RESEARCH ARTICLE

Breaking Images: A Method for Improving Design Students' Visual Literacy

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Abstract: In pursuit of competitive advantage, a growing number of organizations are adopting design-thinking strategies with a strong emphasis on visual methods. As a result, graphic design education must increase a focus on cultivating visual literacy as a thinking tool, in addition to its traditional processes for producing polished artifacts. This article proposes such a pedagogical approach; teaching students to deconstruct an image into pictures of differing levels of fidelity. The spell of realism broken, students can begin embarking on their own stylistic visual communication paths. Drawing on J.J. Gibson's distinction between image and picture, students explore how deliberate choices of pictorial form can advance specific communication goals. Classroom activities encourage them to imagine a world without text — where meaning must be carried solely by pictures — and to challenge the cultural assumption that photographic accuracy is synonymous with effective depiction.

Keywords: graphic design education; studio exercises; visual communication; visual literacy

1. Introduction

In this article, we take the position that visual literacy is a key competency for design students graduating in 2025. Over the past two decades digital cameras, smartphones and AI-driven image generators have radically lowered the cost of creating and sharing imagery. By 2011, more iPhones were "born" than human babies, and YouTube now receives more video in a single month than the three major US television networks

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produced in their first 60 years (Apkon, 2013). Global organizations have responded by embracing design thinking, a mindset in which visualization and rapid prototyping are central (Sarooghi et al., 2019). Consulting firms such as Deloitte, KPMG and PwC increasingly recruit graduates who can sketch systems, storyboard user journeys and communicate strategy through diagrams rather than decks of text-heavy slides. The future looks likely to witness a further expansion of visual media and technologies. The corporate, government and not-for-profit sectors are already growing interested in developing the capabilities of their own staff. Looking for a competitive edge, a growing number of these organizations are adopting design thinking strategies, with a focus on visual methods.

How would one be educated to be a productive communicator in a world where communication happens more through pictures and less through the written word, and clients are looking for help with their visual strategies? In an economy that has moved away from the manufacture of things towards the provision of services, the future may be more about visual design as a thinking tool, and less as an end in itself. Graphic designers, illustrators and others working in fields of visual communication must start to concern themselves with how pictures can be put to use with deliberate intent. Visual literacy — defined here as the ability to read, write and reason with pictures — must therefore sit alongside conventional literacy in any contemporary design curriculum (Avgerinou, 2009; Kedra, 2018). This article responds to that need by (1) synthesizing the literature on visual literacy in design, (2) presenting a structured model for analyzing pictorial fidelity, and (3) describing studio projects that have improved students' confidence in choosing, making and manipulating images.

2. Literature Review

2.1. Defining Visual Literacy

Debates on textual literacy since the 1990s have moved away from relatively simplistic notions of what it means to be literate, to a more fine-grained understanding (Barro & Lee, 2001, p. 556). Questioning what purposes literacy skills are put towards raised the bar put in front of literacy: to read and fill out a form might be a necessary competency to participate in society, but to read and write reports is of a different level. It is an even more literate person who can write an affecting haiku or a play. Research into literacies in many disciplines is ongoing, with an urgent focus on problem solving in a technology-rich environment (Martin, 2018; Tang & Williams, 2019).

The same, dimensional attention can be given in the realm of visual literacy. As with the multifaceted approach to literacy, a dedicated program in visual literacy should ask what tasks pictures are being applied to. Looking at an instruction sheet and constructing an

IKEA chair might require different visual competencies than interpreting a commercial on YouTube, sketching a flow diagram or drawing a storyboard for an animated film.

Multiple authors portray the 21st century as a "bain d'images," in which pictorial representation dominates daily communication (Avgerinou, 2009; Elkins, 2008). Studies on problem-solving in technology-rich environments conclude that visual literacy is among the most critical graduate attributes (Martin, 2018; Tang & Williams, 2019). The convergence of ubiquitous image technology and service-oriented economies thus demands that designers master picture-based argument as fluently as text-based rhetoric.

Attempts to pin down "visual literacy," however, are made difficult by a span across multiple disciplines with, at times, conflicting agendas (Kędra, 2018). Most definitions converge on intentionality: the competent communicator can both decode and encode images with deliberate purpose (Haanstra & Wagner, 2019). *The Visual Literacy White Paper* (Bamford, 2003) and the *European Framework for Visual Competence* (Haanstra & Wagner, 2019) place awareness of why a particular pictorial strategy is chosen at the heart of the construct. This intentional dimension provides the conceptual bridge to design education, where appropriateness-to-task is already a central criterion in typography teaching. We will return to this purpose in the Concepts and Pedagogies section below.

2.2. The Need for Broader Visual Literacy in Graduates

Competency in visual literacy is necessary to prepare learners for living and working in a visually saturated environment (Doyle et al., 2018). Back in 2008 James Elkins began his *Visual Literacy* book with the notion that "a tremendous force of rhetoric has been brought to bear on the notion that ours is a predominantly visual culture" (Elkins, 2008, p. vii). Since then the rhetoric seems less like persuasion and more like stating the obvious. The future will likely witness deeper visual immersion in the "bain d'images." Pictorial representations are predominant modes of daily communication, and skills in visual "reading and writing" are therefore essential for full participation in any communication process. Ernesto Peña Alonso, author of *Visualizing Visual Literacy,* points out that among other drivers pushing the world in an increasingly visual direction, there is an increasing prevalence of contemporary visual technologies (Peña Alonso, 2018).

2.3. Industry Demand for Visual Thinking

As Meredith Davis (2018) pointed out in her Introduction to Design Futures, design for print (in the US) was in decline while the general trend for labor was showing 7% growth. At the same time, web design was growing at over twice the rate of general labor growth (15%), suggesting a shift to graphic design with a more visual interface

that affords interactions akin to conversations, as opposed to graphic design which delivers a perfected, finalized text heavy message from its source to a receiving reader. In addition, Davis describes a pace of technological change to a level where "there is too much technical knowledge for production to be a common threshold for formgiving responsibility" (p.5). While it may seem counterintuitive, design educators might think twice about trying to keep up with technology. Davis (2018) warns that:

> ...college faculty must be cautious not to overload curricula with content of temporary relevance at the expense of more enduring knowledge that transcends a rapidly changing context. At the same time, educators must rethink how to deliver lasting concepts and principles in light of a radically changed landscape for professional practice that bears little resemblance to the past. Curricula must be rethought from the ground up, not modified through endless additions to an industrial-age model. (p.5)

Davis's recommendations chime with the 21st Century business practices of some major corporations. Deloitte's "Centre for the Edge" produced a report about Toyota's "counterintuitive" approach of teaching its autoworkers to do by hand what the Toyota assembly-line robots have been doing much more quickly. An essential finding of the report is that the pace of change for technologies is far and fast outstripping the ability of staff to keep up:

> First, because of changing customer expectations and the pace at which technology is becoming able to replicate human skills, the number and variety of skills required to serve a profitable market is growing faster than the workforce can learn them. And two, skills themselves are becoming less central to creating the type of value that will differentiate a company and help build a deep, long-term relationship with customers. (Hagel et al., 2019, p. 4)

Toyota, rather than wishing to return to a time when the labor in its plants was all manual, is hoping its workers will:

> ...draw upon qualities such as imagination, creativity, problem-solving, and experimentation. The intent is to arm these workers with the right capabilities to enable them to continue to ask the right questions of unforeseen problems and develop new solutions. (p. 2)

Problem solving in a technology-rich environment is a pressing issue. The premise is that skills become obsolete (and quickly!) while capabilities endure.

Similarly, Hagel et al. (2019) identify a wider economic shift from discrete technical skills — often rapidly automated — to enduring human capabilities such as creativity, problem-framing and visual reasoning.

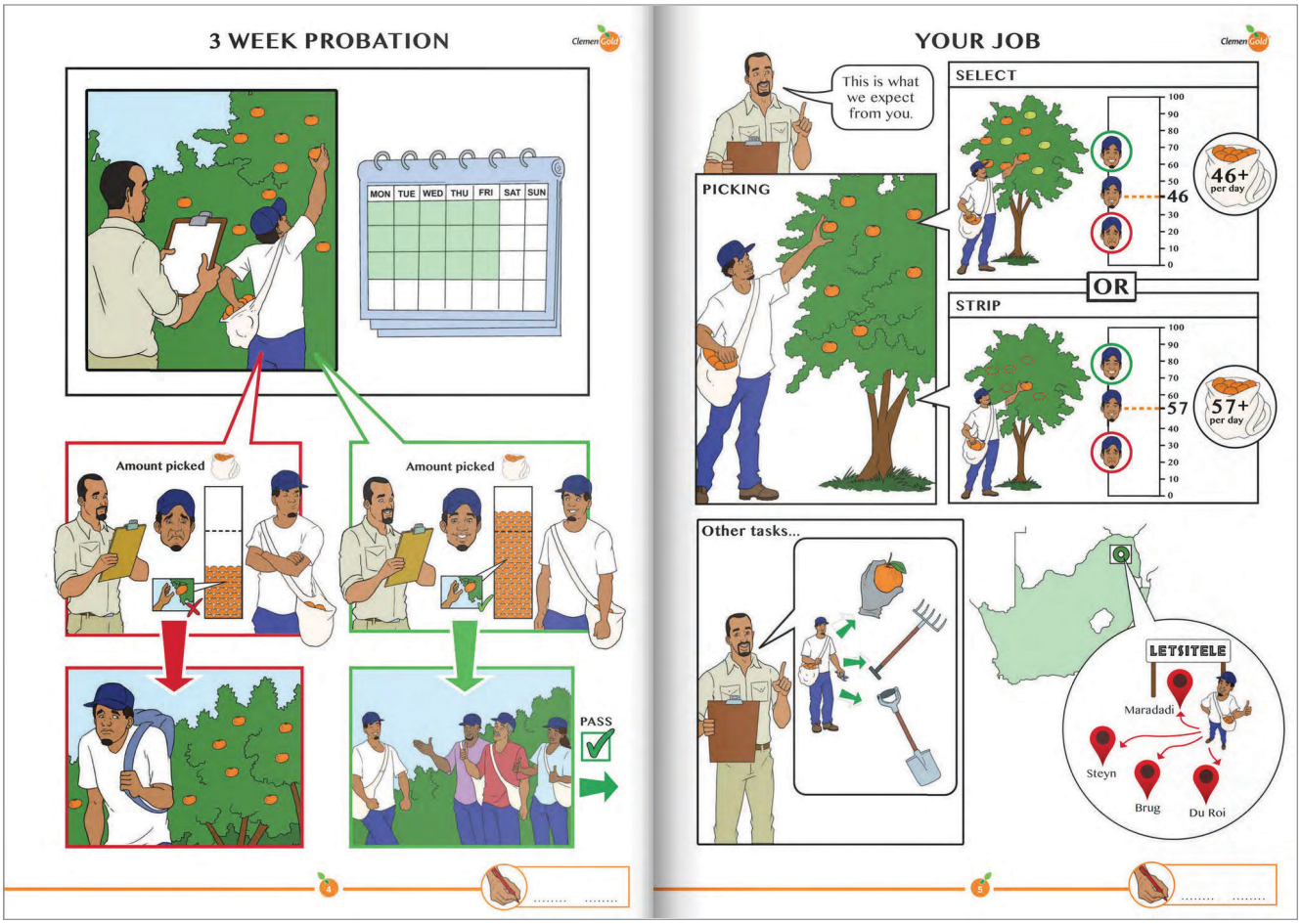

Figure 1. An example extract of a visual contract by Creative Contracts, Cape Town, South Africa, May 2016, for Indigo Fruit (Pty) Ltd, a farming business in Limpopo that grows and supplies Clemengold fruit.

Organizations describe visual thinking as an essential yet underutilized capability (Sarooghi et al., 2019). The Center for Visual Expertise now offers visual literacy training aimed at reducing workplace accidents (Thompson, 2020). More specifically, firms such as Indigo Fruit in South Africa (Figure 1), and Aurecon, a major engineering group in Australia, have begun using comics as employee contracts and induction materials. Aurecon quotes its Global Chief People Officer Liam Hayes as saying that "'The issue of engaging our talent and building their trust is becoming one of the biggest competitive differentiators across many industries and companies'" (Aurecon Group, 2018). Ranked Australia's 5th most innovative company in 2017 by the *Australian Financial Review,* Aurecon also decided to use the employment contract as an exemplar of thinking innovatively as part of its focus on shaping the future of work. This is a major leap. A threshold has surely been crossed when a practice as conservative as law can be made visual and the resulting visualizations must be legally binding.

At the same time, there is a move towards designers engaging with complexity. The complexity, in those nations which have moved away from handling the majority of their own manufacturing, comes from a shift from products to services:

> The economic basis of Western industrial nations has changed dramatically in the last three decades from manufacturing to the provision of information and services. Services now typically represent between sixty and seventy percent of the gross domestic product of developed nations. (Mager, 2008, p. 354)

Gültekin et al. (2016) explain that methods needed to guide designers in developing solutions that consider diverse stakeholder perspectives in these complex contexts are limited. Visually focused methods are high on this list of needs. Specific to the disciplines the authors teach, demand has grown locally in Australia for illustration, but not from the publishing sector. Service designers are working with illustrators and comics artists to help rapidly, and relatively cheaply, prototype service scenarios through sketches, storyboards and comic strips featuring predicted situations and personas. Illustrations in these contexts, apart from being inexpensive ways of producing prototypes, have several advantages. Illustrators can help visualize particular situations which do not yet exist, contribute their considered observations of local behaviors and appearances, amplify or completely avoid as necessary particular visual aspects pertinent to the communication, such as the intended service users' gender, ethnicity, age, and location in ways that are impossible to achieve through photography (Medley & Sercombe, 2019). Furthermore, the inclusion of pictures appropriate to the communication can increase engagement and empathy in the beholder (Grinstein et al., 2019).

In the conventional contexts of publishing, while there may be more outlets than ever for editorial illustration, the pay for illustrators has decreased. Illustrators can be commissioned from anywhere on the globe. For one-off visuals, where continuity or local sensitivities are deemed unimportant, the art director may easily choose the cheapest option. Stock illustration and more recently AI are choices that further undercut this market. In the service design context, by contrast, local knowledge is important, ongoing collaboration is paramount (projects may take years), and illustrators can be paid their worth. Roderick Mills, at the University of Brighton, suggests that illustration has value in this context because:

> Illustration has accessibility, and increasingly as it moves away from reproduction, has potential through performance and the potential of storytelling beyond the image [to] act as a pedagogic tool and for social engagement, [...] and to tell stories, narratives for varying communities. (Mills, 2017, p. 205)

In these service development contexts, the illustrations may never be published more widely than for the scrutiny of a small focus group.

2.4. Visual Literacy as a Key Competency for Graphic Design Students

The authors are lecturers and researchers in the field of visual communication; one from a professional background of graphic design and illustration. When we entered the academy in 2004 it was to teach these two disciplines. In searching for ways to make tacit, experiential knowledge explicit, we discovered that, in the educational institutions we had worked for in Australia and New Zealand, the emphasis in educating the next generation of graphic designers was placed almost entirely on typography and composition. This was exactly the way we had been taught more than a decade earlier. All the graphic design textbooks we could lay hands on as teachers were still dedicated to the application of type.

The study of graphic design is still typocentric. The word "typography" is still being used interchangeably with "graphic design," even in contemporary research that explores the history and future of education in the discipline (Vogel & Wang, 2019).

An outsider to the discipline which, according to most definitions is concerned with communication via the arrangement of type and image — Meggs even calls it a language made from these two elements — might expect both halves of that equation to be rich fields of experimentation and enquiry, but this has not been the case until late in the 20th Century (Meggs, 1992). While editor of *Eye Magazine*, Max Bruinsma commented on the "second class" status of pictures as compared with text in graphic design (Bruinsma, 1997). Some practitioners still report uncertainty in making visual meaning because of this disparity (Yates & Price, 2015).

A few texts have boldly and explicitly sought to address the relationship between text and image, such as Skolos and Wedell's (2006) *Type, Image, Message*, while being worthy developments from the typocentric texts of the 20th Century. However, they have limited their own scope by adopting a focus on photography as the principal choice visual communicators would make to embody the pictorial aspects of their designs: "designers must embrace the creative potential of photo-typographic space" (Skolos & Wedell, 2006, p. 10). Bo Bergström's very informative *Essentials of Visual Communication* nevertheless also suffers from this photographic bias (Bergström, 2009).

Graphic Design Theory (Davis, 2012) and *Visual Communication Design* (Davis & Hunt, 2017) do an excellent job of linking, in the former, the image aspects of graphic design's history to theories including Peirce's semiotics and hyperreality among others; and in the latter, focusing on user and audience interpretation of imagery through Gestalt principles — similar to Dondis' (1974) *A Primer of Visual Literacy* — and again Peircean semiotics (icon, index and symbol).

In short, while there are countless texts on typography for education in graphic design, there is only a relative handful dedicated to image for the same applications. Where

graphic design textbooks cover the image they tend to explore only the photographic. "Graphic design" is still a common term in the Anglosphere, especially regarding undergraduate design education. In the European context "graphic design" is related to the craft of giving form; skills which can be learned. Typography, in this sense, with its conventions around leading, tracking, line lengths and so forth, is well situated here: one can learn readability through rules. It is important for contemporary visual communication courses to focus on capabilities broader than those that have traditionally defined a graphic designer's competencies. "Visual communication" has a more open definition than "graphic design," reflecting Meredith Davis's (2018) recommendation to look to more enduring knowledge that transcends a rapidly changing context. This bigger picture should include visual literacy for designers.

Since 2000, illustration has dramatically re-emerged as a popular choice for graphic designers and art directors looking to embody the imagery of visual communication (Klanten & Hellige, 2005). Theorists too are seriously beginning to explore the potential of escaping the photographic image and the dominance of traditionally defined fine art discourse (Dowd, 2018). Carnegie Mellon's Susan Hagan (2019), arguing for the serious communicative application of illustration, says: "Illustrations are too often seen as shapes, colors, and textures that primarily trigger emotion, rather than as complex contributors to meaning that address the need to understand a problem from a fresh angle" (p. 163).

With the re-emergence of illustration in the new century, visual literacy in the graphic design context should encompass the hand-made aspects of picture making as well as photography and typography. To be visually literate in the context of deliberate visual communication should incorporate how pictures are made, rather than assuming they are made with a camera, and also include the uses to which pictures can be applied (Doyle et al., 2018).

2.5. The Need for Broader Visual Literacy in Graduates

Visual thinking is growing in importance. Companies seeking a competitive edge are shifting from having human resources departments that ensure the individual worker's compliance with the organization, to having human capital departments that are more aware of, and can leverage, their individual workers' skills and experiences, but also allow for individual learning styles so that staff can accrue new skills and capabilities (Llopis, 2019).

In the experience of one of the authors of this article — working with lawyers in the realm of comics contracts, or creating storyboards to help businesses design their services — it has been the client reaching out for help to think and work visually, rather than the illustrator trying to find new avenues for sales. The shift to service design

rather than products and communications ephemera means that illustrators, designers and art directors also need to change their own thinking about the venues where their work could appear; or not appear in the case of work that has no "public" beyond the clients' stakeholders in focus groups.

Visual literacy capabilities will allow illustrators and graphic designers a better view over the whole service process — where the conventional graphic design outputs such as web design, literature and signage fit in as touchpoints — but also allow them to contribute to the client's and user's understanding of processes. In the transition, illustrators and graphic designers will become consulting designers (Doyle et al., 2018, p. 891). In the undergraduate design course in our school, students experiment with visualization techniques, including storyboarding for service design. Prior to these sophisticated applications, design students can be introduced to a way of understanding these concepts that is not dissimilar to how many typography textbooks explain the application of type to convey intended meanings, as a choice focused on "appropriateness to task."

The Visual Literacy White Paper and the *European Framework for Visual Competencies* suggest that awareness of intentionality should be a key indicator of visual literacy (Bamford, 2003). This makes sense. Graphic design, illustration and visual literacy are allied here: all are concerned with visual forms created to express intended meanings to particular audiences. However, unlike words with their dictionary-searchable definitions and established vocabulary, pictures, even of a single subject can vary infinitely depending on how they are captured or made, from the specificity of a photograph of someone known to the viewer, to the very general, such as a pictogram of a person. So, how to understand and evaluate this intentionality of pictures?

While type education is built on tried and tested laws around readability of line lengths, and leading, and exacting numerical measures for type sizes, indents, gutter widths, and so on, for pictures the rules are less clear. Designers report enjoying working to rules: guidelines, a brief, a budget, a set of rules to play the game of design within. With limited choices, the work can begin sooner, the inevitably tight deadlines can be met. In our teaching around communicating using pictures, we explore one way to make images seem more evaluable.

As Robin Kinross (1984) observed, visual and verbal parallels can only go a short distance before they part ways. Is there a more nuanced way of looking for a parallel that could make sense to designers used to type application as a choice among options? Typography is about how the words are set, that is, how the message is put. Rather than the *content* of the message itself, the designer must get the *form* right. For the visual communication designer or art director, picture choice can also be about this focus

on the form more than the content; once the image is given, the focus can be put on selecting the *picture*: how the image is shown.

To develop visual literacy competences and dimensions such as the one described above, our teaching is based on some visual principles borrowed from J.J. Gibson and his intellectual heirs, such as W.J.T. Mitchell, who have productively separated the definitions of *image* and *picture* (in the fields of psychology and art history, respectively) (Gibson, 1971; Mitchell, 2009). Put simply, the *image* is the concept of what needs to be shown — either imagined or available from looking at the visible world — while the *picture* is the chosen way to apply the image. In the authors' teaching, this separation allows dealing with pictures in a way allied to how many typography textbooks explain the application of type: as a choice around "appropriateness to task." Students are asked to think about the tasks towards which they need to apply pictures.

3. Concepts and Pedagogies

3.1. The Development of Visual Literacy Capabilities

In the course the authors have designed, a question is put to students at the commencement of their studies: Why draw? Digital cameras exist on most people's phones (in the Australian experience) but what might be the advantages of *making* pictures rather than *taking* pictures? To borrow again from Gibson, what is to be gained from exploring the *chirographic*, or hand-made pictures, rather than only the *photographic*? For example, a bird in flight could be photographed or it could be drawn in a range of media and degrees of fidelity.

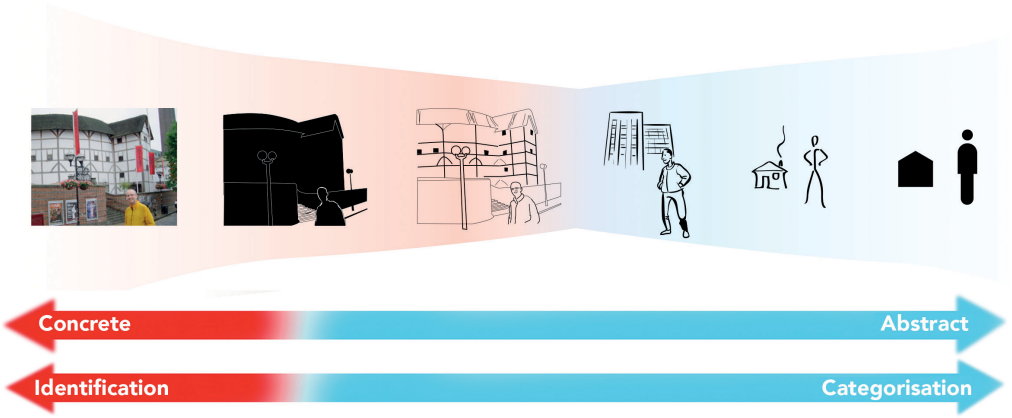

Figure 2. A visual realism continuum may show an array of pictures of iteratively reduced fidelity which bear a relationship to the same image. Pictures may range from "concrete to abstract," "specific to universal," from "identification to categorization," among other visual communication tasks.

To discuss these options with students, the concept of a visual realism continuum — a model used in different ways by various theorists in education and art history (Dwyer, 1972; Gropper, 1963; Knowlton, 1966; McCloud, 1993) — is introduced to help evaluate the communicative potential of pictures iteratively reduced in fidelity from their referent image. An example is given as Figure 2.

As students quickly familiarize themselves with this model, the photographic picture, prescribed by design practitioners and theorists as *the* way to embody the image (Müller-Brockmann, 1983), begins to look exactly like the narrow choice it is.

There are two major tasks of the visual system in establishing for a beholder what she or he is looking at in any moment. These tasks can be labelled *identification* and *categorization*. Towards the realistic or specific head of the visual realism continuum, the model helps in understanding identification. That is, which particular, individual example of the class of objects is being portrayed? Towards the abstract tail of the continuum, the model yields pictures that can help to communicate categorization. Pictures at this end of the continuum cannot be recognized as specific examples: they are more likely to have only the salient features that allow the beholder to quickly ascertain the broad category into which the drawn objects fit. The realism continuum model very quickly makes clear that there are appropriate choices to be made about depiction depending on whether the visual communication task at hand requires the viewer to be able to identify the subjects of the image or merely to be able to categorize them.

Furthermore, as the visual communication designer departs from visual realism and experiments with lower-fidelity options, they can impose their vision on to the image while making the picture. For example, color can be altered such that things that are conceptually alike (as related parts in a system) but visually dissimilar in reality, can be colored the same. Likewise, a uniform contour line may be added to the objects in a scene to more clearly relate them in the overall design. But texture and shape can also be manipulated, pushing the picture in the direction of eliciting synesthetic response from its beholders. For example, smooth textures and rounded corners can be imposed on the drawings to elicit a fondness from its beholders.

3.2. Some Teaching Methods to Improve Visual Literacy

Introductory identification and categorization sketches. We introduce these concepts to students at the commencement of the design degree in our school. To make these pictorial choices more concrete, we have devised a simple exercise that asks students to sketch two people in their classroom with just enough information in the drawings so that a third party can tell the difference between them. Students are asked to do these drawings as quickly as possible, and a stopwatch is started. Following this exercise,

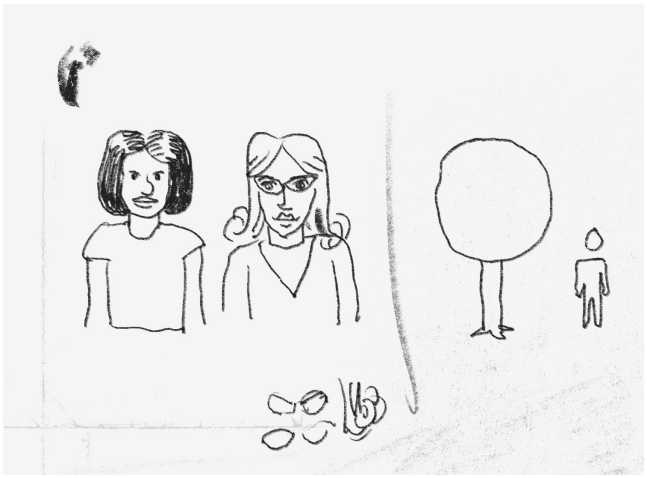

Figure 3. Identification and categorization sketch, courtesy Uriah Gray.

Figure 4. Two characters from the Breaking Images workshop, courtesy Nikola Kucharskoa. Students begin by distorting proportions rather than aiming for visual realism.

students are prompted to now draw a person and a tree so that a third party can tell the difference (Figure 3).

We have run this activity as a first class, first activity for five years. In total, more than 350 students have carried out the exercises. Generally, the first exercise takes between two and five minutes. The second takes only between 10 and 45 seconds. This exercise is a way of introducing the concept that different tasks call for different degrees of fidelity in drawing. The first exercise is about identification. As it deals with differentiating within the same class of objects (people), it necessarily requires more detail and more time and energy to produce. Specifically, more detail in the "short contours" of a drawing: those that sit within the long contours of an object's outline. The second, about categorization, requires only the long contours or outline of a subject's silhouette for the visual task of categorization to be successful. In this way, we introduce and make concrete the visual literacy concept of intentionality: to what tasks are we applying the pictures?

Comics theorist Neil Cohn (2014) laments that in the West students cannot equal the level of visual literacy exhibited in Japan, where children as young as six are able to produce complex visual narratives. Japanese culture, where drawn visual narratives are available for any age group, enables this approach. Anglophone cultures, which historically have encouraged children away from pictorial texts as they grow, by contrast celebrate individual discoveries and style (Doyle et al., 2018). This comparative weakness in visual instruction might be harnessed in a different way. If the escape from visual realism enables, among other things, quick categorization of subjects, and

increases appeal and engagement, encouraging the development of each individual's own drawing approaches or "production scripts" — how they put drawings together according to what they feel and know rather than what they see — might point to as yet undiscovered strengths of drawing and perhaps higher appeal and engagement with beholders of visual communication.

Breaking images: Accelerating towards finding a drawing style. In recent years, one of the authors of this article has conducted workshop as a "hothouse" for developing an individual's illustration style. The workshop questions the value of life drawing and realistic proportions and instead proposes steps to focus students on and accelerate towards their own approach to drawing (Figure 4). At the conclusion of the workshop two hours later, students have two characters of their own design (for the potential for tension or conflict in a narrative) in a two-panel comic strip that demonstrates aspects of the characters' traits (Figures 5 and 6).

In the first step, students are asked to draw a "normal" human face for their age group. Each student may use a remembered formula for this, or they can move the elements around in the face (e.g., erasing and re-drawing eyes, nose, mouth, face outline) until the face configuration begins to "disappear," by which, it is explained, none of the individual elements draws attention to itself as too large or small or placed in the wrong location.

Given that style becomes apparent where depictive choices have been made, in the next step students' choices are made overt: they are urged to "break" the face drawing by moving the elements around within the configuration. Students can begin by erasing

Figure 5 (left). Two-panel comic strip produced at the end of the workshop, courtesy Zuzanna Dominiak.

Figure 6 (below). Examples from the Breaking Images workshop, courtesy of (from left) Wenjie Zheng, Joanna Fung, Bruce Mutard, and Pete Corey.

the eyes and re-drawing these elsewhere in the face, perhaps below the level of the mouth, or by moving the ears up to the top of the head. Paradoxically, the drawings have become more unique and memorable; more like useful character designs.

Students then should take a schematic approach to the entire figure, drawing and reflecting on the "right way" for a human figure to look. They are asked, "where do legs and arms bend?," and "are arms and legs thicker at the top or the bottom?" Again, choices are prompted. Students make multiple sketches, altering the relative drawn lengths of thigh and shin, and of upper arms and forearms, and inverting the thicknesses of limbs. Students learn that proportions matter much less than other perceived physical properties that comprise a visual syntax of the figure. For example, having the fold lines around the elbow working in the right direction is much more germane to the "reading" of the drawing than whether the elbow is halfway along the arm. Students have discovered that where elements are placed in relation to each other is more important for readability than actual proportion.

Students are asked to reflect upon the points at which they thought the tension between normality and uniqueness of expression "felt right" for them as picture-makers. In this way they begin to become aware of their own "production scripts": how a drawing should be put together from what the student knows and feels rather than from how things appear in reality. Escaping pictorial realism allows clear differentiation between character designs. As a result, the impression of consistency in repeated drawings strengthens, and the characters appear clearer to a beholder of the designs.

Caricature. Students are already seeing the outlandish results of deliberately "getting it wrong" with their schematic character anatomy. Caricaturing their own creation further exaggerates those differences that make the character unique. Students caricature their characters by comparing their unique design to a norm for that category of subjects, or, where no norm exists for the character created (for example, if their creation is a bizarre monster), a relatively simple composite may be derived through a combination of the common landmarks (for example, eyes, ears, legs) found in the two designs the participant has just made. Each of the two character designs can be compared to the composite and the differences from the composite should be exaggerated, as in Figure 7 for example.

The reasons for caricaturing the characters, rather than workshop participants accepting their initial character designs, is to push further the possibilities of the design, especially those visual aspects that make it unique, and to make clear to students the plasticity of any drawn creation. To bring the process back to visual communication with intentionality, caricaturing is an important visual capability to have and to understand. Any specific subject, including vehicles or a landscape, colors and shapes,

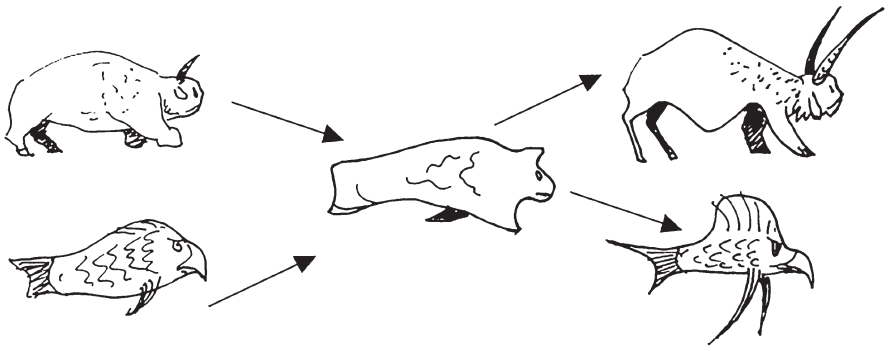

Figure 7. Common “landmarks” are identified in the original character designs (at left), from which a rough composite is made (at center). Landmarks in each character design are moved further away from the landmarks in the composite for the final, caricatured designs (at right). Illustration courtesy of Hanka Nazim.

can be caricatured. It is a fundamental human psychological faculty which improves recall of specific examples (Dror et al., 2008).

For students that progress to be graphic designers or art directors rather than illustrators, this workshop process gives them a compressed glimpse of what illustrators are doing over the course of their career: going deep within themselves to discover what feels right in the way of picture making. Illustrators can record the visible world, to be sure, but they combine recording with interpretation; bringing out their own emotions and intellect on to the page. They make visible as much as recording the already visible. They are building metaphors (Medley, 2019): making concrete on paper or screen concepts which otherwise are too abstract to grasp intellectually or emotionally. These metaphors work in illustrations but also in infographics.

As students progress through their course and gain a fuller understanding of the importance of visual fidelity, and the even greater importance of departures from visual fidelity, these pictorial projects become more complex. As the importance of visual communication only seems to be growing as the future becomes the present, and since these visual literacy capabilities are framed as a necessary skill for the future of work, these pictorial projects can themselves be future-focused. The content used in our pedagogy often comes from science fiction and science fact.

Future warning. The authors of this article prompt students to put themselves in the position of being the communication design experts consulted on the project. The first described here is based upon a US Government report from 1993, *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant,* or WIPP. As its full title suggests, the report describes the need to gather experts to make recommendations on how to stop people opening up a radioactive waste store (Trauth

et al., 1993). The added difficulty for this communication task is because the half-life of the radioactive waste it stores will remain deadly 10,000 years hence.

As with the original report, the students need to work on the assumption that none of the writing systems currently in use around the world may be in use in a world that will be 10,000 years older. This is a sound assumption to make: Egyptian hieroglyphics, though only around 5,000 years old, would have been incomprehensible without their comparison in the Rosetta Stone to known writing systems. Symbols require a common understanding between two or more parties. If the design problem at hand is based upon those future symbols being unknowable, what other strategies of communication can a design team adopt? Writing is out of the question.

After some discussion and testing, students often decide upon strategies using highly iconic (as opposed to symbolic) forms. A useful approach is to make a human figure, perhaps shown doubled over in apparent agony. But this is not the only strategy students have adopted. Where they choose an abstract approach, synesthetic forms, such as jagged edges and sharp points, are designed to repel any future discoverers. Interestingly, students often enquire if they can use typography. The answer is yes, but they are not allowed to use known letterforms. Again, the synesthetic approach, making repellent visual forms, can come into play. From this, students have observed that typography can conform to a kind of picture theory, but not vice versa. Picture trumps type in visual communication!

Student responses are made as prototype statues or bas-relief carvings (made from board) whose material considerations become paramount; what matter will stand the test of time? The medium of these messages matters very much. The prototypes are then tested for comprehensibility by students from outside the class. The feedback is positive, these generic human figures, shown in specific poses, and the repellent abstract forms help to communicate a sense of potential harm in the beholder. Students are learning through these exercises and associated class discussions and lectures that the usefulness of pictures in visual communication is only rarely allied with accurate drawing.

3.3. Challenges in Teaching to Improve Visual Communication Capabilities

Teaching deliberate communication based around images and pictures is not without its difficulties. Some of the greatest challenges are a function of the assumptions that circulate around pictures and drawing. As we explained above, graphic design theory itself, with its extreme bias towards typography, has not helped advance the cause of pictorial communication. The first problem we wish to discuss here is the assumption that pictures are vaguer than words when it comes to contexts of deliberate communication. The second assumption is around what constitutes good depiction. If

educators were clearer about these, they may in turn be able to overcome Kędra's (2018) identification of the marginalization of visual literacy across education curricula. Her observation reminds us that perhaps we have not progressed in education, at least in the Anglosphere, since Fransecky and Debes (1972) observed that we are "weaned away" from pictures as we progress as readers (p. 23).

To the first assumption, that pictures are too vague to be used deliberately without the addition of words to make clear the meaning of the communication: words, the argument runs, are needed to disambiguate pictures. Even some theorists in visual communication, such as, Timothy Donaldson, author of *Shapes for Sounds: Why Alphabets Look Like They Do,* believes this to be the case: "images always need to be explained with supporting text. More often the real communicating is being done by the words" (Donaldson, 2008, p. 9). On the one hand is the claim that pictures are vaguer than words. On the other is the reader who goes to see the movie of her favorite novel, and complains: "that's not how I pictured that setting or the main character." The moving picture has made concrete what the words allowed to remain relatively abstract.

Barnard and Johnson (2005) deftly countered the prevailing view that words outperform pictures when deliberate communication is a requirement. They demonstrated by adding pictures to verbal labels that pictures can disambiguate words just as effectively as the other way around. In the case of both pictures and words, it seems that each benefits from the context that sequence provides. The meaning of a single word in a sentence can be much clearer than that word by itself. Likewise, a single picture may be vaguer than the same picture in a sequence, for example, on an assembly instruction sheet or in a comic.

Another challenge is around the assumption of what constitutes good depiction. The WIPP student exercise, for example, is based on the premise of an illiterate audience for the messages. Communication is achieved, at least to begin with, through relatively iconic forms whose referent is clear. These projects present a science fiction of illiteracy, where communication must be achieved through figural forms. But what about those who cannot draw? Would such a future, requiring accurate depiction as a communication method, not be onerous and exclusionary? Gombrich (2002) declared that the "first prejudice teachers of art appreciation usually try to combat is the belief that artistic excellence is identical with photographic accuracy" (p. 158). As we have explained above however, high visual fidelity is really only necessary to help the beholder identify a specific subject within one class of similar subjects. Those who say they cannot draw often mean they cannot draw realistically (Dowd, 2018; Quito, 2018). For most graphic communication tasks, it is enough for the visual communicator to help the beholder *categorize*: to distinguish one class of subjects from a different class of subjects. In the case of the WIPP design problem, as long as the human figures the students design look

more like humans than they look like anything else, the communication is understood by the beholders tasked with decoding the warning.

Even early visual literacy theorists were fixated on visual realism. They recommended the camera as the means through which children could acquire visual literacy. The assumption that the visually real photographic or filmic image is the one to become expert in continues today with Stephen Apkon's (2009) *The Age of the Image* which, perhaps because the most prevalent kind of image on the Web is the photographic, makes no special mention of any other kind of picture. Cameras are miraculous tools, but provide communicators with an extremely narrow bandwidth of visual communication possibilities. They excel at recording that which is already visual, but not in making visual that which is not. We have intended to show above that the act of making visible is a necessary capability for future graduates of design.

Capabilities in both taking and making pictures are necessary to develop students' visual literacy. Research into style, pattern recognition and comprehension are necessary to further break down the historical assumptions about what constitutes good depiction. The spell of visual realism needs to be broken, so that, at most, students see it as one among many decisions for fixing the image into a picture.

3.4. Design Practices to Engage with Visual Thinking

Working in service design is one way for design educators to acquire this experience of applying pictures, rather than just type, in visual communication.

Most practicing visual communication designers will have by now come across a business that is looking for help in developing a service rather than a product and is looking for guidance through the relatively unfamiliar landscape of design thinking. Design instructors need to avail themselves of some of these practical experiences, in the process becoming familiar with visual design practices as part of the process to understand complexity, rather than the shape of the process's outcome. Visual communication needs to be appreciated as an input to design processes rather than (just) the resulting output. Discourse in the field discusses the benefits of this application towards designerly thinking, including idea generation, prototyping, visualization and its relationship to aesthetic style or aesthetic-lessness and meaning (Tonkinwise, 2011).

For this to happen, design educators will need to be allowed and encouraged to take time out from teaching for practice. Not only has work in service design strengthened the visual communication capabilities of one of this article's authors; it has alerted us to the possibility that clients may have stronger and clearer ideas about the application of the visual capabilities than designers and illustrators possess.

3.5. Course Programming to Enable the Acquisition of Appropriate Teaching Practices

One of the difficulties in focusing course programming on service design is around communicating to high school students the changing work environment for university design graduates. There is a disconnection, at least in Western Australia, between what high school students know about design and the reality of the changes in the design professions. Design in the academy is stuck between these points: how to market service design — working with intangible issues — to students who have in mind the design of physical artifacts. Design educators have always been located between school and industry. Building a bridge between these worlds is more complex than ever with the rapid changes in developed economies moving to the more complex contexts of service development rather than product manufacturing. Davis (2018) insists that "college programs must decide what they can and cannot promise students as professionally relevant outcomes of an undergraduate curriculum" (p. 5).

Our design team carries out "design roadshows"; visiting high schools to gauge, and increase, interest in our design courses. In our surveys of many high schools in Western Australia, the vast majority of students know of "graphic design" as a professional pursuit and have some notions of what graphic designers produce. Similarly, high school students understand at least narrow ideas of game design, because many of them play games in their leisure time, and of interaction design, since most are familiar with navigating the Web. In other words, students understand design as an output, but not as an input into business and organizational processes. Service design, systems or strategic design and other related terms are completely unfamiliar and yet are likely to be of even greater importance by the time the current crop of high school graduates has gone through higher education to become 2025's job seekers. Program directors need to work with university marketing staff to inform future students of these developments.

4. Conclusion

Shifts in technology, communication, and industry are demanding a wider and deeper understanding of the practice of graphic design in which picture generation is as equally valued as typographic form. The possibilities of more symbolic interactions using pictures as the communications medium could be explored and exploited if our society became more visually literate.

Meanwhile developments around thinking visually and more holistically are continuing apace in the corporate, government and not-for-profit sectors. As 21st Century businesses look for a competitive edge, visual thinking around their processes is seen as essential. Graphic designers and illustrators must quickly develop their visual literacy

capabilities. No other existing disciplines are better placed to adopt a position of visual expertise and take charge of deliberate visual communication.

One way of advancing the study of images and pictures for deliberate communication is to separate the definitions of image and picture. Students quickly grasp that type can be the inaudible "voice" through which the client's words are expressed to an audience. Likewise, they can understand that a picture, rendered in varying degrees of fidelity, can be the digital or printed embodiment of the image aspects of the client's message. The visual realism continuum is a useful conceptual model along which to place these pictorial choices. Students (and future designers) can then make informed, visually literate, decisions about whether the task at hand requires the communication's beholders to identify or merely categorize the subjects pictured.

In teaching these concepts, imagining communication scenarios where writing is disallowed as a system for symbolic interaction continues to be one effective way to build students' capabilities in visual literacy.

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