF/X-1a files.
  6. Require additional instruction.”

Approximately two-thirds of the respondents indicated that their students would require additional instruction. Approximately one-fourth of the participants indicated that their students could create a certified and/or error-free PDF/X-1a file. Fewer than 20% indicated that their students could preflight (16.5%), edit (14.1%), impose (10.6%), or trap (9.4%) PDF/X-1a files.

PDF/X-1a instruction, although not well implemented at any educational level, is more likely at the university level than in high schools. In addition, graphic design students are far less likely to be taught about PDF/X-1a files than those in managerial or multifaceted programs.

#### **Presswork Process Control Skills**

The final survey question was designed to measure whether the respondents' students learn the fundamental presswork skills required to print to industry guidelines. Participants were asked: “If one of your average near-to-graduating students was evaluated regarding printing to industry process control guidelines, that student would: (check as many as apply)

1. Be able to measure solid ink densities on a press sheet.
2. Be able to adjust a printing press to meet solid ink density guidelines on a given stock.
3. Be able to measure tonal value increase (TVI) with a densitometer or dot area meter.
4. Be able to adjust an image- or platesetter so that a given printing press will meet industry tonal value increase (dot gain) guidelines.
5. Know the difference between guideline-approved CMYK ink sets and other CMYK ink sets.
6. Require additional instruction.”

Sixty-one percent of the respondents indicated that their students would need additional instruction before they could perform any of the procedures listed in

the question. Thirty-eight percent said their students can measure solid ink densities, while 27% of their students can adjust a press to match specified solid ink densities, 25% can measure TVI (dot gain), 13% can distinguish between guideline-compliant CMYK ink sets, and 13% can adjust an image- or platesetter to make a given press meet industry-approved TVI guidelines. Presswork process control instruction, although not well implemented at any educational level, is more likely at the university and community college levels than in high schools. Students in graphic design programs were least likely to be knowledgeable in presswork process control instruction while those in programs with a managerial focus are most likely to be familiar with those procedures.

#### **Conclusion**

The results of this online survey reveal a wide gap between what responding graphic design and print faculty are teaching and what printing industry guidelines emphasize. Perhaps most importantly, responding graphic design and print teachers lack the basic tools needed to teach guideline-compliant printing including guidebooks, densitometers, colorimeters, and spectrophotometers.

In addition, many teachers are not even familiar with SWOP, SNAP, GRACoL, and FIRST. If teachers do not *know about* or *own* printing industry guidelines, they cannot incorporate their use into classroom lectures, demonstrations, and laboratory assignments. Finally, a majority of students in the programs represented by the survey are not being exposed to printing process control concepts such as monitor calibration, profile-driven color separation, and TVI. Furthermore, the vast majority of students are not learning how to create and handle PDF/X-1a files or how to measure solid ink density and TVI and adjust printing presses accordingly.

#### **Recommendations**

Based on the above conclusions, as well as written comments included by

the respondents in their surveys, the following steps are recommended.

1. *Printing industry standards organizations (SWOP, SNAP, GRACoL, and SNAP)* should make available to every graphic design and print teacher a copy of their respective guidebooks. An inexpensive way to do this, without affecting the organization's revenue stream, would be to create a password-protected PDF file of each guidebook and post it on the Graphic Comm Central website (<http://teched.vt.edu/gcc/>). The password can then be selectively disseminated to teacher members of the Graphic Comm Central listserv.
2. *Manufacturers of graphic arts measurement equipment* should provide a reasonably priced bundle of densitometric, colorimetric, and spectrophotometric equipment so that every graphic design and print educator can obtain the devices necessary to prepare guideline compliant designers, technicians, and managers.
3. *Print trade organizations*, such as GAERF, NPES, NAPL, EDSF, and PIA/GATF and its affiliates, should work with graphic design and print teachers to insure that the equipment bundle described above can be incorporated into every graphic design and print educational program no matter what that program's budget.
4. *Print Ed and the Accrediting Council for Collegiate Graphic Communications*, should require accredited programs to teach printing process control using appropriate equipment and software.
5. *Graphic design and print teachers associations and state departments of education* should include in their conferences training sessions on process control, including densitometry, colorimetry, and spectrophotometry; ColorSync/ICC profiling; and PDF/X-1a creation, editing, and output.
6. *University-level graphic design and print educators* should consider creating and posting on-line instructional materials, such as websites, streaming video, or webinars, that can be used by graphic design and print teachers to learn process control, including densitometry,

colorimetry, and spectrophotometry; ColorSync/ICC profiling; and PDF/X-1a creation, editing, and output. The Graphic Comm Central website would be an appropriate site to host such information.

7. *Publishers of graphic design and print textbooks* should require textbooks at every level to incorporate printing process control procedures.

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**Graphic Communications  
Education Survey  
on next page**

# Graphic Communications Education Survey

**Are you a teacher/instructor/professor of "graphic communications"?**

Yes  No

**What level of graphic arts education is your primary focus? (choose only one)**

- Junior High School
- Senior High School
- ROP/ROC, occupational center, training center, etc.
- Community College (certificate or degree)
- Bachelors or higher college or university

**Which of these descriptors best describes your graphic communications program?**

- Design/art/image creation focus
- Technical/technician focus
- Operations management, sales, sales support
- All of the above

**Are you acquainted with the following guidelines for graphic communications?**

- SWOP* -  Yes  No
- SNAP* -  Yes  No
- GRACoL* -  Yes  No
- FIRST* -  Yes  No

**Do you have a copy of these guidelines available for your use?**

- SWOP* -  Yes  No
- SNAP* -  Yes  No
- GRACoL* -  Yes  No
- FIRST* -  Yes  No

**To what extent do you integrate these guidelines in your classroom?**

*SWOP*

- Not at All
- Somewhat
- Extensively

*SNAP*

- Not at All
- Somewhat
- Extensively

*GRACoL*

- Not at All
- Somewhat
- Extensively

*FIRST*

- Not at All
- Somewhat
- Extensively

**Do you have a densitometer for use in your classroom?**

Yes No

**To what extent do you integrate the use of a densitometer into your teaching?**

- Not at All
- Somewhat
- Extensively

**If one of your average near-to-graduating students was told, "the cyan density should be 1.40," that student would:**

- Require additional instruction
- Be able to use that information to make decisions/adjustments.
- Be able to use that information and explain it to others.

**Do you have a colorimeter or spectrophotometer for use in your classroom?**

- Yes  No

**To what extent do you integrate the use of a colorimeter or spectrophotometer into your teaching?**

- Not at All
- Somewhat
- Extensively

**For what purpose(s) do you use the colorimeter or spectrophotometer? Check as many as apply:**

- Calibrate and characterize monitors
- Characterize scanners
- Characterize proofing devices (such as laser or ink-jet printers)
- Characterize printing presses (digital and/or conventional)

**If one of your average near-to-graduating students was told, "Profile the ink-jet proofer and use the profile to make a color separation," that student would:**

- Require additional instruction.
- Be able to create, upload, and use a profile to make color separations.
- Be able to create, upload, and use a profile and explain to others how to do the same.

**If one of your average near-to-graduating students was told, "the tonal value increase (dot gain) is 22%," that student would:**

- Require additional instruction.
- Be able to use that information to make decisions/adjustments.
- Be able to use that information and explain it to others.

**Which of these methods of monitor calibration do your students use?**

- None
- Built-in visual procedures in Windows or Mac operating system
- External monitor calibrator/colorimeter.

**How often do your students calibrate their monitors?**

- Occasionally
- Weekly
- Each class session

**If one of your average near-to-graduating students was told, "separate a digital photograph using the U.S. Web Coated (SWOP) v2 profile," that student would:**

- Require additional instruction.
- Be able to use that information to set Photoshop and/or other graphics software.
- Be able to use that profile and explain to others how to use it.

**Are you familiar with PDF/X1 protocols?**

- Yes  No

**If one of your average near-to-graduating students was evaluated regarding PDF/X1a files, that student would: (check as many as apply)**

- Be able to create a page layout file that meets PDF/X1a file format requirements.
- Be able to create a preflighted and/or certified error-free PDF/X1a file.
- Be able to edit supplied PDF/X1a files.
- Be able to trap supplied PDF/X1a files.
- Be able to impose supplied PDF/X1a files.
- Require additional instruction.

**If one of your average near-to-graduating students was evaluated regarding printing to industry process control guidelines, that student would: (check as many as apply)**

- Be able to measure solid ink densities on a press sheet.
- Be able to adjust a printing press to meet solid ink density guidelines on a given stock.
- Be able to measure tonal value increase (TVI) with a densitometer or dot area meter.
- Be able to adjust an image- or platesetter so that a given printing press will meet industry tonal value increase (dot gain) guidelines.
- Know the difference between guideline-approved CMYK ink sets and other CMYK ink sets.
- Require additional instruction.

**How many years have you been teaching graphic communications?**

- 0 - 3
- 4 - 6
- 7 - 10
- 11 - 15
- 16 - 20
- more than 20

**Which of the following would aide your efforts to teach students about the latest guidelines and protocols in graphic communications? (check all that apply.)**

- Additional equipment to use in training
- Newer textbooks or instructional materials
- Field work experience for students
- Attending professional seminars or workshops
- Webinars or other on-line professional development resources
- Other

**Please provide the name of your favorite business or professional association relevant to graphic communications education.**

**Please indicate if your graphic communications program is accredited, by: (check all that apply)**

- PrintED
- ACCGC - Accrediting Council for Collegiate Graphic Communications
- Other

**What industry or teaching certifications do you hold that are relevant to graphic communications?**

**Would you like to be contacted with the results of our survey or resource materials for graphics arts education?**

- Yes  No