An Approach to Developing Digital Visual Literacy (DVL)

Florence Martin
University of
North Carolina,
Wilmington

Anne Spalter
Spalter Studios

Oris Friesen
Future Information
Technologies

John Gibson
Glendale Commu-
nity College

Abstract

Digital visual literacy (DVL) is a set of skills that enable stu-
dents to function in an increasingly digital and visual work-
place. DVL draws on a range of disciplines in the sciences, arts
and humanities to enable student engagement with computer-
based visual materials on four key fronts: Cultural Context,
Communication, Computer Graphics, and Commerce.

The goal in designing these DVL modules is to help
students become critical viewers of digital visual materials
and leverage the visual power of the computer to explore
ideas, communicate effectively, make fully informed decisions,
and function with confidence in today's increasingly visual
environment. Twelve instructional modules were developed as
a result of an NSF grant and these modules are freely-available
for instructors for use. (The website for download will be
provided after the review).

The importance of DVL, the motivation for DVL, and
the uniqueness of these DVL modules are described in this
article. These DVL modules were formatively and summatively
evaluated to measure their effectiveness in computer literacy
courses. The feelings of both the academics and the students on
the importance of the DVL content and the usefulness of the
instructional materials that were used to teach the course are
also reported.

Introduction

The term "Literacy" which in simplistic terms can be
defined as the ability to read, write, communicate, and compre-
hend has become a key concept in education. It plays an important
role in the theoretical literature and also in terms of pedagogy and

Florence Martin is an Assistant Professor in Instructional Technology at the University of North Carolina, Wilmington. Her email is florence-martin@gmail.com.

Anne Morgan Spalter is an artist at Spalter Studios. Her email is annespalter.com.

curriculum development (Olson, 1991). Research has attempted to separate the various literacies and define them. Some of the old literacies that have been in place for years are visual literacy which dates back to about 30,000 years (Curtiss, 2004), textual literacy which dates back to about 4000 years (Curtiss, 2004) and cultural literacy. We also have the more new literacies such as media literacy, computer literacy and internet literacy.

With the advancement in technology and digitizing of information, digital visual literacy has evolved. Deriving from Hobbs & Chouvin's earlier definitions (Hobbs, 1997, p 7; Chouvin, 2003) digital visual literacy can be defined as the ability to access, analyze, evaluate, and communicate information in a digital format that engages the cognitive processing of a visual image. Spalter & Tenneson (2006) describe that to be a "literate" citizen, one should be able to evaluate digital visual materials, use digital visual representations of data and ideas in decision-making, and create effective visual communications using computers.

Digital Visual Literacy can be defined as the ability to construct meaning from digital visual images. It is the ability to create and interpret computer-based visual materials effectively and has become a key aspect of virtually every field, from the sciences to commerce to communication and entertainment. "A wise man once said that a picture is worth 1000 words. But when visual symbols are used in place of words to express an idea or to evoke a feeling or mood within us, it is necessary for the viewer to be able to understand the message" (Oring, 2000, p.58). Messaris (1995) argues that when viewers understand the implications of images, it makes them more resistant to the manipulative uses of images.

Visual Literacy is defined as the "ability to construct meaning from visual images" (Glorgis, Johnson, Bonomo, Colber, & al, 1999: 146). The notion of visual literacy has drawn the attention of researchers from various disciplines, with the increase in the visual nature of the instructional materials due to the digitization of the information available by the changes in the

technology. In fact even the field of Computer Literacy has been made more meaningful with the intersection of Digital Visual Literacy. Computer literacy has been defined as "an understanding of computer characteristics, capabilities, and applications, as well as an ability to implement this knowledge in the skillful, productive use of computer applications suitable to individual roles in society" (Simonson, Mauere, Montag-Toradi, & Whitaker, 1987, p. 233). Digital Visual Literacy and Computer Literacy intersect with each other and it is this intersecting area that is discussed in this current paper.

Bamford (2003) states that visual literacy also involves problem solving and critical thinking and can be applied to all areas of learning. Some of the implications of Visual Literacy according to Bamford (2003) are enhancing verbal and written literacy skills which are developed when students write and talk about images, and students being introduced to image production where they learn manipulation techniques at an early age.

We live in a digital world, and technology has changed the way teachers teach and students learn. Technology is increasingly at the center of learning and teaching and it is becoming necessary for information to be processed quickly and efficiently. The adage "a picture is worth a thousand words" is revealed in the way images are utilized in interactive media and in creating effective online instruction. This digitizing of information, has led to the coining of the new term "digital visual literacy" (DVL).

Oris Friesen is President of Future Information Technologies. His email is oris@cox. net.

John Gibson is faculty in Business & Information Technology at Glendale Community College, Glendale, Arizona. His email is John. Gibson@gcmail. maricopa.edu.
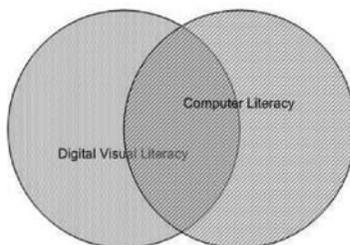
Figure 1. Intersection of Digital Visual Literacy and Computer Literacy

What is DVL?

A modern, literate person is one who is not only able to read and write but is educated in all the basic means necessary to thrive in a digital, networked world. An important aspect of this general literacy is *digital visual literacy*, the ability to critically analyze visual materials, create effective visual communications, and make judgments and decisions using visual representations of thoughts and ideas.

Digital visual literacy is a set of skills that enable students to function in an increasingly digital and visual workplace. These skills are based on concepts from a range of established disciplines but are not simply a collection of modules from courses in, say, computer science and graphic design; they build on basic concepts in such disciplines but are modified with awareness of related skills in other disciplines. The basic DVL skills are informed by original sources in single disciplines and interdisciplinary projects. Ideally, students should learn DVL skills in authentic contexts, such as learning how to make a business presentation, rather than study them solely in the abstract (Spalter, 2008).

The Motivation for DVL

Although we have been living in a highly visual society for dozens of years now, it is the advent of computer-generated visual materials that is making visual communications vital for workplace performance as well as enlightened citizenship. Digital visual literacy is required in a wide range of workplace tasks, from interacting with today's computer applications to using a digital camera, sharing images, making a website, creating presentations, understanding medical scans, and visualizing data in a wide range of fields. DVL is also essential in visually oriented fields such as architecture, industrial design, film and video, and photography.

Computers have fundamentally changed the nature of visual communication, in part because they enable a powerful abstract encoding of visual images and models for the first time

in history. Because visual information is represented mathematically, it can be replicated, modified, and shared in new ways. Unlike previous visual technologies (from oil paint to the microscope), computer graphics is easily accessible to amateurs.

DVL draws on a range of disciplines in the sciences and arts and humanities to enable student engagement with computer-based visual materials on four key fronts: Cultural Context, Communication, Computer Graphics, and Commerce.

- The Cultural Context considers the connections between digital imagery and larger social issues relevant to creators and audiences for digital imagery. It also gives students strategies for "reading" images in these contexts to better articulate their meanings. Cultural context issues often provide motivation and relevance for other DVL topics.
- The Communications aspect draws on concepts from art and design and vision science that can help students use computer-based tools to reliably create more effective visual communications. DVL modules often focus on communication skills that can be tested with standard business software assignments.
- The Computer Graphics aspects comprises the basic relevant technical concepts underlying the different types of graphics used in today's business software. Students who have learned these concepts more easily become power users of current software packages and can also more easily use different versions or brands in the future.
- The Commerce area focuses on the impact that digital visual tools, services, and content are having on the economy and the IT workplace.

Each group's relevant learning outcomes can be further divided into three categories, Levels I, II, and III. In general, Level I focuses on awareness and basic knowledge; Level II introduces more knowledge and concrete skills; and Level III introduces more advanced skills, additional knowledge areas, and continued

Figure 2.
The Four C's
(Created by Anne
Spalter)
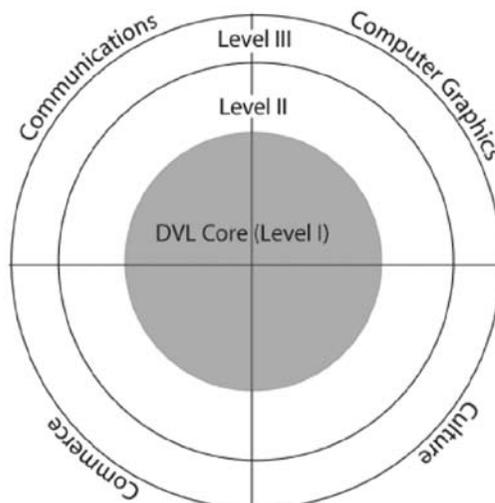
practice/improvement of outcomes in Level II. Module develop-
ers can use the Groups and Levels diagram to guide decisions
about what types of modules to develop, what materials should
be in them, and how to choose effective groups of modules
within an area or across levels of difficulty.

Computer Literacy

Computer literacy is a fundamental part of the under-
graduate curriculum in this decade. It is as basic to undergradu-
ate students as the course work in the core curriculum (Dugger,
Shelli, Lisa & Crystal (2003). Students educated in computer
literacy use the computer skills in most of the other courses in
their discipline. Many studies have discussed the contents of
computer literacy course and instructional strategies in terms of
learning effectiveness. An "all-purpose computer literacy" class
that expects everything to be taught in one semester is consid-
ered unrealistic (Beard, 1993). According to Ndahi and Gupta's
study (2000), the most frequently required computer skills were
word processing and the knowledge of database software. In
addition, the trainees voiced a strong interest in learning file
management and preparing presentations.

According to Lankshear and Knobel (2003), some of the

new computer literacies include electronic gaming, synchronous and asynchronous communication, weblogs, webpages, and multimedia text production. Andrews (2004) researched the new literacies in computer technologies including the environment in which students learn how to read and write with multiple modalities (graphics, animations, video, audio, hyperlinks, and print). With the multiple modalities in place it has become very essential for a computer literate student to also be digital visual literate. Another strategy that is becoming popular is using instructional games to teach computer literacy (Squire & Steinkuehler, 2005). With the changes in technology, the different elements of computer literacy are prone to change constantly and hence it is important for educators to constantly revise the course to include the latest technology advancement. The rapid pace of technological advances in the computer industry has also forced businesses to reorganize, to acquire the latest systems, and demand a computer-literate workforce (Porter & Miller, 1985). Therefore, they seek computer literacy in almost everyone they hire (Ndahi & Gupta, 2000).

In most cases, computer literacy includes digital visual components, which is normally not called out. For example, in Excel visual charts play an important role in data analysis and decision making, in creating PowerPoint slides the visual aspect is important to have a visually appealing presentation, in MS Word the typographical principles have an appealing effect and the digital images add value in a blog. The DVL elements highlight the importance of the digital visual components in computer literacy.

Digital Visual Literacy Curriculum

Very little work has been done to develop interdisciplinary curricular materials for DVL. Although there is a good deal of instructional material related to 2D and 3D computer graphics, the bulk of it is developed for highly specialized students and taught chiefly in computer science or engineering departments. Some of the relevant DVL skills are taught in highly specialized

curricula, such as art and design departments, visual studies and visual culture courses and in schools and departments of communication. They generally do not address the broader role of visual communication in today's IT-based work environment.

Some examples of visual literacy courses include those following in the steps of Professor Bob McKim's "Visual Thinking" course (McKim 1980); courses using Professor Edward Tufte's widely read series of books (Tufte 1997); interdisciplinary design and technology courses at schools such as Brown University and MIT's Media Lab, and multimedia literacy programs such as that at USC's Institute for Multimedia Literacy [IML]. In general, these courses are not directed toward entry level IT students. This paper outlines the integration of Digital Visual Literacy in the basic computer literacy courses at the Community College District.

In this project, funded by the National Science Foundation, pioneering instructional modules on DVL were developed via a partnership between a Community College and a University. The curricula and modules for DVL allow instructors to choose only the materials relevant for their topic and require only slight modifications for existing classes, in particular the introductory computer science and literacy courses required of students pursuing technical education at community colleges and elsewhere. The content, provided by the university, is incorporated into modules deployed in basic computer literacy courses at the community college. These modules include a set of skills that enable students to function in an increasingly digital and visual workplace. These modules are available for anybody to use in computer literacy courses.

Some of the modules that have been designed during the first two years of the grant are,

> IL 1) Introduction to Digital Visual Literacy
> IL 2) Visual Practical Copyright Skills
> IL 3) Visual Rhetoric for blogs
> IL 4) Influencing decisions with charts – Office 2003

IL 5) Visual Display of Information using Powerpoint –
Office 2003
IL 6) Visual Dialog in Ecommerce
IL 7) Visual Display of Information using Word – Office
2003
IL 8) 3D Graphics using Graphics Teaching Tool
IL 9) Graphics Literacy using MS-Paint
IL 10) Influencing decisions with charts – Office 2007
IL 11) Visual Display of Information using Powerpoint
– Office 2007
IL 12) Visual Display of Information using Word – Office
2007

DVL Instructional Modules

DVL modules can be used in a mix-and-match manner to
augment current IT literacy offerings. The goal is to help stu-
dents become critical viewers of digital visual materials and
leverage the visual power of the computer to explore ideas,
communicate effectively, make fully informed decisions, and
function with confidence in today's increasingly visual environ-
ment. Twelve instructional modules were developed during the
first two years of the grant. The description of each of these
modules follows.

IL1-Introduction to Digital Visual Literacy

This lecture introduces DVL and the DVL modules and
should be given before the first module is used in class. It can be
combined with the introduction of the first module or given on
its own. This module introduces how DVL draws on a range of
disciplines in the sciences and arts and humanities to enable
student engagement with computer-based visual materials on
four key fronts: Cultural Context, Communication, Computer
Graphics, and Commerce. It brings awareness of the dramatically
increasing importance of creating and interpreting computer-
based visual communication and provides examples of real-world
digital visual applications.

IL2- Practical Visual Copyright

When students enter the IT workplace, they routinely need to incorporate images in presentations, web sites, and other documents. Images are easy to find on the Web and from other sources, but cannot be used indiscriminately. Just as students must learn to research and reference textual sources, they must also properly source, reference, and, if necessary, license images that they plan to use in documents to be distributed via print or online. In addition, students may well be creating their own original digital visual materials and need to understand how their work is protected from misuse by others.

This module supports the DVL areas of Commerce and Cultural Context. Students learn how the law strives to balance the monetary value of visual materials with the need to share and communicate ideas visually. Students also explore motivational cultural issues through real-life case studies and discussions of the application of copyright law to emerging digital practices such as "e-mixes" of commercial visual materials.

IL3-Visual Rhetoric for Blogs

The persuasive essay is a fundamental part of textual literacy. Today's "essays" must often include visual elements which generally originate from digital environments but may include scanned non-digital materials. This module addresses the need to be as persuasive with digital images as with text and to use the two together to maximize the power of one's argument. The focus is on persuasive "writing" in a digital, networked, temporarily responsive (if not actually real-time) context by creating Blogs on issues of personal interest. Additional "real-time" aspects include using cell phone cameras to upload images and comment on events as they occur.

This module supports the DVL areas of Communications and Cultural Context. Students learn how to create a Blog and use digital images to communicate effectively. The Blogging context of this module introduces concepts in social computing, including social protocols of public and private visual communication.

IL4-Visual Dialog in ECommerce

Web-based e-commerce depends in many ways on visual computing. Obviously, images of products are essential for customer decision-making. The professionalism of images in e-commerce sites varies, but most large corporations employ art directors, photographers, and graphic designers to create and populate their web sites. Product images have gone from small pictures replicating (although in much lower resolution) catalog images to zoom-able and often multi-view images. (And many web sites, including Amazon.com, lost money for years before building up a critical mass of users by refining transaction processes.)

The role of visual computing in attracting customers has recently reached a new level with the ability to have a visual dialog with customers by allowing customer image upload. Amazon.com has been pioneering this new feature. Innovative uses of textual dialog (such as professional and user reviews of products and services, product suggestions, wish lists, recommendation lists, etc.) have helped to define online marketplaces. We believe that visual dialog will have similar profound impact on how we shop and interact online. This module supports the Commerce area of DVL by introducing students to the concept of an "image economy" and exploring the value of images in terms of the students' desire to purchase a product based on site- and customer-supplied visuals.

IL5 – Graphics Literacy

The computer has revolutionized the manner in which graphic art is created. It has vastly changed the manner in which art-copy is produced for the advertising and publishing industries. A wealth of information today is received in a digital, visual format. Much of what is learned is simply *absorbed* by looking at graphic images.

This module is designed to promote student awareness as to the technology and talent involved in creating computer graphics. A further intent is to demonstrate that graphics are easily obtainable and that persons other than the original

creators may modify them. This of course, might raise issues of copyright infringement.

IL6-3D Graphics

This module introduces some basic technical concepts in 3D graphics using the Graphics Teaching Tool (GTT). Basic terms and 3D processes are introduced and then applied using the GTT. Students will also explore Web sites in which 3D graphics are used in the business world to show products and processes.

This module is designed to promote student awareness to the GTT technology and talent involved in creating three dimensional computer graphics. This module can be used as a follow up to the Graphics Literacy module where the creation and modification of 2D graphics is studied. This module supports the Computer Graphics aspect of DVL which comprises the basic relevant technical concepts underlying the different types of graphics used in today's business software.

IL7-Visual Display of Information using Word (Office 2003)

A Word document is not just about the content of the text: it includes the way text looks (which helps to convey the content) and the use of images to enhance the communication. In this module students gain awareness of the role of design and imagery and learn that it is important to consider even in Word processing software. They then learn to choose effective visuals to complement their text and to identify and apply basic design and type guidelines. This module supports the Communication area of DVL. Consumers of media today expect to receive textual information accompanied by supporting images, and graphically arranged to help them quickly locate the information they are interested in.

IL8-Visual Display of Information using PowerPoint (Office 2003)

Presentation software is ubiquitous in today's IT/ knowledge workplaces, from corporations to the health and legal

industries and beyond. Unfortunately, many presentations are not nearly as effective as they could be, in part because their creators do not fully appreciate the visual aspects of the medium. In this module students are shown the vital role of design in creating an effective PowerPoint presentation. They learn how to use PowerPoint's graphics tools to create effective visual communication through formatting of text, and the use of diagrams, graphs, charts, and other visual sources.

This module supports the Communications area of DVL. Students learn basic design and typographic guidelines and how to apply them in a typical presentation program. These introductory-level skills are essential in virtually any IT/knowledge-work field.

IL9-Influencing Decisions with Charts (Office 2003)

It is especially important for students who plan to enter the business world to recognize the need to run "what if" scenarios with charts and graphs and to present important business information in visual formats so that decision makers are able to get the "big picture" quickly, with a minimum expenditure of time and effort. This module helps students learn how to analyze and interpret numeric data using charts and how to select the appropriate type of chart in a standard spreadsheet program, MS Excel. Students also learn how to identify misleading uses of charts.

This module supports the Communications, Commerce, and Cultural Context areas of DVL. This modules chief focus is optimal numerical information visualization. The module also explores cultural and commerce issues in its discussions of how charts can inform many types of decisions for better or worse.

IL10-Visual Display of Information using Word (Office 2007)

A Word document is not just about the content of the text: it includes that way text looks (which helps to convey the content) and the use of images to enhance the communication. In this module students gain awareness of the role of design and

imagery and learn that it is important to consider even in Word processing software.

Students will learn to identify and apply basic design and type guidelines to documents created using Word 2007. They learn to use Word 2007 features including paragraph styles and document themes. They learn to use professional topographical features in Word 2007 and to avoid features which result in unprofessional visual results. They learn to choose effective visuals to complement their text while observing copyright law.

This module supports the Communication area of DVL. Consumers of media today expect to receive textual information accompanied by supporting images, and graphically arranged to help them quickly locate the information they are interested in.

IL11-Visual Display of Information using PowerPoint (Office 2007)

Presentation software is ubiquitous in today's IT/ knowledge workplaces, from corporations to the health and legal industries and beyond. Unfortunately, many presentations are not nearly as effective as they could be, in part because their creators do not fully appreciate the visual aspects of the medium. In this module students are shown the vital role of design in creating an effective presentation using PowerPoint 2007. They learn principles of visual design and how to use tools and features in PowerPoint 2007 to create effective visual communication.

This module supports the Communications area of DVL. Students learn basic design and typographic guidelines and how to apply them in a typical presentation program. These introductory-level skills are essential in virtually any IT/knowledge-work field.

IL12-Influencing Decisions with Charts (Office 2007)

It is especially important for students who plan to enter the business world to recognize the need to run "what if" scenarios with charts and graphs and to present important business information in visual formats so that decision makers

are able to get the "big picture" quickly, with a minimum expenditure of time and effort.

This module helps students learn how to analyze and interpret numeric data using charts and how to select the appropriate type of chart in a standard spreadsheet program, MS Excel 2007. Students also learn how to identify misleading uses of charts. This module supports the Communications, Commerce, and Cultural Context areas of DVL. Its chief focus is optimal numerical information visualization. The module also explores cultural and commerce issues in its discussions of how charts can inform many types of decisions for better or worse.

Formative Evaluation of the DVL Modules

The term "formative evaluation" was coined by Michael Scriven (1967) and is the process of collecting qualitative or quantitative data during the developmental stage of the instructional design process (Seels and Glasgow, 1990).

Purpose

The purpose of this evaluation was to measure the effectiveness of the Digital Visual Literacy Modules by evaluating the content taught in the computer literacy course, and to identify the feelings of both the academics and the students on the importance of the DVL content and the usefulness of the instructional materials that were used to teach the course. In this study, the focus of research is a formative approach where an evaluation was done to improve the curriculum design of the digital visual literacy modules.

The instructional designer for the DVL grant evaluated the instructional materials based on the analysis data (assessment data to measure student attainment of module objectives, project data, and attitude data) to determine weaknesses in the instruction and worked with the faculty to modify the material. The data collected in this process also provided us immediate feedback on the effectiveness of these modules.

Seven of the 12 DVL modules were evaluated during the

References

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Bamford, A. (2003). The Visual Literacy White Paper. Adobe Systems. Retrieved from http://www.adobe.com/uk/education/pdf/adobe_visual_literacy_paper.pdf on August 28th, 2007

Beard, C. (1993). Transfer of computer skills from introductory computer courses. *Journal of research on computing in education*, 25, 4, 413-430

Fall 2006, Spring 2007 and Summer 2007 semesters. The introductory DVL module was taught along with all these seven modules and was not evaluated by itself. Graphics Literacy was and the Office 2007 modules were not evaluated during this phase.

### Computer Literacy Courses (CIS 105/ BPC 110)

Two undergraduate computer literacy courses (CIS 105 and BPC 110) offered at a Community College District were identified to be the test base for these digital visual literacy modules. In these courses, students are given a solid introduction to computers and the software applications they will use in their professional and personal lives.

CIS 105 includes an overview of computer technology, concepts, terminology, and the role of computers in society. Students also discussed social and ethical issues related to computers. They were also taught how to use word processing, spreadsheet, database, and presentation software. It included some programming and use of the Internet. Finally, students explored relevant emerging technologies. On the other hand, BPC 110 is an introduction to business and personal computer operations and usage. Software applications for analyzing and solving business problems including word processing, spreadsheet, database, and presentation graphics are taught in this course.

Participants

The students and faculty in the community college district who piloted the DVL modules in Fall 2006, Spring 2007 and Summer 2007 were surveyed to find their feelings on these instructional modules. There were a total of 182 students from the various semesters (Fall 2006 and Spring 2007) enrolled in either the CIS 105 course or the BPC 110 course. 13 faculty taught these various modules. Both students and faculty were directed to an online site to fill out the attitude survey after the module was taught and the assignments were completed.

Student and Instructor Survey
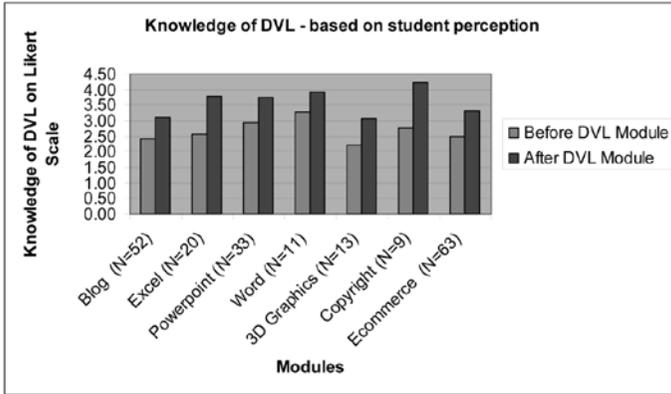
Instructors and students were surveyed online to provide their perceptions about the importance of the DVL content and the usefulness of the instructional materials in these courses. The responses to these online surveys are shown in Tables 1 and 2. The project and assessment data for the modules were collected from the faculty in an Excel template, and a summary of this data is shown in Table 3.

The student survey included 14 Likert type questions and two open ended questions on what they liked and what they disliked about the DVL module. On the other hand, the faculty were surveyed using a 12 item Likert type questionnaire. Both the student and faculty survey were rated on a five point scale (Strongly Agree =5, Agree=4, Neither agree nor disagree=3, Disagree=2 and Strongly Disagree=1) except for a couple of questions. The questions on the student survey were rated on a five point scale from Very Knowledgeable about =5, Knowledgeable about=4, Uncertain =3, Somewhat knowledgeable about =2 and Not knowledgeable about =1

There were a two questions which asked them to rate their knowledge of DVL prior to beginning this module and after the module was completed, and it was noticed that there was an increase in student attitudes for all the different modules for these two questions. The graphical representation of this data is shown below.

Bhola, H. S. 1990. *Evaluating "Literacy for development" projects, programs and campaigns: Evaluation planning, design and implementation, and utilization of evaluation results.* Hamburg, Germany: UNESCO Institute for Education; DSE [German Foundation for International Development]. xii, 306 pages.

Chouvin, B.A. (2003) Visual or Media Literacy. Journal of Visual Literacy, 23, 2, 119-128

Table 1
Student Survey Data

Rating Scale: 5 = strongly agree 4 = Agree 3 = Neither agree nor disagree 2 = Disagree 1 = strongly disagree	Blog (N=52)	Excel Charts (N=20)	E-Commerce (N=63)	Power point (N=33)	Word (N=11)	3D Graphics (N=13)	Copyright (N=9)	All Modules
1. Rate your knowledge of Digital Visual Literacy (DVL) prior to beginning this module.	2.43	2.55	2.49	2.93	3.27	2.23	2.78	2.67
2. The goals/objectives of the DVL module were clear to me.	3.69	4.10	3.89	4.00	4.09	4.00	4.00	3.97
3. The DVL module teaching materials were well-organized	3.85	4.10	4.12	4.14	4.18	3.69	4.22	4.04
4. The DVL module learning activities helped me develop the skills I was expected to learn	3.38	3.95	3.76	4.02	3.91	3.46	4.22	3.81
5. The DVL module gave me enough opportunity to practice what I was learning.	3.54	3.80	3.82	3.86	3.27	3.38	4.11	3.68
6. The DVL module content was relevant to this course.	3.68	3.95	3.84	4.23	4.27	3.69	4.11	3.97
7. The amount of time allotted to the DVL module was about right	3.83	3.60	3.86	3.84	4.09	3.54	4.11	3.84
8. The DVL module assessment/project tested what was taught	3.57	3.50	3.92	4.00	3.91	4.08	4.22	3.89

9. I learned a lot from this DVL module.	3.34	3.55	3.82	3.93	4.09	3.23	3.67	3.66
10. The overall quality of the DVL module was good.	3.63	3.90	4.11	4.02	4.09	3.31	4.11	3.88
11. I would recommend this DVL module to other students.	3.45	3.55	3.84	3.73	4.00	3.31	3.78	3.67
12. I would enjoy learning more on Digital Visual Literacy like this module in future lessons.	3.43	3.40	3.78	3.70	4.09	3.54	3.56	3.64
13. My knowledge of digital visual literacy increased as a result of this module.	3.49	4.05	4.13	4.07	3.73	3.62	4.33	3.92
14. Rate your knowledge of Digital Visual Literacy (DVL) after you completed this module.	3.12	3.80	3.31	3.75	3.91	3.08	4.22	3.60
Average	3.57	3.79	3.91	3.96	3.98	3.57	4.04	

Table 2
Faculty Survey Data

Rating Scale: 5 = strongly agree 4 = Agree 3 = Neither agree nor disagree 2 = Disagree 1 = strongly disagree	Excel	Blogs	3D Graphics	Word	Power-point	E-commerce	All modules
1. The DVL module had clear goals/objectives.	5	4.5	4	5	4.5	5	4.67
2. The DVL module instructional materials were well-organized	4	5	3	4	4.5	5	4.25
3. The DVL module learning activities and materials were appropriate to the skills being taught.	4	4	3	4	4.75	5	4.13
4. The DVL module had enough opportunity for the students to practice	4	3.5	4	2	3.5	2	3.17
5. The DVL module assessment/project were aligned with the objectives	4	4	5	5	4.5	5	4.58
6. The DVL module content was relevant to the course.	5	4	4	5	5	5	4.67
7. The amount of time allotted to the DVL module was about right	4	2	4	2	3	5	3.33
8. The instructor guide of the DVL module was easy to use	3	4	3	4	4.25	5	3.88
9. The instructor guide of the DVL module had all the details needed.	2	3.5	3	4	3.25	5	3.46
10. The overall quality of the DVL module was good.	4	4	4	4	4.5	4	4.08
11. I would recommend this DVL module to other faculty.	3	3.5	3	4	4.5	4	3.67
12. I would enjoy teaching more on Digital Visual Literacy like this module in future courses.	4	3.5	5	4	4.5	4	4.17
Average	3.83	3.79	3.75	3.92	4.23	4.50	4.17

Semester	Module	Activity Type	N	Percentage scored
Fall 2006	Ecommerce	Project	53	81.60%
Fall 2006	Blog	Project	17	83.36%
Fall 2006	Blog	Posttest	38	66.05%
Fall 2006	Excel	Project	19	93.88%
Fall 2006	Powerpoint	Project	19	89.48%
Fall 2006	Powerpoint	Quiz	21	87.42%
Spring 2007	3D Graphics	Quiz	14	89.25%
Spring 2007	3D Graphics	Project	10	100.00%
Spring 2007	Powerpoint	Project	28	90.56%
Spring 2007	Powerpoint	Quiz	9	85.78%
Spring 2007	Word	Quiz	13	71.08%
Spring 2007	Word	Assignment	15	85.67%
Summer 2007	Copyright	Quiz	10	86.00%
Summer 2007	Ecommerce	Project	14	98.83%

Table 3
Assessment and Project Data

From the student surveys, eliminating the prior knowledge question and post knowledge question the average of survey items was calculated. The Copyright (M=4.04), Word (M = 3.98) and PowerPoint module (M=3.96) were rated the highest, followed by E-Commerce (M=3.91) and Excel Charts (M=3.79).

For the faculty survey, Ecommerce (M= 4.50) and PowerPoint (M=4.23) module were rated the highest, followed by Word (M=3.92) and Excel (M=3.83) module. The instructors rated positively to most of the items on the survey, except for the time factor items.

Assessment and Project data.

Most of the modules had a posttest or a project data. Some of the modules had both a posttest and a project. This data was collected to evaluate student performance. Except the Blog posttest and Word Quiz, students scored above 80% on all the assessments. Changes had to be made to the above two tests as it did have some

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unclear questions when an item analysis was performed. Details of the scores from the post-test and projects is reported in Table 3.

Summative Evaluation of the DVL Modules

Summative evaluation is a method of judging the worth of a program at the end of the program activities. The focus is on the outcome (Bhola, 1999). In the summative evaluation process one looks to see how well a group did on a learning task that utilized specific learning materials and methods.

High School Courses

A web design course from Wickenburg High School and Journalism course from Apollo High School were identified to be the summative test base for these digital visual literacy modules.

Student and Instructor Survey

Instructors and students were surveyed online to provide their knowledge on DVL and on their perceptions about the importance of the DVL content and the usefulness of the instructional materials in these courses. The responses to these online surveys are shown in Tables 4, 5 and 6. The Pre and Post DVL Achievement test included 10 true or false items that tested them on the knowledge of DVL. The results of the achievement data is included in Table 4. The student attitude survey included 4 Likert type questions the DVL modules. On the other hand, the faculty were surveyed using a 6 Likert type questionnaire and 6 open-ended questions on the DVL modules. Both the student and faculty survey were rated on a four point scale (Strongly Agree =4, Agree=3, Disagree=2 and Strongly Disagree=1)

Student Evaluation

39 students participated in the Pre-DVL survey. 13 students were from Wickenburg high school enrolled in Mrs. Rogers web design class and 26 students were from Apollo high school enrolled in Ms. Halls Journalism class. There were 22 Female students, and 17 male students who participated in the

Pre-DVL survey. 37 students were 18 years or younger, and 2 students were 32 years or older. 32 students participated in the Post-DVL survey. 23 students were from Apollo high school from Ms. Hall's journalism class. 9 students were from Wickenburg high school enrolled in Mrs. Rogers web design class.

Ms. Hall's students participated in Intro to DVL, Copyright, Graphics Literacy and Office 2003 (Word, Excel and PPT modules). Ms. Roger's students participated in Intro to DVL, Copyright and Ecommerce modules.

There was an overall increase in the post DVL scores (90%) compared to the pre DVL scores (73%). Except for item 6 on the DVL survey, there was an increase in the number of students who got all the other items correctly. This signifies an increase in knowledge on the DVL content on learning from the DVL modules.

Students' attitude rating ranged from 74% to 83% for the attitude related questions that were asked. The question on "I can apply the DVL concepts I learned here" was rated as the highest.

Faculty Evaluation

Ms. Hall from Apollo High School and Mrs. Rogers from Wickenburg High School participated in the faculty survey. Except for item two where one of the teachers just agreed about being prepared to teach the DVL Modules, they strongly agreed to all the other items on value, organization, quality of the DVL modules. They also strongly agreed on enjoying using the DVL modules and will also be able to apply the DVL principles in other courses.

Conclusion

The digital visual literacy modules added value to the computer literacy courses, especially in teaching Microsoft Office skills. In a normal setting, teaching office skills could be structured approach, where students learn the tools and create documents, spreadsheets or presentations. But digital visual

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Table 4
Pre DVL and Post
DVL – Student
Achievement Data

		Pre-DVL (N=39)	Post-DVL (N=32)
1	The visual appearance of textual information is relatively unimportant so long as its legible	69.23%	93.75%
2	Digital visual Literacy is the same as Multimedia Literacy	66.67%	81.25%
3	DVL includes cultural awareness. That is, an image might mean different things to different people.	89.74%	96.88%
4	DVL does not include learning to evaluate images to decide if they are true and accurate.	53.85%	93.75%
5	DVL includes the ability to use computers to create effective visual communications	89.74%	90.62%
6	DVL includes the ability to make decisions using digital visual representations of data and ideas.	89.74%	87.5%
7	The concepts underlying DVL comes from the arts and humanities, sciences and business	48.72%	81.25%
8	Compared to the past, computer technologies have speeded our change toward a visually oriented society.	92.31%	93.75%
9	Because electronics are expensive and difficult to use, image-making is becoming more and more restricted to professional designers and photographers.	53.85%	90.62%
10	DVL includes the ability to make informed decisions using digital visual representations of data and ideas.	79.49%	90.62%
	Total	73.33%	90%

literacy can help them create more effective, presentable material and present better. Including DVL in teaching office applications makes the office modules several notches higher in quality. Students this decade need the skills not just for presenting the information but in presenting it effectively.

Society is visual and we respond positively and quickly to good images. These modules not only taught the students to

	Strongly Agree – 4, Agree – 3, Disagree – 2, Strongly Disagree – 1 (N=32) Mean	Percentage	
1	The overall quality of the DVL module was good.	3.12	78.12%
2	I would enjoy learning more on Digital Visual Literacy like this module.	2.97	74.22%
3	I can apply the DVL concepts I learned here in other academic classes	3.31	82.81%
4	I can apply the DVL concepts I learned here to my job	2.97	74.22%

Table 5
Student Attitude Data

	Strongly Agree – 4, Agree – 3, Disagree – 2, Strongly Disagree - 1	Percentage (N=2)
1	The DVL concept and content added value to the course	4	100%
2	I felt sufficiently prepared to teach the DVL module(s).	3.5	87.5%
3	The instructor guide of the DVL module(s) was well-organized.	4	100%
4	The overall quality of the DVL module(s) was good.	4	100%
5	I would enjoy teaching more on Digital Visual Literacy.	4	100%
6	I can apply the DVL concepts from these module(s) in other courses.	4	100%

Table 6
Teacher Attitude Data

create visual images but also to be able to interpret them which is critical for students to succeed in the global economy. The copyright concept in the modules, taught the diverse learner and instructors about abiding by the copyright rules. Communicating and brainstorming different ideas becomes easier when using visuals than when using text.

Table 7
Teacher Attitude
Data – Open Ended
Questions

There were six
open-ended
questions on the
teacher survey. The
responses of the
two teachers are
reported below.

		Teacher1	Teacher2
1	How did the DVL module(s) impact the teaching for this class?	They helped tremendously. The examples provided in each of the modules were extremely helpful.	It was a nice way to introduce e-commerce and copyright laws to the students
2	How did the DVL module(s) impact student learning within the course?	Students enjoyed the modules -- especially the webquests and individual projects.	I believe this visual really helped the Advanced Web Design student pull together pieces regarding how visual digital literacy should impact and does impact the sites that they build
3	What worked best in this DVL module?	Everything. I appreciated the rubrics and quizzes. Having all the materials ready to go and easily accessible was fantastic.	The PowerPoints were very easy to use
4	How did you make room for this DVL module in your course?	Although the course title is "journalism," I am currently making the transition to teaching "graphic communications." This curriculum fit perfectly. Although I cut some of the modules a bit short due to time constraints, the students still completed the outcomes.	I just added it on to the end of one of my units
5	What are the areas of improvement in this DVL module?	Some of the links were out of date and the Excel module was a little too difficult for my students. I would also love more "projects" in the Word module. Next year I would like to include some of the other modules in addition to the ones I taught this year.	Nothing at this time - With a few more times using them I will find things I will want to add in

Another advantage of these modules is that they could be used in a variety of courses. Most curricula can use any one of these DVL modules. Courses such as English, Communication and Computer Science could benefit by mixing and matching modules. These modules can make the students more sophisticated and discerning viewers of visual images. The modules use current themes such as blogs to capture student interest. Teaching the visual aspect of PowerPoint could be used in any of the other courses. It is also applicable in studying business applications.

Acknowledgement

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