Course
CMP-5075-2
Raster Graphics

Computer Science

INTRODUCTION

The goal of the *Raster Graphics* course is to provide adult learners with the means to express their creativity and to produce images and photomontages that reflect their artistic sensibility. This course goes beyond mere photo retouching and offers adult learners a computer platform for the development of raster graphics skills.

In this course, adult learners deal with various learning situations that help them acquire practical knowledge about a raster graphics program. They explore the environment of the program and make sure they understand how its tools and commands work. They carry out a project by choosing appropriate images and correctly using the tools and commands of the program required. They adopt ethical behaviour when communicating ideas and respect intellectual property.

By the end of this course, adult learners will be able to produce bitmap images by adding and modifying objects, colours, filters and special effects. They will be able to identify the most common image formats and understand the concept of transparency in computer graphics. They will be able to use the basic tools of the raster graphics program required to produce images or photomontages using sketches or images from a digital camera, an image bank or the Web. They will know how to prepare images to be used in various future projects, such as a Web page, a multimedia project, a 2D or 3D animation project or any other application or environment that uses bitmap images. They will demonstrate a sense of ethics in their communications and understand the importance of respecting copyright.

SUBJECT-SPECIFIC COMPETENCIES

This course targets the following subject-specific competencies:

- *Interacts in a computer environment*

- *Produces computerized documents*

- *Adopts behaviours that reflect a concern for ethics, safety and critical thinking*

Thus, it is by activating and integrating all three subject-specific competencies and by using other resources that adults are able to effectively structure their learning.

During the learning situations, adult learners communicate using a human-machine interface and evaluate their efficiency in using a computer environment. They carefully plan their work and adapt their plan as they work. As they carry out a project and upon its completion, they evaluate their efficiency and make any necessary corrections while adopting ethical behaviour.

PROCESSES AND STRATEGIES

As they learn about computers, adult learners are called upon to use various processes and strategies. These processes and strategies represent the way in which adults go about solving problems, meeting challenges and, in general, carrying out their learning activities.

For the *Raster Graphics* course, the suggested approach is the production process.

Production process
• This process consists of two steps: planning and production. Four values are associated with it: communicate clearly; validate the production on a regular basis; maintain ongoing feedback and collaboration; accept the change. • During the planning stage, adult learners must define the work to be done as precisely as possible. Planning must be flexible and allow adjustments throughout the project. • During the production stage, adult learners must complete the project according to the planning established; maintain ongoing feedback and collaboration; accept change, even at the end of the production stage, and respond to change rather than following the initial plan.

Examples of strategies	- Comparing the current situation with the desired situation - Determining the steps involved in carrying out the work - Drawing up a work schedule - Choosing a work method - Making adjustments to the plan as they work - Analyzing their results

To meet the requirements of the production process, the initial plan must be flexible enough to allow for adjustments throughout the project. Through discussions with the teacher or with their peers, adults learn to reflect on each step in their process and arrive at a result that will differ from their original plan. By applying the above process, they learn to cooperate with others and to accept changes during the course of a project.

CROSS-CURRICULAR COMPETENCIES

The cross-curricular competencies are not developed in a vacuum; they are rooted in learning situations and contribute, to varying degrees, to the development of the subject-specific competencies, and vice versa.

Several cross-curricular competencies can be useful in dealing with the learning situations in the *Raster Graphics* course. Two are considered particularly relevant to this course: *Uses creativity* and *Adopts effective work methods*.

▪ **Intellectual Competency**

When adult learners manipulate images, they *use creativity*. They immerse themselves in a context or intention and engage in their work while adopting a flexible approach.

▪ Methodological Competency

Before creating a bitmap image, adult learners gather ideas and express them using sketches. This step allows them to analyze and organize their ideas, plan their resources, draw up a work schedule and thus develop their ability to *adopt effective work methods*. As they complete their project, adult learners follow the plan they have drawn up and make adjustments to it as the need arises.

SUBJECT-SPECIFIC CONTENT

The subject-specific content consists of knowledge and cultural references. The prescribed content for this course is outlined below. However, depending on the context (e.g. if certain tools or functions are not available in a given software program), other equivalent content may be substituted for that outlined below.

KNOWLEDGE

- ***Definitions and properties of the main concepts associated with bitmap images***

  - Basic unit: the pixel

    - Pixel definition
    - Number of bytes of a pixel and its impact on the number of colors
    - Pixel dimension

  - Properties of a bitmap image

    - Definition
    - Settings of colours, shades and contrasts
    - Resolution
    - Dimension
    - Number of colours
    - Compression
    - File size
    - Transparency
    - Animation
    - Aliasing

  - Image formats

    - PNG, TIFF, JPEG, GIF, BMP
    - Proprietary formats (PSD, CPT, XCF)

- ***Rules of image composition***

- ***Standard terminology associated with raster graphics***

- ***Customizing the environment***

  - Modifying the zoom

  - Showing, hiding or changing the properties of the grid, ruler and guides

  - Activating the grid's magnet feature

- ***Using selection tools and their related functions***

  - Select by zone

  - Select by colour

  - Select by path

  - Inverse selection

  - Select all

  - Expand or contract (to increase or decrease the size of the selection)

- ***Managing layers***

  - Creating, merging and linking layers

  - Changing the properties of layers

    - Name

    - Opacity

    - Visibility

    - Lock

    - Order

    - Blending modes

- ***Modifying parts of an image using layers***

  - Arranging the parts of an image over several layers

  - Transforming part of an image

    - Stretching or shrinking

    - Modifying the proportions

    - Cutting or pasting

    - Using a layer

    - Using a selection of pixels

    - Rotating (specifying the centre and the angle of rotation)

    - Smoothing

- Using tools to draw
  - Paint
  - Choosing a foreground or background pattern or colour
  - Align
  - Delete
  - Clone
- Adding text
  - Using text boxes
  - Changing the properties of a text box
  - Converting a text box into pixels
  - Applying filters and special effects
- ***Saving an image in different formats in order to export it to other applications or to use it on the Web***
- ***Printing digital images by taking the main printing parameters into account***

CULTURAL REFERENCES

The following cultural references will help adults understand some of the factors that influenced the development of computer science. These references give a cultural dimension to instruction, expand the adult learners' knowledge and make their learning meaningful. The teacher, with input from adult learners, may choose other references that are more appropriate to the task at hand.

- ***Events and chronology***
  - Evolution of the advertising industry
- ***Heritage objects***
  - Publications from different time periods
  - Works by graphic designers and photographers
  - Pictorial art
- ***Regional or national references***
  - Advertising and marketing firms; Web site and video game designers; film producers
  - Anecdotes
  - School-related elements

FAMILIES OF LEARNING SITUATIONS

The goal of the *Raster Graphics* course is to provide adult learners with the means to express their creativity and to produce images and photomontages that reflect their artistic sensibility.

This course gives adult learners the opportunity to perform actions that will enable them to interact in a computer environment, produce quality computerized documents and adopt ethical behaviours.

The shaded cells in the table below provide specifics about the contexts in which the prescribed families of learning situations are applied in this course.

Subject-specific competencies	Families of learning situations related to . . .		
	Information	Creation	Critical thinking
Interacts in a computer environment	Interacts by interpreting signals he/she receives and using input and output peripherals	Discovers what computers can do by consulting documentation and by experimenting	Critically examines computerized communication tools by applying evaluation criteria
Produces computerized documents	Communicates by using computerized services	Creates by correctly using the appropriate functions	Evaluates his/her work by setting quality standards
Adopts behaviours that reflect a concern for ethics, safety and critical thinking	Communicates respectfully, using the conventions of a given medium	Acts prudently by adopting safe behaviours	Validates information by using validation criteria

First, adult learners discover what computers can do by consulting documentation and by experimenting. For example, they may determine what is feasible or choose the right tool to carry out a project.

Then, adult learners create documents by correctly using the appropriate functions in order to work more efficiently. Throughout the project, they communicate respectfully, using the conventions of a given medium.

BROAD AREAS OF LEARNING

The broad areas of learning deal with major contemporary issues. Ideally, the situations to be studied should be selected in keeping with the educational aims of the broad areas of learning since these areas of learning provide a broader context for the learning situations and thus serve to make learning more meaningful. Two broad areas of learning are considered particularly relevant to this course: Environmental Awareness and Consumer Rights and Responsibilities, and Media Literacy.

▪ **Environmental Awareness and Consumer Rights and Responsibilities**

Learning how to develop an active relationship with his or her surroundings while maintaining a critical attitude toward consumption and the exploitation of the environment is an essential part

of an adult's education. A learning activity that makes adult learners aware of the importance of business images meets the educational aim of the BAL Environmental Awareness and Consumer Rights and Responsibilities.

- **Media Literacy**

Being able to better understand how media information is processed is one of the aims of the Computer Science program. A learning activity that helps adult learners become aware of the means used to produce media images meets the educational aim of the BAL Media Literacy.

EXAMPLE OF A LEARNING SITUATION

All learning situations, no matter what broad area of learning is targeted, place adult learners at the heart of the action. Learning situations promote the development of subject-specific and cross-curricular competencies, the acquisition of computer knowledge and skills and the mobilization of various resources that are useful in carrying out the tasks at hand.

The table below shows the elements that need to be considered when developing a learning situation and highlights those selected for the learning activity described on the following page.

ELEMENTS REQUIRED IN LEARNING SITUATIONS	
Broad area of learning (targeted) - Contextualizes learning to make learning more meaningful	• Media Literacy
Subject-specific competencies (prescribed) - Are developed in action and require the active participation of adult learners	• Interacts in a computer environment • Produces computerized documents • Adopts behaviours that reflect a concern for ethics, safety and critical thinking

Families of learning situations (prescribed)
- Group together situations appropriate to the course, based on issues drawn from reality
- Promote the acquisition of computer knowledge and skills
	• **Information**
	  o Communicates respectfully, using the conventions of a given medium
	• **Creation**
	  o Discovers what computers can do by consulting documentation and by experimenting
	  o Creates by correctly using the appropriate functions

Cross-curricular competencies (targeted) - Are developed in context together with the subject-specific competencies	• Uses creativity • Adopts effective work methods
Knowledge (prescribed) - Includes computer knowledge and skills that adult learners must acquire in the course	• Properties of bitmap images • Rules of image composition • Modifying parts of an image using layers • Planning a project • Creating photomontages • Preparing an image for mass media projects

This section provides an example of a learning activity. It includes a context that serves as a common thread throughout the activity; however, it is not formally spelled out. Although they may not be explicit, the learning situation includes the elements identified in the previous table: the broad area of learning, the subject-specific competencies, the families of learning situations, the cross-curricular competencies and the prescribed knowledge. To promote learning, these elements must be structured in a coherent and meaningful way.

Teachers can target any element as a focus of learning, be it actions related to the subject-specific or the cross-curricular competencies or the prescribed knowledge that adults must acquire.

EXAMPLE OF A LEARNING SITUATION

An ideal world

Task: Create a photomontage of an ideal world.

The teacher can ask adult learners to create an image of an ideal world using photomontage techniques. Using images they have collected, adult learners cut out the parts they want to keep and then distribute them among various layers in order to process them. To prepare for the task, adult learners are asked to draw a sketch of what they intend to do and plan the steps involved in their project. Once the project is completed, the adult learners present it in a medium of their choice.

To carry out the activity, adult learners will draw on their existing knowledge and skills. They are not expected to master all of the course content before they start their project; rather, they will construct their knowledge as they work, using the means at their disposal: the documentation provided, planning, communication with peers (when the situation permits), and reflection and review. The teacher encourages the adult learners to create an image that allows them to use only a few of the software's features. By proceeding in this way, adult learners can validate their knowledge by integrating it gradually into concrete actions.

During this activity, adult learners use mainly selection tools to cut out objects, and layers to distribute and manipulate these objects. They plan their work in advance and, in collaboration with the teacher or their peers, analyze their results at each step, adjusting their approach based on their needs.

END-OF-COURSE OUTCOMES

Computer graphics refers to the creation, manipulation, storage and display of images using computer equipment and techniques. The *Raster Graphics* course gives adult learners the opportunity to discover the world of computer graphics by allowing them to apply different techniques to the creation, modification and manipulation of bitmap images.

When adult learners *discover what computers can do*, they become familiar with the main concepts of raster graphics by consulting available software documentation, tutorials and guides. They search the Internet for information or consult their peers. They explore the capabilities and limitations of the application's tools and commands by using these features in concrete activities. In this way, they develop strategies that they can apply in their project. They look for inspiration in images from various sources or draw sketches to plan their project.

When adult learners *create* a bitmap image, they determine the objective of the task, are open to different ways of doing things, analyze the task to be carried out and mobilize the necessary resources. They apply their knowledge to the tools available, manage layers and use transparency; they import images from a digital camera, an image bank or the Web; select the parts they want to use and process them in a consistent and harmonious manner. They save or export their images in the appropriate format and print them out, taking into account the main printing parameters. Thus, adults become more versatile and efficient in using a raster graphics program.

When adult learners *communicate*, they demonstrate their sense of ethics, act responsibly by respecting copyright and use the conventions of a given medium.

Throughout the learning process, adult learners develop competence in the following knowledge and skills: they create bitmap images by adding and modifying objects, colours, filters and special effects; and use the basic features of a raster graphics program in order to produce images or photomontages. In addition, they do not hesitate to consult various resources to obtain help when difficulties arise.

EVALUATION CRITERIA

Interacts in a computer environment

- Use of appropriate strategies to interact and to troubleshoot

Produces computerized documents

- Thorough planning of the work

- Appropriate formatting based on document type

- Application of appropriate tools and functions

Adopts behaviours that reflect a concern for ethics, safety and critical thinking

- Adequate communication using the conventions of a given medium