Digital Imaging or Imaging Digitally?

The implications for Photography Educators

Abstract:

Employing the first year semester one subject *Digital Imaging* from the Bachelor of Photography program offered at Griffith University as a case study, this paper describes a personal educational journey: a venture to bridge photography students' ever-widening perceptual gulf between "digital" and "traditional" imaging technology.

The causes and consequences of this growing photographic apartheid are discussed and a case for complete technological integration is made. The paper details the presenter's conceptual point of departure from what might be termed a typical "graphic designer's model" of digital imaging and taking the agenda back to *photographic imaging - digitally*.

Finally some examples of educational projects and teaching approaches are provided. These learning projects employ "guided deliberation" to illustrate the intrinsic relationship between digital practice and traditional activities and so generate a deeper and more comprehensive understanding of photo imaging technology.

Background:
Successful photo-education requires continuing development and refined educational curricula and teaching techniques in an ever-changing social, technological and "political" landscape. Adapting to and incorporating technological change is an ever present educational challenge which, until recently, we seem to have managed with reasonable success.

The subject Digital Imaging is offered in the first semester of the first year. It centred on students working with Adobe PhotoShop as a means of manipulating images. This is the only "digital" subject within the Bachelor of Photography program offered at QCA Griffith University. It has always been very popular with a minimal failure rate. Students greatly enjoyed the freedom, speed and magnitude of the image manipulation afforded by the technology.

History:
Historically new films, cameras or processes were affordable and attendant change easily accommodated within existing curricula. Generally these technological changes arrived on our turf through our "front door". We need to recall that digital technology entered the photographic world in a somewhat roundabout manner finding application first in the graphic arts where drum scanners displaced film separation techniques. Then graphic designers, eager to avoid the tedium of Letraset, quickly adopted digital tools. With the advent of Macintosh and PhotoShop in the design establishment, photo educators felt compelled to incorporate some digital technology. Prohibitive costs and rapid obsolescence of early digital capture toys automatically forced teaching institutions to retain core traditional imaging technology and create add-on affordable digital subjects.

The logic was simple: If we can't capture images we can at least manipulate. In the process, however, we adopted the ubiquitous expression, *digital imaging* without realising its attendant mindset: that computers are central and consequently that Digital Imaging is about *computers* not photography.

In common with the vast majority of photography programs, our degree is offered in a college or university school that also hosts graphic design courses. Design subjects are taught in ready-made design media labs. Young teaching staff were naturally attracted to Digital Imaging. Young, enthusiastic people, from a design background, having a limited appreciation of photography and lacking a deeper appreciation of technological integration and complementarity essentially developed and taught our digital imaging program. To make matters worse, when our photographers later began teaching digital imaging they followed the only model in town – the design model. This binary approach to imaging technology entrenched barriers– barriers in location and barriers in students' minds.

Thus, it came to pass that digital imaging became an escape. Students could escape the rigours and tortures of studios and dark laboratories to do "creative – fun" stuff with computers in labs managed by the design department where they learned PhotoShop tricks. Cut-and-paste were the daily fare: equivalent is to teaching photographers how to make collages and little more. Cutting and pasting without concern for imaging fundamentals. Scanning and printing were mere mouse-clicks: child's play. Whatever the result – it was true and correct – it had to be so - computers don't lie: Digital Imaging was a photographer's paradise.

Point of departure

In Early 2002, an influential member staff lobbied the convener of photographic programs with the startling (but not surprising) observation that "Our third year students don't know how to scan or print!" This catchcry soon gathered momentum. Even casual observes realised that most third-year student folios were produced with digital technology but students lacked genuine *control*. With only two weeks before semester begin, and having to re-develop two other subjects I was not happy to accept responsibility for developing a new subject, coordinating four lecturers, five tutors and 80 students. To make matters more interesting the department is experiencing a funding crisis – we are unable to have lecturers actually teaching this subject. It was decided that the course structure would involve full-time staff presenting 1hr "mass" lectures and assessing work, while tutors assist students in completing practical assignments in the computer labs. New lab infrastructure was promised to facilitate the new "teach them how to scan and print" approach. Every computer was to be supported by an inkjet printer allowing students the opportunity to make numerous test prints and so learn image control through trial-and-error practice.

Given the challenge, the primary concern quickly became establishing some form of working approach from which a new program might emerge.

Fundamental Questions:
What is Digital Imaging? What is a digital image? How can core *photographic* concerns such as exposure, processing and tonal control, be addressed in a media lab environment? How can this be taught to first year students?

Some Thoughts:

- *There is no such thing as a **digital** image*. The file is merely a set of instructions for each picture element: these instructions are forwarded to some other device – no different to a teacher instructing a student to make a print exposure at f8 and 11 seconds.

- An image file equates to the *latent image*. In traditional imaging light affects silver halides such that photoelectrons are held within halide crystals in proportion to the incident radiation. The image remains hidden until its reduction (processing) to silver. *Image processing* determines density, contrast, saturation etc. (Unlike silver halide processing digital processing allows us to model – within reason - potential processing outcomes, which we see on screen)

- Imaging Digitally employs pure *photometry*. Light values are measured and assigned digital numbers that control other devices. Thus scanning and printing are, in effect; multi-point automated off-easel colour printing techniques.

- Images have *3 dimensions*. X, Y raster positions which are replicated with relative ease. The Z or Density/Luminance dimension however poses *exceptional* control and reproduction difficulties.

- The image a student sees "on screen" is not *the image* but merely one of an infinite number of possible screen "representations" of the file – the set of instructions. Thus the screen image is, in essence, an unreliable *illusion*. (particularly in the Z dimension) Like traditional imaging we cannot judge the latent image until the actual processing chemistry or output device has acted upon the instructions.

- Working digitally is identical to working with silver images – it merely looks different – *it is in fact confused by the illusion of the screen image*. Everything we do "digitally" can be done in "traditional" form.

- Very few practitioners in Australia work with computer screens correctly (photometrically) calibrated to output devices. If uncalibrated equipment is the norm, exposing students to the technological limitations makes good sense from an educational perspective.

- If we are dealing with files as *instructions* then why not engage with them directly – why accept the illusion (by working visually – off the screen) when we can simply learn to recognise the relationships between digital numbers and actual image outcomes on the selected device?

- To achieve the aim of giving students control, the subject must centre on *Imaging* digitally not *digital* imaging. The semantics *are* important. Emphasis must be on producing images not playing with computers and software.

- Given that teaching the subject "at the coal face" will not be possible, the re-developed subject must comprise *guided self-learning and discovery* - directed at *understanding* how the technology functions.

- *Trial and error* has proven the most effective means of learning in "traditional" imaging education. It stands to reason that learning to image digitally should not prove substantively different.

Program Structure

Digital Imaging

Former Structure	**New Structure**
	Theory Lectures
Practice supported by theory	Guided practical learning in labs
Tutorials in computer labs.	
Learning Projects	
	3 Basic Learning Exercises
Retouching an image	Copying a Colour Print
CD Cover (design)	Retouching an Image
Self – promotional piece (design)	Photographing a Panorama

Program Rationale

- Weekly lectures presented background information and the conceptual framework required for meaningful engagement with practical learning experiences.

- Practical work is designed exclusively around photographic concerns. The digital equivalents to everyday photographic practice such as cropping, exposure, brightness range, contrast, colour balance etc.

- Practical work structure involved acquisition of basic imaging concepts and controls through structured learning exercises. Each exercise is accompanied by a detailed set of instructions. Each finished exercise required submission with detailed **written *critical* assessments** of input, screen representation and output qualities against a set

of criteria. Assessment weighting is biased (50%) to "evidence of *understanding* imaging concepts"

- Application and refinement of acquired knowledge and skills in 3 practical assignments each including critical analyses of outcomes and the fundamental logic underpinning imaging choices. Assessment weighting is biased (30%) to "evidence of *understanding* imaging concepts" The final piece is designed to illustrate the seamless integration of analogue and digital technologies.

Outcomes:
An end of semester subject evaluation established the new program's effectiveness. Feedback regarding students' "most valuable learning" included: "… getting it right on the monitor is not what it will print out" and that "data trashing (use of slide mapping) is not good". Students also acknowledged the benefits of learning how "To scan it right to be able to use it and keep detail". The course also made them "…aware of good & bad prints" and the value of "... looking at images in a critical way" However full-time staff felt over-worked. The guided learning approach demanded more detailed and extensive written feedback.

Parting thought
Digital processes are essentially photometric – the nearest traditional equivalents are in fact densitometry and sensitometry. Effective imaging professionals require technical literacy and skills. We must be prepared to revise the notion that imaging through digital processes – *with control* - requires less technical understanding than so-called traditional processes. This fiction originates from the "security blanket" provided by the computer screen image that constantly seduces us into working visually but naively.

Examples of Learning Exercises and Assignment Briefings Follow

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1807 QCA Digital Imaging 2002

Teaching week 5

Exercise C

Digital Photo Copying in Colour (cont)

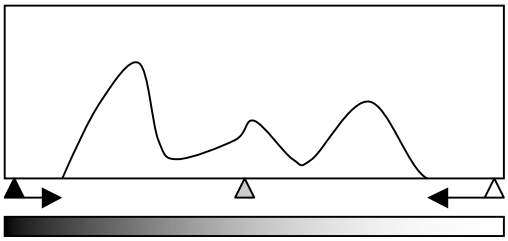
Aims:
To introduce students to the input output nature of photographic imaging
To investigate fundamental imaging controls and limitations
To introduce basic hardware and software operations

Introduction.
In this section we will explore the most useful imaging controls offered by digital technology. Please note that there are a number of controls offered in PhotoShop (and on scanners) which are NOT RECOMMENDED for professional applications because they seriously degrade image QUALITY. These are found in the Image adjust part of the program and will be discussed in the DI Lecture program.

Controlling Input-output relationships

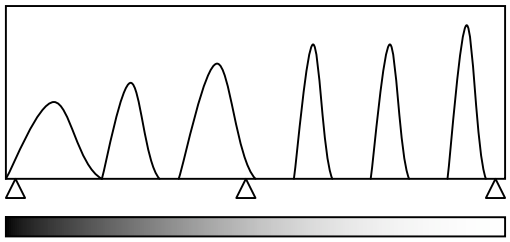
Using the Histogram

- Load the image file created last week into PhotoShop. Make a new copy to manipulate.
- Working on the new file, select Image Adjust – Levels to generate a histogram. (N.B. Do NOT use "auto levels" – this is a rough solution for amateurs – not imaging professionals) The histogram shows how often various "brightnesses" occur in the image. Experiment by moving with the 3 triangles under the histogram. Switch between the 3 "channels" (RGB) and note the changes you see. (Never forget that what the screen shows is NOT what you will actually print- only a rough indication!)
- Back to the histogram. If your histogram completely fills the horizontal bar you have made full use of all 256 available levels – one indication of a "good" scan. If not (the usual case with primitive desk-top scanners) you can "stretch" the limited number of levels to have 255. BUT, as you will see, there is no free lunch – not even in digital imaging! Place the right and left triangles at the extreme ends of your histogram and your screen image will seem to "jump" in tonal quality. Whites will be white and blacks quite dark. Click OK. This "histogram clipping" fulfils a function similar to selecting the correct paper grade in B&W printing but – as you will see – it also degrades image quality.



- Now, go back to Image Adjust – Levels and re-visit the histogram – it will now fill the space but – look carefully – it will probably show a comb-like structure with missing levels! This is like a tonal ladder with missing tone steps!
- Using the selection tool open up a rectangle which only includes the grey scale.
- Now, go back to Image Adjust – Levels and observe the histogram for this selection - look carefully – it will resemble a set of spikes – each spike represents one step. Count the steps visible in the original grey scale – the one you scanned and then count how many steps were recorded as separate spikes in the histogram.

- If the two sets of steps match you have a good scan. Missing steps – usually in the black regions indicate poor scanner response. You may wish to verify what you see by "scanning" across the grey scale with the picker and noting the actual digital numbers. Carefully note your results for your report. Click outside the selected area to exit.



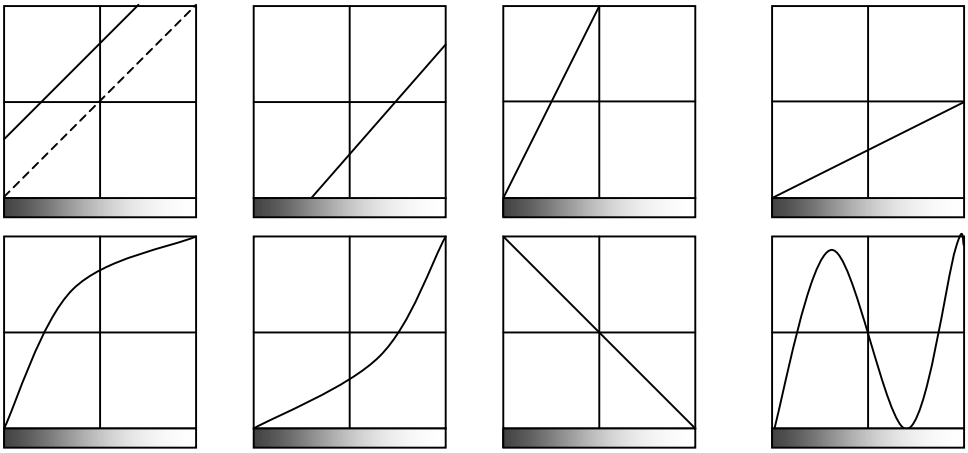
Make a print from this file and compare it with the first print you made.

Using Curves.

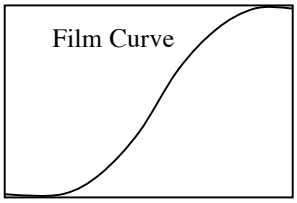
Introduction

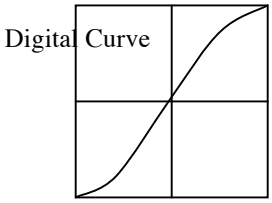
This is most powerful and useful control! It fulfils the same function as developing a film to the correct degree. Too much or too little development results in too high or too low a contrast for good prints. (For reference consult T-max film curves)

- Load the image file created last week into PhotoShop. Again make a new copy to manipulate.
- Working on the new file, select Image Adjust –curves. A box now appears on the screen. The diagonal line represents all possible curves. Conduct the following curve-shift experiments in RGB channel (grey):



- Repeat this experiment using each of the 3 channels (red then green then blue) separately. Observe the effects! Note how, with small changes, you can introduce subtle colour shifts in shadows, mid-tones and highlights (But never forget that what the screen shows is NOT exactly what you will actually print- only a rough indication!) If you see an interesting effect why not make a sample print. But do not click OK in the curves dialog box as this will change the data.
- Photographic film normally has a curve similar to the one shown below. Over 150 years photographers and imaging scientists have learned that this curve shape produces the best "looking" photographs.





- Working with the image file which you "clipped" previously, now induce a nice, gentle "S" shaped curve as illustrated above. How does this look "on screen"? Save this file and make a comparison print.
- Critically evaluate the image tones in the curve-adjusted print compared to the "clipped" only print.

Questions.

In your written report detail your findings, Where possible relate your digital experience to your "traditional" practical photographic experience.

When analysing the prints you produced do not forget to consider how the files appeared on screen. Comment on the following issues:

- *colour saturation*
- *colour bias* (called colour cast)
- *contrast*
- Image "smoothness"
- Overall "look"

Exercises A, B & C Assessment Sheet

Student: _____

Criterion	Weighting	Result									
Evidence of Reading Set Text	20%	1	2	3	4	5	6	7	8	9	10
Understanding Imaging Concepts	50%	1	2	3	4	5	6	7	8	9	10
Print Quality Achieved	20%	1	2	3	4	5	6	7	8	9	10
Presentation & Finishing	10%	1	2	3	4	5	6	7	8	9	10

Adherence to the brief and completion of all set exercises	Pass Resubmit

Required for assessment:
Exercises parts A,B,&C
Typed (Word Processed) analytical reports,
Original images and copies
All images neatly mounted and submitted in an A4 "Ziplock" folder or equivalent
N.B. Students are advised to create back-up image and document files on Zip disks.

Assessor's Comments:

ASSIGNMENT 3 **Panorama Photograph**
DUE DATE: **5 PM. FRIDAY, TEACHING WEEK15, (14 June)**
Place in Photography Assignment Box.

OBJECTIVES:

- To examine students' expertise in the application of basic image manipulation. (Application of skills acquired)
- To develop students' expertise in shooting and scanning photographs for a specific outcome
- To develop skills and knowledge in the use of digital printers.

PROCEDURE:

- Students are to photograph a set of images on transparency or colour negative 35mm film. These must be suitable for later combination to create either a 180 or a 360 degree panorama.
- Applying all available knowledge and skill, students' are required scan and combine thes images to create a "seamless" digital panorama print.

Notes:

- Before proceeding the concept and location chosen should be approved by your lecturer.
- Original image must be in colour
- Where possible "global' image corrections should be done before scanning. (Check with tutor)
- Retain a copy of your file in Zip disk for reference.

SUBMISSION REQUIREMENTS

Your same-size digital copy – neatly mounted for presentation.

A written report containing:

- A critical evaluation of the outcome
- All corrections applied and at which stage of the imaging process corrections were applied
- An in indication of the logic for the chosen procedure.
- Diagrams showing tone curve adjustments for colour and contrast. (See Kansai CH 4 –21 for a proforma)

All items must be clearly labeled with your name, assignment number and tutorial group. All items must be securely enclosed in a single package such as an A4 zip lock folder. A4 plastic inserts are not suitable. Long prints may be rolled and submitted in a tube.

ASSESSMENT CRITERIA FOR ASSIGNMENT 3 (25% weighting)

Student's Name: _____

CRITERIA	WEIGHT	CATEGORISATION							
		V poor		Average				Excellent	
		3	4	5	6	7	8	9	10
Image splicing	10								
Contrast	20								
Colour Balance.	20								
Colour Saturation.	10								
Clear, professional Report	10								
Evidence of *Understanding* Imaging Concepts	30								