

CHAPTER TWO

BLENDED LEARNING

2.1 DEFINITION OF BLENDED LEARNING

Literature reveals a number of different definitions for blended learning. The most widely used definition of blended learning, is that it is the integrated combination of traditional, face-to-face methods of learning with web-based, online approaches (Harrison, 2002:Online).

However, Driscoll (2002:Online) found in her research that the term can actually refer to any of the following scenarios:

- ☞ to combine or mix modes of web-based technology (e.g., live virtual classroom, self-paced instruction, collaborative learning, streaming video, audio, and text) to accomplish an educational goal;
- ☞ to combine various pedagogical approaches (e.g., constructivism, behaviourism, cognitivism) to produce an optimal learning outcome with or without instructional technology;
- ☞ to combine any form of instructional technology (e.g., videotape, CD-ROM, web-based training, film) with face-to-face instructor-led training and
- ☞ to mix or combine instructional technology with actual job tasks in order to create a harmonious effect of learning and working.

Labrow (2002:Online) asserts that blended learning is simply the mixing of more than one type of learning within a single learning programme, and according to Smith (2001:Online), it is a new surge combining the synergy of consulting services and content via several deliveries including web-based, self-paced and instructor-led classes. The focus is on improved performance of both students and educators.

According to Masie (2002:137), blended learning is the use of two or more distinct methods of training. This may include combinations such as:

- ☞ blending classroom instruction with on-line instruction;
- ☞ blending on-line instruction with access to an instructor;
- ☞ blending simulations with structured courses and
- ☞ blending managerial coaching with e-learning activities.

The fact that blended learning means different things to different people may appear to be a problem, but in reality these definitions illustrate the untapped potential of this methodology.

The following section looks at reasons why blended learning has become such a popular trend in education.

2.2 WHY SELECT BLENDED LEARNING?

According to Reay (2001:6), blended learning has become all pervasive in the training industry. Rather than create an artificial divide between e-learning and more traditional approaches, many organisations are attempting to find the best mix of both to provide the most effective learning solution. It should be noted that e-learning is often seen as the equivalent of on-line distance learning. However, in this study the researcher prefers to use the broader definition of e-learning, i.e. that it is anything delivered, enabled, or mediated by electronic technology for the explicit purpose of learning (Hicks, 2000:75).

Ward and LaBranche (2003:22) assert that blended learning is often referred to as the best of both worlds where learning events take place by combining aspects of face-to-face instruction and e-learning. It is seen as a powerful strategy that expands and enhances the learning experience.

McC Campbell (2001:71) identifies some of the strengths of e-learning:

- ☞ The use of varied e-learning methods results in highly engaging programmes.
- ☞ Huge cost savings come from students not needing to leave their work, or homes and travel long distances.
- ☞ Students progress at their own pace and do not hold back others or become bored by a slower pace. Students can repeat parts of a programme that are not clear to them.
- ☞ Students can complete learning at times that work best for their schedules.
- ☞ Many students learn more effectively on their own rather than in groups.
- ☞ E-learning seems especially appropriate for transfer of information and cognitive understanding.
- ☞ Complex performance skills can be learned efficiently with technology-enhanced learning such as flight simulators.
- ☞ Highly efficient e-learning programmes can be developed by following the principles of good instructional design.

According to McC Campbell (2001:71), centuries of experience have shown the power of students coming together for face-to-face lectures. The following are some of the strengths of face-to-face learning:

- ☞ The enthusiasm of the facilitator for the content is contagious and encourages learning.
- ☞ Students prefer to learn in a social situation.
- ☞ There is accountability in a classroom that is missing in e-learning.
- ☞ Learning occurs casually and indirectly when individuals interact.
- ☞ Instructor-led sessions remove students from their daily work responsibilities, so participants can focus on learning. There is no such protection when using e-learning methods.

- ☞ The questions and comments of students help raise and address important issues, and make it comfortable for others to talk.
- ☞ The pattern of learning in a group environment is established in almost every educational institution and connects with past learning experiences.
- ☞ The facilitator speeds up the process of knowledge acquisition.
- ☞ Classroom experiences provide opportunities for students to practise and rehearse skills and to receive feedback from others.

Bersin (2003:Online) states that e-learning became a craze in the late 1990's - every training institution started an initiative, purchasing training software, and putting courses and instructors on the web. However, now that the first few millions have been spent, important questions need to be asked:

- ☞ What results are achieved from the e-learning programmes?
- ☞ How can results of all the training be correlated and measured?
- ☞ Which of the investments is giving the highest return?
- ☞ Should investment in e-learning be increased or decreased?

The unfortunate truth is that many e-learning programmes do fail, often as a result of under-estimating the complexity of the development, rollout, or measurements needed. In many instances the emphasis is on the "e" of e-learning instead of focusing on the learning part thereof. Reay (2001:6) re-enforces this idea by stating that e-learning brings advantages and new opportunities to the learning situation. However, its limitations, particularly in presentation and delivery, affect the content and design of material and the effectiveness of the learning process. For many learning needs there is nothing that surpasses real-time presentation to an audience or face-to-face tuition. This fact results in the growing trend to integrate e-learning into conventional learning, creating blended learning programmes.

Harris (2002:Online) stresses that the need for blending is simple: students are very different, and if training solutions should be developed that will work for many students, then the differences must be acknowledged,

accommodated and catered for, by ensuring the maximum range and variety of learning opportunities. Some students like to work on their own, without any direction at all. Others also like to learn on their own, but in a structured and directed environment. Still others prefer socialized learning which entails working through concepts and formal principles by experimentation in a primarily social context, and others like to reflect privately on material, whether presented on the electronic or traditional page.

The world-class Thomson Job Impact Study (Harris, 2002:Online), the first of its kind to measure the effectiveness of blended learning against single training options, developed a study in collaboration with leading corporate organizations and academic institutions including Lockheed-Martin; Utah State University; University of Limerick, Ireland; Anoka-Ramsey Community College, Minnesota; Executive Service Corps of Chicago; and KnowledgePool.

The first phase of the study, released in 2002, aimed to determine if there were significant differences in the accuracy and time it took students to perform real-world tasks after using blended learning training approaches, e-learning training programmes or no training at all. Results from this phase revealed that a structured curriculum of blended learning generated a thirty percent increase in accuracy of performance and a forty one percent increase in speed of performance over single-delivery options. Lead researcher Stacey Boyle (Harris, 2002:Online) says the biggest surprise was the fact that the students who were exposed to the blended curriculum were able to save so much time performing the tasks. *"What it really means is that those who had the blended learning were able to work more efficiently," and that "They had the resources available to them, and the instruction was structured better for them to be successful at the real-world task at the end."*

Boyle and her team also identified five core features as contributing to the success of the blended learning model used in the study, namely:

☞ access to live mentors during the online portion of the training;

- ☞ assessments designed to mime real-world tasks;
- ☞ early use of the software being taught;
- ☞ integration of learning objects with realistic scenarios and
- ☞ use of scenario-based exercises to teach the software application.

The second phase of the study sought to identify the essential instructional components of a successful blended learning solution. The researchers studied five separate groups of students to compare e-learning with three different types of blended learning solutions: instructor-led training, text-based programmes and scenario-based exercises.

- ☞ The instructor-led training group received blended learning driven by scenario-based exercises within the context of an instructor-led course.
- ☞ The text blend group received scenario-based exercises that included access to text objects.
- ☞ The scenario-based exercise group received scenario-based exercises that included access to NETg Learning Objects (NLOs).
- ☞ The e-learning group received a standard e-learning course.
- ☞ The control group was established to benchmark performance and did not receive any training.

All of the groups completed a post-assessment and three real-world tasks.

As in phase one of the study, the new results also confirm that a defined blended learning solution heightens overall on-the-job performance achieved by e-learning alone and that either blended or single-delivery models are more effective than no training at all. When compared with the e-learning group, the blended learning groups were twenty seven to thirty two percent more accurate in task performance and performed the tasks forty one to fifty one percent faster.

The following remarks by Ward and LaBranche (2003:23) summarise why blended learning is fast becoming the most popular teaching methodology: *“Like something that is greater than the sum of its parts, blended learning offers the potential to offer a better learning experience and greater value. Blended learning is a student-centered strategy. Students have more options, more time and more freedom to explore learning. It extends learning before or after the physical learning experience, and enhances learning by taking the student outside of the traditional classroom to take advantage of the power and depth of the Internet and other e-learning opportunities.”*

As indicated in the previous paragraph, blended learning solutions can enhance learning programmes. However, the promise of effectiveness and value that blended learning brings to the table depends upon thorough evaluation of the many delivery options available and a well thought out strategy for integration and implementation (Strategic Visions International, 2002:Online).

2.3 WHAT IS THE RIGHT BLEND?

In blended learning, it is not the mixing and matching of different learning delivery modes by itself that is of significance, but the focus on the learning outcome (Singh & Reed, 2001:1). They therefore propose a refined definition for blended learning by stating that it focuses on optimising achievement of learning objectives by applying the “right” learning technologies to match the “right” personal learning style to transfer the “right” skills to the “right” person at the “right” time.

The following principles are embedded in this definition:

- ☞ focus is placed on the learning objective rather than the method of delivery;
- ☞ many different personal learning styles need to be supported to reach broad audiences;

- ☞ each student and instructor brings different knowledge into the learning experience and
- ☞ in many cases, the most effective learning strategy is “just-what-I-need, just-in-time”.

According to Valiathan (2002:1), there is no single formula that guarantees effective learning, but there are some guidelines which categorise blended learning into three models:

- ☞ skill-driven learning, which combines self-paced learning with instructor or facilitator support to develop specific knowledge and skills;
- ☞ attitude-driven learning, which mixes various events and delivery media to develop specific behaviours and
- ☞ competency-driven learning, which blends performance support tools with knowledge management resources and mentoring to develop workplace competencies.

Reay (2001:6) asserts that blended learning is not just about adding online materials to a conventional training catalogue. Blended learning must be relevant, and demand a holistic strategy leveraging the best characteristics of all learning interventions, as well as considering the mix of mediums, e.g. how a blend of synchronous, instructor-facilitated and asynchronous, self-directed, self-paced approaches can best be combined to meet student needs. An effective blended approach will find the strengths and supporting competencies of traditional classroom training, presentations, stand-alone interactive online training and asynchronous and synchronous Web-based training. Successful implementation requires an understanding of the strengths of the respective mediums, recognition of how students approach and use information directed through each medium and an awareness of available knowledge resources and how they can be best leveraged through online and traditional teaching methods.

In this study the researcher investigates the strengths and weaknesses of the different mediums that can be used in a blended learning approach (*cf.* 2.4). In a further quest to find the right blend, the researcher looks at sound instructional design models (*cf.* 2.5), as well as principles of good teaching practice (*cf.* 3.4).

2.4 ELEMENTS OF BLENDED LEARNING

The following sections look at the advantages and disadvantages of different types of elements that could be selected to form part of a blended learning programme.

2.4.1 Printed material

Print is the foundation of any form of educational delivery. While the technological developments have added to the repertoire of tools available to instructors, print continues to be a significant component of all education programmes (Wills, 2001:Online).

Hartley (1995:279) asserts that a student should receive a package of study material, which includes a wide variety of printed materials. These could be study guides, books of readings, text on design and quality assurance of assignments, curriculum planning and assessment guides.

A number of different printed materials can be used as part of educational programmes. Some examples are:

◆ Textbooks

Wills (2001:Online) claims that textbooks should be the basis and primary source of content for the majority of educational programmes. Textbooks play a critical role – specially when the student and instructor are not in daily contact.

◆ **Study guides**

The main purpose of a study guide is to guide students in their study through the source of content (Holmberg, 1995:71). The study guide could contain some of the content of the programme, but the bulk of content comes from a textbook, a collection of readings or a combination of these two sources. Study guides should include activities, related readings and additional resources available to the student. In deciding to use a study guide an instructor can take advantage of using one or more high-quality textbooks. On the down-side, it is unlikely that an instructor will find a textbook which precisely matches the curriculum. Furthermore textbooks can change editions, go out of print or simply become too expensive for students to buy.

◆ **Self-contained study manuals**

Holmberg (1995:71) distinguishes between study guides and self-contained study manuals. A self-contained study manual contains all the content or subject matter, as well as the guidelines that would be included in a study guide. To produce a self-contained study manual, the instructor therefore has to write everything which would go in a textbook, as well as all the activities which turn it into a tutorial in print. He suggests that the latter may be used in cases where the programme content is fairly elementary and does not call for a study of different sources.

An advantage of using self-contained study manuals is that programme content can be tailored precisely to the programme. Furthermore, content, examples and case studies can be chosen to be appropriate for the local situation and everything the student needs is under the control of the instructor. The major disadvantage of using self-contained study manuals is the time and resources needed to produce a manual of high quality.

◆ **Workbooks**

Workbooks are often used to provide programme content in an active manner. A typical format may contain an overview, the content to be covered, exercises or case studies to elaborate the points being made and a quiz or test (with an answer key) for self-assessment (Wills, 2001:Online).

◆ **Syllabus**

Students should receive a comprehensive and well-planned programme syllabus that provides programme outcomes, performance expectations, descriptions of assignments, related readings, grading criteria and a schedule to be followed by the student in order to cover the content within a given timeframe (Spear, 1999:3). A syllabus must be as complete as possible in order to guide the students through the programme, specially in the absence of daily contact with the instructor. Sorrentino (1997:Online) adds that a syllabus should include programme goals, performance objectives, examples of student work as well as information on how to contact the instructor.

The following are some advantages of using printed material:

- ☞ From a teaching point of view, print is by tradition a powerful medium. Reading is second nature to most students. As a result, they are easily able to focus on the content without becoming mesmerised or frustrated by the process of utilising all kinds of technology (Wills, 2001:Online).
- ☞ Print materials can be used in any setting without the need for sophisticated presentation equipment. Given adequate light, print materials can be used any time and any place without the aid of supplemental resources such as electricity, viewing screens and specially designed electronic classrooms. This portability aspect is particularly important for rural students with limited access to advanced technology (Kember, 1991:40).
- ☞ Both Wills (2001:Online) and Kember (1991:40) agree that print materials are typically student-controlled, meaning that a student can decide in which order to access the material. A student can for instance decide to rapidly move through redundant sections and focus on areas which demand additional attention.
- ☞ Printed material is undoubtedly the least expensive instructional tool to develop (Keegan, 1996:174). Furthermore, there are many established facilities to produce these materials.

- ☞ In comparison to technically sophisticated electronic software, print is both easy and inexpensive to edit and revise. New electronic production leads to printing on demand, meaning it is not necessary to have an estimated number of copies duplicated – but material can be printed as students register (Macdonald-Ross, 1995:305).
- ☞ It can be argued that printed material can be developed time-effectively, because the developer's primary focus remains on content concerns and not on the technical requirements of the delivery system (Wills, 2001:Online).

Literature reveals the following limitations of printed material:

- ☞ By its reliance of the written word, printed material can only offer a limited view of reality. Despite the use of excellent sequential illustrations or photos, for example, it is impossible to adequately recreate motion in print (Holmberg, 1995:79).
- ☞ Printed material is passive and self-directed and it takes more self-motivation from students to read a book than for instance watch a television programme. Without feedback and interaction, instruction suffers, regardless of the delivery system in use. Even if feedback mechanisms are incorporated in the material, there is a time-delay before interaction from the instructor takes place. This could lead to students losing interest (Wills, 2001:Online).
- ☞ If students do not have good reading skills, the effectiveness of printed material could be crippled (Schlebusch, 2000:60).

2.4.2 Face-to-face instruction

Traditional face-to-face instruction can also be included as an element in a blended learning programme (Singh and Reed, 2001:3). The aim of teaching is simply to make student learning possible. The instructor has a crucial and demanding role to play in the process of student learning, by creating a

context in which the students' desire and ability to learn can work most effectively.

Lectures continue to be one of the most commonly used teaching methods in education (D'Cruz, 2003:Online). Research done as far back as 1988, suggests that traditional lectures, if well planned and presented, are as effective as other methods - but not necessarily more effective - for conveying information (University of Technology, Sydney, 2002:Online). However, there is little point in simply conveying information without stimulating students' motivation to learn and giving them opportunities to develop understanding. Methods which actively involve students are more effective than lectures for encouraging them to take deep approaches, which are likely to result in developing understanding, encouraging critical thought, challenging opinions or changing conceptions. This, of course, does not mean that lectures should be abolished, but rather that lectures should be conducted in such a way that they maximise the chances of students developing understanding.

Lectures can be used to give broad contextual information, to highlight the important or interesting aspects of a topic, to demonstrate problem solving techniques, or to show the relative strengths of two sides of an academic controversy. However, they should not be used to transmit information that the students can acquire (perhaps more effectively) from reading a textbook or accessing the Internet. Lectures which are based around a set text should be used to clarify, expand, or explain the content of the text rather than merely to repeat it. It should also not be assumed that transmission by the instructor implies reception and learning by students. Felder (1992:Online) asserts that of all instructional methods, lecturing is the most common, the easiest, and the least effective. Unless the instructor is a real spellbinder, most students cannot stay focused throughout a lecture. One of Felder's studies indicates that immediately after a face-to-face lecture students recalled 70% of the information presented in the first ten minutes and only 20% of that from the last ten minutes. However, actively involving students in learning instead of simply lecturing to them leads to improved attendance, deeper questioning, higher grades, and greater lasting interest in the subject. Students learn more

effectively when lectures include activities which engage their thoughts and motivation.

The following factors should be taken into consideration when planning lectures (University of Technology, Sydney, 2002:Online):

- ☞ Students are not empty vessels into which knowledge can be poured. They try to make sense of new information in the context of their existing knowledge. Students can have pre-existing misconceptions about the subject which affect the way they interpret and try to understand new concepts. It follows that in order to encourage student understanding, the instructor needs to know about students' prior knowledge and conceptions and help them to change misconceptions. This can be done by asking students to explain concepts in their own words; to discuss and to debate the conflicts and paradoxes present in the subject; to point out links between the specific subject and others and to relate new knowledge to everyday examples. Students take an active role in their learning when they are constructing knowledge themselves.
- ☞ As novice students, students often experience subjects as a collection of topics, without being able to gain an idea of the relationships between them or how they link to related subjects. To help overcome this, instructors should give students an overview of the whole subject at the beginning, e.g. a written subject outline or diagram of the subject can be helpful. Students can then link each new session back to this overview and to previous sessions. Making the structure of each session clear to students can help them to fit the topics together in their minds and begin to make sense of them.
- ☞ Students can be easily overburdened. Presenting too much content too quickly can rapidly overwhelm students' ability to understand it. This is particularly so if the content is very new, detailed or conceptually difficult. Students are likely to have a greater chance of understanding if given opportunities to mentally process and reflect on new material. This may mean that the amount of material an instructor plans to cover in a lecture

should be reduced, providing other sources of information - such as printed or Web-based lecture notes, in order for students to learn important concepts more effectively.

- ☞ Involving the students in activities where they engage with the content can promote understanding and critical thought, and hence raise the quality of student learning from lectures. There is a wide range of activities that can be used to get students to actively participate in the lecture. Instructors should choose a variety of activities and always focus on those that will best suit the aims of the specific learning process. Whatever activity is chosen, it is important to explain to students how the activity aims to assist their learning. After any activity students should be allowed to report back to enable them to hear different perspectives from the instructor and their peers.

The task of an instructor has many dimensions (University of Technology, Sydney, 2002:Online; Young, 2002:Online). It involves:

- ☞ the provision of a broad context of knowledge within which students can locate and understand the content of their more specific studies;
- ☞ the creation of a learning environment in which students are encouraged to think carefully and critically and express their thoughts, and in which they wish to confront and resolve difficulties rather than gloss over them;
- ☞ constantly monitoring and reflecting on the processes of teaching and student understanding and seeking to improve them and
- ☞ helping students to achieve their own aims, leading them to understand that learning requires commitment, hard work, responsibility for their own learning, and a willingness to take risks.

These are not easy tasks, and there is no simple way to achieve them. Still less are there any prescriptions that will hold good in all disciplines and for all students. Lecturing must be carefully tailored to suit both that which is to be learnt and those who are to learn it.

In the past decade, some instructional experts suggested that a lecture format is not as effective as other forms of instruction due to the passive involvement of the student (McKethan & Everhart, 2001:4). They assert that the traditional lecture method is not suited for the ever-expanding educational objectives of today's society, diversity of students' needs, and the increasing volumes of information. Further, in consonance with these arguments research undertaken by the learning and technology e-lab at The Maisie Center in the United States, suggests that even students involved in e-learning, learn best when they collaborate with others, i.e. when they have a "social context" for learning (D'Cruz, 2003:Online). Collaborating with others as part of the learning experience improves critical thinking, communication skills, recall, course completion and a positive attitude towards learning. This implies that in terms of blended learning there are more benefits to be gained from face to face instruction than merely getting a lecture from the instructor. Some of these benefits are (D'Cruz, 2003:Online; Young, 2002:Online; Kapp, 2002:4):

- ☞ Face to face students get to know each other, connect professionally and socially and might discover how they can mutually benefit from networking.
- ☞ Students develop attitudes partly from seeing them role modelled by others - particularly people they respect. A good practice for classroom learning is to combine a diverse range of people in groups and facilitate an exchange of opinions to positively develop attitudes.
- ☞ An important element for developing team spirit is feeling "included". An instructor should use as many techniques as possible to foster a sense of inclusion. It is particularly useful to set up projects that require collaboration and communication amongst students. Social development is a natural process encouraged by simple events that create a common bond amongst people and synergy happens when a team achieves results that are more than the sum of their individual skills and experience. Setting up class presentations and group projects can present powerful learning experiences.
- ☞ Students are motivated to improve their performance when performance is assessed relative to their peers. In a classroom setting students want to

demonstrate to the instructor and their peers that they are learning or have knowledge. People strive to be at least as good as, if not better than, their peers. Instructors who have commented on positive elements of students' work have found that people respond to this kind of recognition by raising the standard of their work .

- ☞ Where a student develops a relationship with an instructor and other students, a sense of accountability ensues, e.g. students would feel accountable for meeting deadlines to submit assignments. By setting up a common focus and challenge for students, the instructor creates an environment where students depend on each other. This typically results in increased accountability.

The researcher notes that there are some concerns about face-to-face lecturing not being the answer to modern-day teaching. However, in conclusion, it can be stated that there is enough evidence in literature to indicate that the social context still plays an important role in the learning experience.

2.4.3 Instructional television

The third possible element to be used for blended learning, is instructional television. According to Bates (1995:61), there are many forms of instructional television, for example:

- ☞ educational broadcasting where programmes are broadcasted on public or private television channels;
- ☞ tele-programmes where lessons are pre-recorded and distributed to students on video cassette and
- ☞ live television broadcasts where the instructor and students are connected via video-conferencing media and can interact in various ways (*cf.* 2.4.4).

Wills (2001:Online) asserts that instructional television (ITV) is an effective delivery system that can be integrated into the curriculum either as a single lesson, a selected unit or a full programme.

The following advantages of ITV are found in literature:

- ☞ As far back as the 1980s, Bates and Gallaher (1987:6) claim that the following characteristics of television make it valuable for educational purposes: “*Television is the only medium that can combine words, still and moving pictures, events occurring in real time, slow or accelerated motion, animation and text. This gives it a power to present information that other media lack*”. Wills (2001:Online) agrees that ITV is an effective way to take students to new environments, e.g. the moon, a foreign country, or through the lens of a microscope.
- ☞ According to Sherry (1996:4), researchers have consistently found that instructional television can motivate and captivate students, and stimulate interest in the learning process.
- ☞ In his list of advantages of ITV, Wills (2001:Online) continues by saying that since many students have watched television, the medium is familiar and accessible and students will not have any problems using the technology.
- ☞ Video recordings are often better than real demonstrations because they can be replayed, stopped or played in slow motion (Wills, 2001:Online). They are versatile as they provide flexibility and student control. Well-designed videotapes present students with the opportunity to interact with the lesson material by repeating until they master it and by reflecting on and analysing the information. Furthermore, video segments can closely be integrated with other learning materials so that students can move between lesson material supplied by different media, e.g. study guides.

The following are a few disadvantages or limitations of ITV:

- ☞ Bates (1995:87) states that while professional broadcast production can take advantage of the unique presentational characteristics of television, it

distances the instructor from the production and often presents problems related to the integration of television programmes with the rest of the programme material. Broadcast quality ITV is also very expensive to create.

- ☞ Spear (1999:2) observes that video production is time consuming and can be technically demanding, often requiring relatively sophisticated production facilities and equipment. Unless professionally produced, video programmes often look amateurish.
- ☞ Spear (1999:2) also remarks that once completed, it can be difficult to revise and update the content of ITV programmes and videotapes.
- ☞ Despite its ability to reach a large section of the student population, open-broadcast television is a one-way communication medium which does not provide for interaction between the student and the instructor (Wills, 2001:Online). Videotapes could thus be used passively, without interaction in which case their instructional effectiveness is limited.

2.4.4 Video-conferencing

Video-conferencing is yet another element that can be used as part of a blended learning programme. Video-conferencing can be defined as the set-up where an instructor in one area lectures to students at various other locations. Communication is established via a combination of transmission media and devices. Communication can either be one-way, i.e. the students can see and hear the instructor, or two-way, in which case both the instructor and students can see and hear each other. In the latter case it is referred to as interactive video-conferencing (IV) (Wills, 2001:Online).

Porter (1997:166-167) describes a typical IV scenario as taking place in a classroom dedicated to this type of instruction. The classroom should be equipped with special consoles, in-table microphones and television monitors. Instructors present information and the television cameras show the viewing audiences in remote locations what is being presented at the site where the broadcast originates. The instructor works from a console where documents,

transparencies, computer displays, photographs, slides and other graphics can be displayed by controlling a camera. Microphones located at the console, as well as on the students' desks allow students and instructors to talk to each other within the classroom, as well as discuss coursework with students in remote locations. Many rooms are equipped in such a way that the camera can be switched to show the person who is speaking; in this way, the instructor knows who is speaking and can communicate directly with that student.

Students in a remote location can see what is happening in the site originating the transmission. Furthermore, the instructors and students at the origination site can also see and hear the participants in remote sites. Optimally, this format allows audience questions from remote sites that receive an immediate response from the instructor. Ideally there should be a local instructor on each of the remote premises who can facilitate individualised learning, feedback, and integration following the distant presentation.

IV can be effective because of the following factors:

- ☞ IV provides increased contact between instructors and students because it allows real-time interaction. IV enables distant students to see and hear the instructor as well as other students (Porter, 1997:168).
- ☞ According to Reed and Woodruff (1995:Online), IV allows the integration of different media in a presentation, e.g. blackboard writing, hand-written documents, videos, computer slides and other graphics may be incorporated and viewed at all sites.
- ☞ IV enables connection with experts in other geographical locations (Reed & Woodruff, 1995:Online). Instead of the instructor presenting a lesson, an expert in the region could be invited to present information to remote students.
- ☞ Porter (1997:168) mentions an important advantage of using IV, namely that the televised presentation could be videotaped for later reference or

use. Students who missed the conference or who want to review a class session may either borrow or buy the tapes.

The following limitations of IV should be mentioned:

- ☞ Certainly the most limiting factor of IV is described by O'Rourke (1999:103) as being the initial context of the equipment and leasing the lines to transmit conferences.
- ☞ Porter (1997:167) indicates that due to the technology used, only a limited number of sites can be linked in an interactive video-conference. Furthermore it is advisable that the groups at the remote sites are kept small (for instance less than 20 students) to enable good interaction.
- ☞ Wills (2001:Online) points out that students may be shy to communicate in front of a camera and therefore may remain uninvolved in the lesson.
- ☞ If visuals, like hand-written or copied materials, are not properly prepared, students may find it difficult to read.
- ☞ On the technical side, if the "pipe" that carries the transmission among sites is not large enough, the students may observe ghost images when rapid movement occurs (Reed & Woodruff, 1995:Online). Similarly if the system is not properly configured, class members may observe an audio echo effect. The result is audio interference that detracts from the learning environment.
- ☞ Porter (1997:167) raises a valid point by indicating that even if the latest technology is used, the quality of the programme still depends on the instructor's effectiveness in presenting information to students. Being a presenter in IV requires much more of the instructor than merely giving a lecture. The instructor would have to be trained in using the advanced IV technology. Furthermore, the instructor would preferably have to have a presentational personality and be able to present information in a lively way.

2.4.5 Computer assisted learning (CAL)

CAL might be considered as a possible element of blended learning. Raby (2001:17) defines CAL as a technique that uses the computer as a self-contained teaching machine to present discrete lessons to achieve specific educational objectives. Information is delivered via fixed lessons on a compact disc (CD). CAL (also referred to as Computer Based Training, CBT) provides perhaps the best opportunity for student self-guided learning (Cann, 1997:Online). In today's society where there is an increasing emphasis on students to take ownership of learning processes, merits of the lecture approach to instruction is debatable while the usefulness of computer-based instruction appears to be warranted.

According to Lawson (1999:32), CAL is an effective training medium founded on its interactivity with the student. The computer becomes the instructor, using a mix of full-motion video, animation, graphics, text and audio.

The following are some of the advantages of CAL:

- ☞ CAL enhances the accessibility of learning in instances where either distance or time may separate workers from needed knowledge. CAL can give students at various locations, having various working circumstances, equal opportunity to learn. CAL thus vastly improves training flexibility (Cann, 1997:Online; Trepper, 1999:3).
- ☞ CAL programmes come in a variety of types, including tutorials or knowledge-based programmes, games, and simulations (Andrisani, Gaal, Gillette & Steward, 2001:312).
- ☞ Well-planned CAL programmes can in some instances be more cost-effective than live training. Although developing or purchasing CAL course materials and hardware requires a significant investment, live training can be much more costly. Examples of costs involved for live training include the development of the course and course materials, paying for the learning site and instructor, and travelling. Weidner (1999:52) asserts that CAL is expensive to develop, but it costs less per class to present.

- ☞ CAL can include multimedia techniques like graphics, sound, animation and full video clips. This results in learning content being presented in a much more realistic way, making it more interesting to the student (Trepper, 1999:3).
- ☞ CAL course material can be updated frequently and at a low cost. Corrections, additions, and changes to course materials are readily accomplished and new CD-ROMs are less expensive to print and distribute than printed material.
- ☞ CAL allows trainees to deal with learning in bite-size chunks, rather than sitting for hours in a classroom. The flexibility to segment content may lead to students obtaining better results.
- ☞ Classroom training often proceeds at the pace of the slowest student. CAL, however, is self-paced and self-planned, with the students themselves choosing their own paths through the mass of information encompassed by the package. Within a self-paced instructional programme, a student may review specific topics on which he/she needs clarification. Or, if familiar with the topic, he/she may quickly complete the course and progress at a faster rate. Essentially, all students who complete the programme will be able to master the topic and function at similar levels. This is in stark contrast to classroom instruction (CI), in which a group of students is trained based on a predetermined time, and students are individually expected to master the topic during that time.
- ☞ CAL leverages the capabilities of top-notch instructors. It allows a good instructor to serve many students and permits the talents of experts to be made widely available.
- ☞ Successful use of CAL packages will not only increase students' knowledge, but will require them to develop other important skills, including self-assessment and planning of studies, information technology skills, creativity and self-motivation.
- ☞ Research done by Maul and Spotts as far back as 1993 (1993:24) indicates that using CAL can reduce the amount of time needed to complete training.

- ☞ According to a study done by Perry (1994:2), it was found that knowledge retention was higher with students that used CAL packages.
- ☞ Trepper (1999:4) asserts that, when using CAL, students get immediate feedback to questions and exercises. This enhances the learning process.
- ☞ Interactive CAL courseware represents a move towards active learning. In a classroom setting, some students tend to be shy and non-participative. The personalised interaction inherent in CAL, however, results in students being more participative and thus gaining more from the training (Trepper, 1999:4).

However many advantages there are to using CAL, instructional designers need to be careful not to fall into the trap identified by Hoyle (2003:3) as the “*deadly sin of e-learning*”. This happens when the printed pages of the text book simply gets transferred to electronic format and what is supposed to be CAL, becomes merely e-reading. The goal of a CAL training programme is to impart knowledge or teach a particular skill. The most important components of CAL include meaningful programme content, a creative design, and the incorporation of interactivity appropriate to the programme's task. It is imperative to take cognisance of some of the most important guidelines for developing well-designed CAL programmes:

- ☞ The interactive nature of CAL has been credited with a 50% gain in learning and a 20-40% gain in retention over traditional instruction (Andrisani *et al.*, 2001:320). The key factors in promoting interaction in any CAL programme include the method of interactivity employed and the type of feedback used. The type of knowledge being imparted or the particular skill being taught should dictate the appropriate level of interactivity – this can range from minimal user intervention to high user control. Developers must give users a sense of control while providing training in a structured environment that promotes optimal learning and retention. The key to successful CAL involves developing an interesting programme, asking relevant and well-conceived questions, calculating the many paths users will take in exploring the programme, and anticipating varied user responses - all in the context of a visually rich environment.

- ☞ Special consideration should be given to the screen layout. Good principles of design, such as the proper use of colour and white space, the absence of scrolling, the limited use of attention-capturing devices, and the variation in font type sizes and styles for effect, all impact how students view a CAL programme. Additionally, consistency in the placement of text, graphics, audiovisual elements, and navigational devices are crucial in gaining user confidence, which results in credibility for a CAL programme (Andrisani *et al.*, 2001:321).
- ☞ One of the most important characteristics of CAL is its ability to provide students with immediate feedback to their responses. Feedback is an important part of the interaction between the student and the computer because it lets the student know how well he/she is doing (Maul & Spotts, 1993:24). Feedback not only informs students about their progress and competency levels, but also increases their level of confidence and decreases their level of anxiety. The reinforcement provided for correct responses motivates students to continue with the programme, and their ability to immediately discover the correct answer to an incorrect response, is an effective method of not only learning information, but also retaining it (Maul & Spotts, 1993:25). Within the realm of visual feedback, there are guidelines for providing feedback for correct and incorrect responses. The feedback offered should be brief, such as using the word Good or Correct for the right answer. Feedback for incorrect responses should begin with the word No or Incorrect, followed by a sentence containing the correct response, and perhaps a reason why this particular answer is considered to be correct. It is important, for the sake of consistency, that feedback be displayed in the same location on every screen. The font type size, style, and colour used to display feedback should also be consistent (Andrisani *et al.*, 2001:322).
- ☞ Effective CAL programmes will provide students with a variety of hands-on exercises and tutorials (Weidner, 1999:52).
- ☞ In addition to immediate feedback, Weidner (1999:53) asserts that the CAL programme should also be able to present a student with a report, indicating his/her progress.

- ☞ CAL programmes should be graphically rich, combining audio, animation, video, line art and icons all accompanied by the appropriate use of colour (Weidner, 1999:52).
- ☞ Weidner (1999:53) furthermore suggests that CAL programmes should have a brief tutorial that will show students how to access and use different segments of the course material. A reference manual should be available, either as a hard copy, or in electronic format on the CD.

Despite the extensive list of advantages of CAL, researchers have identified some disadvantages of using CAL programmes:

- ☞ According to McKethan and Everhart (2001:4), studies on the effectiveness of CAL have shown inconsistent results. The effectiveness of CAL appears to be dependent upon its purpose, the context of its use and the design of the software.
- ☞ Although research supports the use of CAL as a supplementary tool to instructor-provided information, its effectiveness as an independent instructional tool is not conclusive. Three investigations show no favourable results when studying CAL as a sole instructional method as compared to traditional instructional methods (LaBonty, 1989, Morrell, 1992, Ruef & Layne, 1990 as cited in McKethan & Everhart, 2001:4). Gardner (as cited in McKethan & Everhart, 2001:4) studied the effects of hands-on activities in science versus using a combination of hands-on activities, CAL, as well as text-based activities. He concludes that the combination of methods produced higher achievement.
- ☞ Another concern is product quality. Some developers may understand the programming aspects of formulating a CAL course, yet have no real expertise in learning pedagogy (Lawson, 1999:33). As a result, learning goals and objectives are not clearly defined, which leads to confusion on the part of the student.
- ☞ Using CAL, implies that a student will, to a large extent, do self-study. This requires certain skills and a high level of self-discipline, and not all students cope with these demands.

- ☞ Weidner (1999:53) asserts that CAL does not work well for discussion-oriented subjects requiring vigorous interactions within the class itself.
- ☞ CAL requires students to have access to special equipment - often the latest in computer technology - to be able to accommodate the graphics, sound, animation and video clips.

Perry (1994:3) asserts that the decision whether to use classroom or CAL methods for a learning programme, depends on both the audience and the course content. Some of the specific factors that must be taken into consideration are:

- ☞ the target audience, including their educational level and computer literacy;
- ☞ course content, including whether it will be presented in linear or free-form;
- ☞ how the programme will be used (e.g., will students take the material home to study or will it only be used in a class situation?);
- ☞ the computers that will be available;
- ☞ the availability of talented instructional designers and experts to render technical support, and
- ☞ budget and time lines.

Dvorak (1999:73) is one of many researchers that holds the opinion that CAL can never be a complete replacement for instructor-led classes. Trepper (1999:4) reiterates that although CAL is often used as self-paced learning, it can best be used in a facilitated approach. The facilitated approach combines the benefits of CAL with the advantages of having an instructor in the classroom to help students as needed. In the facilitated CAL approach, students learn through discovery while also setting the pace of their learning. To facilitate learning, instructors coach students while the students develop new skills. This approach creates an environment in which knowledge is shared through the collaboration of individuals while under the guidance of instructors.

The instructor's role in this approach is to facilitate maximum sharing of information and knowledge among students rather than control the delivery and pace of the course. The instructor therefore provides direct feedback to students while creating an environment to generate peer discussion. The instructor acts as a problem solver when mistakes are made or technology glitches occur.

Facilitated CAL can also take the form of combining CAL with video-conferencing technology. Feldman (2002:37) asserts that KnowledgeNet, one of the fastest-growing e-learning companies, uses Internet groupware in conjunction with traditional conference-call technology, and found that this produced highly effective learning results.

In conclusion it can be noted that the many advantages of CAL make it a versatile method of delivering training. However, an instructor should take into consideration the wide range of factors mentioned in this section to ensure that an appropriate CAL programme be selected for the specific needs of the students.

2.4.6 Computer communication technology

This section continues to investigate possible elements that can form part of a blended learning programme.

One of the main advantages of recent developments in computer and communication technology is that the computer can be used as a tool to facilitate instructor-to-student as well as student-to-student communication. Online communication is typically described as being either synchronous or asynchronous (Wills 2001:Online).

☞ Synchronous technologies facilitate real-time interaction. This means that students from a variety of locations communicate online during the same period of time. This type of conferencing session may be a simple "chat" session in which participants communicate via a series of text-based

messages, or involve participants meeting online at a specified time to watch presentations or share software applications. Commonly used synchronous technologies are audio-conferencing by phone and computer-conferencing (*cf.* 2.4.6).

☞ Asynchronous discussions are unbounded by both time and place. That means that students can be on or off campus and participate online at a time that is convenient to them. In education settings, an asynchronous discussion on a topic might take place over a number of weeks. For example, an instructor might set up a discussion group as part of a course Web site. Students are assigned to one or more discussion groups. Typically a discussion question or topic is posed to guide the discussion. Students post text-based messages related to the topic over a number of days. Through a series of typed messages, students can debate issues, answer questions, interview guests, and even participate in role plays.

Computer communication technology opens up a number of e-learning possibilities. Some aspects are mentioned here:

◆ ***Electronic mail***

Electronic mail (e-mail) can be used to send messages or submit assignments. If there are less than 20 students in the class, e-mail discussion groups could be set up. Scarce (1997:Online) indicates that the Internet is an enormously popular medium of communication that has developed its own norms of interaction, and expected and accepted behaviours of participants. Students participating in e-mail discussion groups learn to present themselves socially through a particular conversational style and learn to use Internet etiquette. Furthermore, they learn to think critically by interacting with text and with one another, thereby developing a multiple-way dialogue.

◆ ***List serves***

List serves stands for “list server” and works like an electronic mailing list, sending e-mail messages to students whose names are on the list (Hofstetter, 1998:6). Whenever someone sends e-mail to the list serve, every member of

the list will receive a copy. A list serve is thus a simple way for groups of students to communicate with one another through e-mail and allows its members to view all of the messages posted to the list and to post their own messages and replies. List serves can be used to facilitate discussions where more than 20 students are enrolled in a class (Scarce, 1997:Online).

♦ ***Bulletin board***

A bulletin board service (BBS) functions like an electronic bulletin board, i.e. an instructor can post notices or other information on the bulletin board and students can access the information by logging into the bulletin board (Hofstetter, 1998:3). There are many existing bulletin boards, but it is preferable that an instructor uses special software to create a separate bulletin board for a particular programme (Porter, 1997:116). Depending on the software that is used, a BBS can be used in many different ways, e.g. the instructor can post information to students, students can respond by posting messages to the BBS where other students can retrieve it, students can have on-line, synchronous dialogue and partake in other on-line activities. The BBS is thus mainly used to facilitate instructor-to-student and student-to-student communication.

♦ ***Computer-conferencing***

Computer-conferencing is two-way synchronous communication and involves individuals who are connected via computers equipped with a camera, sound system and computer conferencing software (Porter, 1997:170). The individuals can be seen and heard by all participants logged into the conference. Instructors and students can discuss information, ask and respond to questions and share documents and other materials in real time. A major advantage is that participants do not have to meet at a pre-arranged site to be able to communicate. However, although computer conferencing allows participants to work together in real time, it does not create the same classroom feeling as video-conferencing because students still primarily work alone at a personal computer. Furthermore, there are a number of technical stumbling blocks to overcome: every student's computer must be equipped with the required technology; often the response time is slow and there may

be a lag in communication between the moment a person finishes speaking and the moment communication arrives on screen.

◆ **World Wide Web**

The *World Wide Web (WWW or Web)* is a networked hypertext system that allows documents to be shared over the Internet (Hofstetter, 1998:10). As the Web's wealth of information and accessibility grows, this medium has taken on a more prominent role in society. An advantage of this technology is the ease and instantaneous access to a magnitude of resources, opening new doors to the educational process. Students no longer have to be satisfied with out-dated videos and books for their information, the WWW showcases the most current materials, which are easily and often updated all over the world (Rosen, 1997:Online). Information stored on a web-site can include hypermedia (such as video clips, animation, sound effects, music, photographs and other graphics), hypertext (documents), and other unlinked text or graphics (Porter, 1997:21). The prefix *hyper* simply means that the information has been designed to link a piece of information with another related piece of information.

One way to incorporate the Web in a programme, is to use it as an electronic reserve shelf. The concept of an electronic reserve shelf is an innovative instructional tool that allows instructors to bring more real-life and frequently-updated material into the classroom (Kuechler, 1997:Online). This helps to get students involved in actual research beyond the confines of traditional library research. In its basic form an electronic reserve shelf mirrors the traditional reserve shelf for a particular programme in the campus library. The instructor can put any of the following on this shelf: homework, assignments, guidelines for writing a paper, newspaper clippings, class handouts, additional readings, sample work by students and much more. The advantages are firstly that several students can access the same piece of information simultaneously and secondly that additions and modifications are easy to make so instructors are more likely to broaden the range of materials. The electronic reserve shelf can be expanded to include web-site links to related documents.

2.4.7 Web-based instruction (WBI)

Another important element that can be included in a blended learning programme is WBI. A web-based programme uses a web-site as a virtual classroom (Spear, 1999:2). A web-site forms the basis of the programme and in contrast with simply using the Web as an electronic reserve shelf, the programme web-site features all activities surrounding the particular programme, e.g. syllabus, work scheme, assignments, students' marks and all other information students need to have. Although the basic coursework may be completed by using information and resources linked through the web-page, it could be assumed that students taking web-based programmes also have access to e-mail, mailing lists, bulletin boards and other Internet services. Therefore, these Internet-related activities are often an expected part of a web-based programme.

All advantages of CAL (*cf.* 2.4.5) are inherent in a properly designed and delivered web-based programme. The following additional advantages can also be identified (Weidner, 1999:53; Vogeler, 1997:Online):

- ☞ Instructors have the opportunity to re-enforce learning by providing lecture notes, visuals for review, and additional materials quickly and inexpensively.
- ☞ Programme material can easily and constantly be updated by uploading it to the website. Content can be updated anytime.
- ☞ Software used specifically to administer web-based programmes, allows instruction management, i.e. monitoring and control of students' access to content, monitoring students' class time and recording scores and other student data.
- ☞ If required, live data can be used in student exercises. This capability is especially valuable when it involves large amounts of information from enterprise databases.
- ☞ WBI can approximate some of the unique elements of group activities in face-to-face classroom training. Depending on the speed of the Internet

connection, capabilities range from web-type keyboard discussion groups to live audio and video communication.

- ☞ Flexibility of WBI allows for various types of modular construction. Illustrative materials, animations, simulations, or even whole segments of content can be inventoried, and the student can decide in which order to complete the modules.

As in the case of advantages of using WBI the disadvantages are very similar to those of CAL. The one added disadvantage of WBI, is the bandwidth restrictions. This determines the speed with which material is accessed on the Internet, and could lead to frustration if the interaction with the material is slow.

Research on the effectiveness of WBI has shown mixed results:

- ☞ Dominguez and Ridley (1999:72) compared the effect of web courses with that of traditional training on student learning. They found no significant differences in grades between the online and offline students of the same course.
- ☞ Selwyn, Marriot and Marriot (2000:170) found that students' attitudes towards the Web courses, though generally positive, were influenced by their initial introduction to the Web. Extended introductions tended to lead to more positive feelings associated with the Web.
- ☞ Web courses have shown that greater human interaction has been associated with greater problem-solving capabilities (Jareka, Bonk & Lehtinen, 1999:370). Furthermore, greater interaction with the instructor and fellow students has been associated with improved student attitudes to WBI (Ryan, Carlton and Ali, 1999:274). The lack of direct physical connection between the student and the instructor may be a significant barrier to a student's developing a positive attitude to computers.

The research results mentioned in the previous paragraph indicate that WBI may well deliver more effective results in a blended learning environment.

2.5 INSTRUCTIONAL DESIGN FOR BLENDED LEARNING

After looking at the different elements available for presenting blended learning programmes, the researcher will now explore instructional design guidelines.

According to Treat (1999:Online), instructional design (ID) provides a process and framework for systematically planning, developing and adapting instruction based on identifiable student needs and the content requirements. Hodgkinson (1994:60) states that designing a new programme is a complex exercise and needs careful planning. The process of doing so in order to meet flexible needs is best achieved collaboratively, preferably after discussion with experienced instructors. Literature reveals a range of different ID models that exist for developing learning programmes. However, the researcher concludes that most models consist of a combination of the phases as portrayed in *Fig 2.1*. This specific ID model for developing a blended learning programme is proposed by the staff of the University of Alberta (2002a:Online).

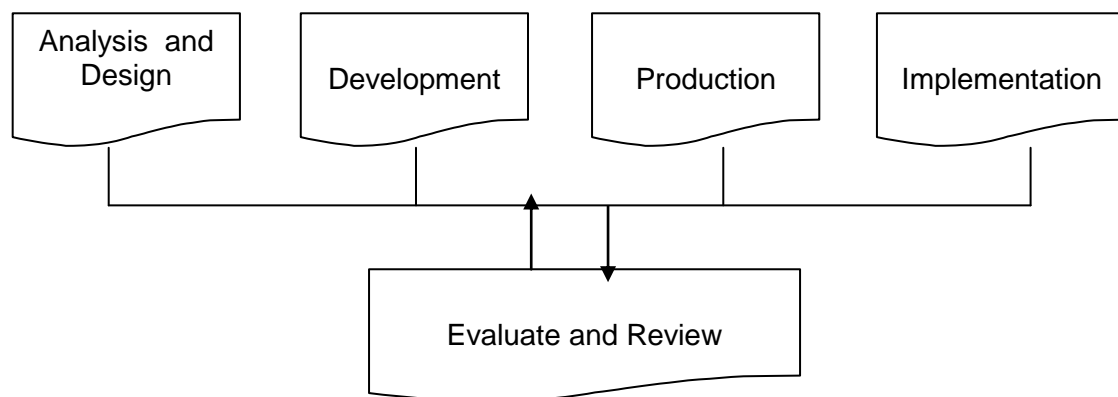


Fig. 2.1 Phases of instructional design (University of Alberta 2002a:Online)

An important fact is that developing a programme is an iterative process in which the developers must move flexibly back and forth between the phases.

Although ID can be done by a team, where each of the different phases is handled by experts, programmes are often developed by the instructors. In this study the researcher refers to the developer of the programme as the instructor.

The following section aims to elaborate on the phases of ID as portrayed in Fig 2.1.

2.5.1 Analysis and design phase

One of the most important aspects of the analysis and design stage is to analyse the target population of students. Sound instruction requires considering the characteristics of students, and some aspects to consider are (University of Alberta, 2002b:Online):

- ☞ What are the prospective students' learning needs?
- ☞ What prior experiences are they likely to have?
- ☞ What factors might affect their success in the programme?
- ☞ What type of materials and technical support will students need to be successful?

Careful consideration should be given in selecting an instructional strategy. Questions to be answered include:

- ☞ What teaching strategies have been found effective for the specific content?
- ☞ Which strategies will be most effective with the specific target population?
- ☞ How will students be engaged to keep them motivated?
- ☞ Which instructional strategies take best advantage of the opportunities offered by new media?
- ☞ What administrative support will be required?

Singh and Reed (2001:4) indicate that a financial analysis should be done, looking at the cost of content development as well as the delivery costs. This could play a significant role in deciding on the delivery options.

The following worksheet, given as table 2.1, can be completed to assist the instructor in finalising the analysis and design phase (Reigeluth, 1999:Online):

Instructional Design Worksheet

Name of project lead:

Date:

Discipline focus:

Department/Institution:

Course title(s):

Date course(s) will be offered:

Names and responsibilities of project team members:

Is this project part of a larger programme of study? If so, indicate the name of the programme and the relationship of this project to it.

Describe existing resources related to this course.

Identify the instructional strategies that will be used for the different levels of learning in the following matrix:

Kinds of learning	Presenta- tion	Tutorial	Drill	Independent study	Discussion	Game	Lab
Invariant tasks							
Concept classification							
Procedure using							
Understanding							
Generic skills							

Where will your students be located? (Note: you may check one or more categories.)

Location of students	
Students will meet regularly on campus	
Students will meet occasionally	
Students will participate from a distance	
Students will be located in several time-zones	

Describe the characteristics of the prospective students including the following information: programme(s) of study, age range, educational backgrounds, work experience, access to technology, and comfort with technology-mediated learning. Identify appropriate delivery methods and media. (Note: you can select more than one option.)

Delivery methods	Yes	No	Maybe
Web			
Videoconference			
CD-ROM			
Print Materials			
Videotape			
Audiotape			
Face-to-face instruction			

Media to be developed	Yes	No	Maybe
Audio			
Video			
Graphics			
Animation			
Text-based content			

What campus facilities will be required to support the students?

Campus facilities	
Library	
Computer help desk	
Computer lab	
Classroom	

Table 2.1 Instructional design worksheet (Reigeluth, 1999:Online)

Once the analysis and design phase has been completed, the instructor can proceed to the development phase.

2.5.2 Development phase

In the induction pack for writers by the Open Training and Education Network (OTEN, 1994:11), instructional designers are informed to start the development phase by constructing an instructional plan. This plan should include detailed information about the layout of the programme, learning objectives, assessment methods, and the media and instructional technologies that will be used. The instructor should create a curriculum plan for the programme (University of Alberta, 2002a:Online). This plan must include all the elements as listed by OTEN, as well as student activities. A brief overview of each of these now follows:

◆ *Learning outcomes*

Melton (1997:29) defines learning outcomes as statements of desired outcomes of learning expressed in terms that make it clear how measurement can be achieved. These outcomes provide a logical basis for measuring and reporting on student achievement because attention is focused on what is to be learnt rather than on the process of learning. Treat (1999:Online) suggests that learning outcomes should be set out clearly at the start of the writing process and should be used for reinforcement and motivation during progress through the programme. Outcomes in the context of the South African OBE approach is discussed in sub-section 3.3.3.

◆ *Framework and content outline*

Melton (1997:51) states that a framework for the programme must indicate how the programme will be broken down into units of instruction and thereafter into related study sessions. It should also outline a study schedule indicating the time allocated to each of the study units. The content which will be covered in relation to each learning outcome should be identified and outlined. Wills (2001:Online) proposes that in selecting the content, factors like the students' ages, cultural backgrounds, past experiences, interests and

educational levels should be considered. The student analysis alongside with the learning outcomes should then form the basis for selecting the content.

♦ ***Media and instructional technologies***

The media and instructional technologies which will be used to deliver the content should be selected. As stated previously (*cf.* 2.4), media and instructional technologies for a blended learning programme could include printed material, face-to-face lectures, ITV, as well as a wide range of teleconferencing or computer-related communication techniques. Selecting the right blend of technologies has been discussed (*cf.* 2.3). The challenge here is to integrate delivery components, based on identifiable student needs, content requirements and technological constraints.

♦ ***Assessment methods***

Deciding on assessment procedures and the timing thereof forms an integral part of the development phase (Treat, 1999:Online). The selection of assessment methods will be influenced by the content that will be assessed, and whether continuous assessment and/or an end-of-the-programme examination will be used. When using continuous assessment, the timing of the assessment plays an important role in the overall effectiveness thereof. One should bear in mind that early in the programme the students may not have learnt anything significant enough for testing, but on the other hand an early assignment provides an opportunity for early interaction and feedback. Furthermore it is desirable that assignments be related to major sections of content and that they are spread evenly throughout the programme schedule to generate regular feedback to and from students. According to a document produced by the Maricopa Centre for Learning and Instruction (2000:Online) assessment is effective when it:

- ☞ is student centered;
- ☞ is congruent with instructional objectives;
- ☞ is relevant;
- ☞ is comprehensive;

- ☞ is clear in purpose, directions, and expectations;
- ☞ is objective and fair;
- ☞ simulates end behaviour/product /performance;
- ☞ incites active responses, and
- ☞ shows student progress and development over time.

Thorpe (1993:67) asserts that apart from formal assessment, student self-evaluation should form an important part of blended learning assessment strategies. Two approaches can be used, i.e. activities based on the content material and self-review questions. The purpose of both is to help students to reflect back on a period of learning.

◆ **Activities**

According to Reigeluth (1999:Online) the following kinds of learning can be identified:

- ☞ *Invariant tasks* require memorizing factual information or routine procedures. They do not require any understanding, nor do they require learning how to deal with variation.
- ☞ A *procedural task* involves performing a procedure, which is a sequence of activities to achieve a goal. Synonyms include method, technique, skill, and rule. A procedure can be either a physical procedure, which entails the execution of physical movements, a mental procedure, which entails the execution of mental operations or a combination of physical and mental activities.
- ☞ *Concept classification* is a mental skill which requires a student to classify instances as being examples or non-examples of a concept. It is considered to be the building blocks for most of the cognitive capabilities a person possesses. Procedures, for instance, describe how to change things or to achieve a goal. Those "things" are concepts which are simpler components of the procedure and must be mastered before the procedure can be learned.

- ☞ *Understanding* is meaningful learning. It is usually contrasted with rote learning (memorisation), although it is also distinct from specific and generic skill application.
- ☞ A *generic skill* is a skill which can be applied across a variety of subject domains, and usually takes longer to acquire than domain-dependent (subject-area) skills. The major kinds of generic skills include thinking skills (such as problem solving techniques), learning strategies (such as creating mnemonics to help you remember things), and metacognitive skills (such as monitoring and revising your problem solving techniques or mnemonic-creating techniques).

The type of learning that is required will determine the type of activities that are selected. Involving students in activities deepens their understanding and enables them to readily transfer what they have learned to new situations (University of Alberta, 2002a:Online).The following are some guidelines that can be followed in planning activities:

- ☞ Provide assignments that simulate in some way the real world application of the course content.
- ☞ Engage students in meaningful activities throughout the instruction and not just at the end of a module or unit.
- ☞ Require students to generate meaning for themselves by asking them to analyse, compare, evaluate, and synthesise the concepts, principles, and procedures.
- ☞ Provide opportunities for interaction and collaboration amongst students.

This section gave a brief overview of aspects to consider in developing a blended learning programme. It is the view of the researcher that sound pedagogical principles should be applied in considering each of these aspects. It was therefore decided to further investigate such principles (*cf.* 3.4).

2.5.3 Production phase

This is the phase in which the instructor actually creates (or selects) the educational resources, i.e. the media elements (e.g. video tapes, CDs, web sites) and other instructional materials (e.g. study guides, activities, assessment and on-line resources).

Some of the design principles appropriate to educational technology are discussed in this section.

◆ **Instructional multimedia**

Instructional multimedia can include, amongst others, CDs and videos. Dowie and Campbell (2002:Online) provide the following principles for the design and production of instructional multimedia applications (*cf. table 2.2*).

Principle	Examples of applying the principle
The programme is compelling for students	<ul style="list-style-type: none"> ☞ novelty, surprise, or humour is used to enhance motivation ☞ students are shown how what they learn will help them solve problems or perform tasks in the real world ☞ anecdotes and case studies breathe life into the content
The programme is academically credible	<ul style="list-style-type: none"> ☞ information contained in the programme is current and accurate ☞ pertinent theories, principles, and procedures are represented
Students know what to expect	<ul style="list-style-type: none"> ☞ learning objectives are stated as part of each major unit of instruction
The navigation system is efficient and well planned	<ul style="list-style-type: none"> ☞ on-line help is available at all times ☞ menus, buttons, and other controls are used consistently throughout the programme ☞ directions and overt signals let students know what they are supposed to do ☞ users are informed of their location in the programme through the use of titles, frame numbers, and other indicators ☞ students can select study and practice sequences that are best for them

The visual layout promotes learning	<ul style="list-style-type: none"> ☞ content is broken into units that are small enough to be readily learned ☞ long, linear sequences of screens are avoided ☞ the text is organized into short, easy-to-read paragraphs
Media elements are used wisely	<ul style="list-style-type: none"> ☞ a variety of media is used to effectively illustrate facts, concepts, principles, and procedures ☞ the various media employed complement rather than compete with each other ☞ graphics, fonts, and other visual elements are legible, functional, and attractive
The application supports active learning	<ul style="list-style-type: none"> ☞ learning objectives are matched with appropriate learning activities ☞ the unique capabilities of the computer provide meaningful interactivity and feedback ☞ students are provided with opportunities to check their level of understanding ☞ explanatory feedback is provided for both correct and incorrect responses ☞ students are able to develop an in-depth understanding applying their skills and knowledge in complex, real-life context.

Table 2.2 Principles for the design and production of instructional multimedia (Dowie & Campbell, 2002:Online)

◆ **Online resources**

Instructors are now in the fortunate position of having an increasingly abundant range of high quality resources freely available on the Internet. According to Dowie and Campbell (2002:Online), the following aspects should be considered in evaluating a particular online resource:

- ☞ Does the resource provide alternative explanations or examples that will be valuable for your students?
- ☞ Does the resource include demonstrations or simulations that extend what you are able to do in your classroom?

- ☞ Are learning activities that involve case studies, problem scenarios, or topics for discussion included in the resource?
- ☞ Is the content authentic, current, and relevant?
- ☞ Are there multiple paths through the content, so that students have flexibility in modes of learning, difficulty levels, and opportunities for review or enhancement? Will students know what they are expected to do, where they are, and where they have been? Is there a search feature?
- ☞ Is the resource engaging and interactive, i.e. will the students be actively involved?
- ☞ Do the students have the time to make effective use of the resource? Too often instructors pile additional activities on top of pre-existing lesson plans. The resource should add value, not just "add on".
- ☞ Does the resource meet high standards of access and equity? If the resource or activity is required, all students should be able to access it in a reasonable time frame without going to extraordinary effort.

◆ **Web sites**

A web site contains the following basic elements: a *home page*, graphic or text *menus*, *information screens*, and *hyperlinks* to other sites. The following basic design fundamentals should be considered (University of Alberta, 2002a:Online):

- ☞ Divide written information into logical units. Discrete, succinct “chunks” of information are easier to read on a computer screen than long chapters. Limit each unit that contains printed information to no more than the equivalent of three pages of typed text.
- ☞ Break up large blocks of text. Minimize large grey masses of print. Most web pages contain lines of text which are too long to be easily read. A reader's comfortable eye span is 40 to 60 characters per line on a computer screen. One of the easiest ways to control the format of text passages is to place the text within tables on your web pages.

- ☞ Organize the content on the page so that it is logical and predictable. Place elements such as headings consistently from one page to the next.
- ☞ To ensure a uniform, professional look to the courses within a programme, it is essential to establish a set of parameters for the visual elements in both the online and print materials. These guidelines should include information about the font, size, and colour of the normal type, headings, subheading(s) and how emphasis will be added. In general, use 10 to 12 pt. Times or Arial font for the normal text within the site.
- ☞ Build clear navigation aids. Incorporate easily understood icons, headings, and menus. As well, the page layout and overall visual style should be consistent throughout the site. Aim for a functional elegance while providing cues so that users know where they are within the site at all times.
- ☞ Graphics add interest and breathe life into text presentations, but be aware of download speeds especially for those users with slower modem connections. People find it frustrating when it takes longer than 10 or 15 seconds to view an image. In general, it is recommended that online graphics are no larger than 20K.
- ☞ Use colours with restraint. Keep colours and layout conservative, conventional, and simple. Be aware not to create a page which is overdone in which everything is garish and nothing in particular is emphasized. When selecting a background colour, subtle pastel shades are a good choice. Ensure that the font type contrasts sharply with the background, and avoid using background images as they obscure text.

◆ ***Printed material***

Because print is largely a one-way communication medium, the challenge is to design instruction to maximize the amount of interaction in print materials that will be used in a blended learning programme (Wills, 2001:Online).

Misanchuk (1994:111) addresses a number of practical ways to write good study material. Some basic principles are proposed that will ensure good

page design, e.g. that the writer avoids writing too much text on one page, use unjustified right-hand margins as it is easier to read, avoid too many different font types and only use graphics when it really serves a purpose. Hodgkinson (1994:63) agrees that one of the central concepts regarding printed material is readability. This has little to do with the content of text in terms of its complexity and everything to do with print, word length and grammatical structure. An easily readable font and font size should be selected and sentences should be kept short.

Misanchuk (1994:113) suggests using active voice instead of passive voice sentences, making writing personal by using words like “you” and “me”, keeping content clear, concise and coherent by using short sentences and cutting out redundant information. It is also preferable that material is divided into sections. The OTEN guide (1994:16) underlines some of the previous statements by suggesting that the writing style should be plain, conversational English. This could be established by using simple, active voice sentences, familiar words, personal pronouns (e.g. I, you, we), contractions (e.g. I’m, let’s), a friendly tone and humour, where relevant.

Kember (1991:11) states that one of the ideal characteristics of study material should be that it is self-instructional. The OTEN guide (1994:16) describes self-instructional material as study material that is specially written with particular programme objectives in mind. Furthermore, it is structured in such a way that students can do most, if not all, their learning from the materials alone. “The materials must carry out all the functions an instructor would carry out in a conventional situation – guiding, motivating, explaining and so on.” The student must be guided through the programme material in such a way that he/she should be able to attain the learning outcomes with minimal contact by the instructor. One way of reaching this goal is to use the active learning approach where content is combined with activities. Activities help students to practise newly acquired skills, check their own understanding of material, apply and transfer their learning into realistic situations, think for themselves, become self-directed students, enter into dialogue with their tutors and focus on key areas of learning.

2.5.4 Implementation phase

Once the instructor has completed the production phase, the programme can be implemented.

A number of administrative issues have to be resolved in order to effectively implement a new programme. At this stage, most of the instructional design work has been completed and the implementation issues often relate more to project management than to educational theories. As the focus of this study is didactics, the researcher will not expand too much on this specific phase. However, the following decision matrix given by the University of Alberta (2002a:Online) gives a comprehensive overview of the administrative and management issues to be considered in ensuring the long-term success of technologically enhanced courses. The matrix outlines the policy areas and key issues which must be addressed when implementing a blended learning programme. It is provided to help the instructor keep track of the many administrative tasks involved in managing the implementation of a blended learning environment. The instructor can indicate the status of each policy area by ticking the *resolved*, *in progress* or *not an issue* column on the right-hand side. A matrix sheet can be completed at the end of every week of implementation, and in this way the instructor can ensure that no issues are left behind or stay unresolved.

The matrix is based on the strategic management decision zones as described by King (2000:Online).

	Key Issues		
	Resolved	In progress	Not an issue
Academic			
Course integrity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Transferability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Student/course evaluation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Admission standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Curriculum/course approval	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accreditation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recruiting/marketing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Governance and fiscal administration			
Tuition fee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technology fee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FTE's	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Administration Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staffing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Faculty			
Compensation and workload	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Development incentives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Faculty training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Congruence with union contracts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Faculty support	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Faculty evaluation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Legal			
Intellectual property	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compliance with the Freedom of Information and Protection of Privacy Act (FOIPP)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Faculty, student, and institutional liability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Student support services			
Advisement & counselling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Library access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Materials delivery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Student training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Test proctoring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Computer accounts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Registration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Financial aid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Labs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Technical			
Systems reliability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Connectivity/access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hardware/software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Setup concerns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technical support (staffing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scheduling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Labs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Cultural			
Adoption of innovations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organizational values	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Table 2.3 Matrix outlining the policy areas and key issues which must be addressed when implementing a blended learning programme (University of Alberta, 2002a:Online)

2.5.5 Evaluation and review phase

Once the programme has been implemented, the next phase is to evaluate it. According to Reeves (2002:Online), the term evaluation refers to the process of researching the quality of the outcomes achieved by a programme, course, or other educational activity. The objective of this research is to assess the strengths and weaknesses of the learning activity and determine if and how it might be improved.

The diagram in fig. 2.1, indicates that evaluation is not a separate phase in instructional design, but that it is an ongoing process that should take place throughout the life of an instructional project, from its initial conception to project completion.

Lockwood (1995:197) indicates that evaluation can either be formative or summative.

☞ Formative evaluation is an on-going process to be considered at all stages of the instructional design process. It enables the instructor to improve the programme as it proceeds. This kind of evaluation will identify major gaps in the instructional plan or the need for minor adjustments and facilitates programme and content adaptation. Calder (1995:22) explains that evaluation is formative when it is used with the intention of developing or improving the functioning of an activity or the effectiveness of a component. Thorpe (1993:9) ascertains that formative evaluation is concerned with the evaluation of progress towards achieving programme

outcomes, during implementation. It typically answers the questions: “*How are we/they doing?*”, “*What should we be doing next?*” It aims not to measure the effectiveness of a programme, but to identify any changes it requires which will improve it and make it more likely to eventually achieve its outcomes.

- ☞ Summative evaluation assesses the overall effectiveness of the finished programme. Because summative evaluation is usually done at the end of a programme, it will not help current students but can be used as a springboard in developing a revision plan or form the baseline of information for designing a new programme. The purpose of a summative evaluation is to assess whether the project met its initial goals. If initial goals were not met, the summative evaluation can be used in a formative manner, to advance the next iteration of the project (University of Alberta, 2002a:Online).

In this study both formative and summative evaluation will be used to evaluate the programme through action research (*cf. 4.2.2*).

In the view of Wills (2001:Online) the following factors relating to a programme should be evaluated:

- ☞ the use of technology, i.e. familiarity, concerns, problems, positive aspects and attitude towards the technology;
- ☞ the quantity and quality of interaction with other students and with the instructor;
- ☞ programme content, i.e. the relevancy, adequate body of knowledge and layout;
- ☞ the assessment methods, i.e. the frequency and relevancy of tests and assignments;
- ☞ the support services, i.e. the support that students get from the organisation as a whole as well as the instructor as an individual;

- ☞ student achievement, looking at the rate of participation of students and the marks obtained for assignments and
- ☞ the instructor, to determine his/her contribution to the effectiveness of the programme through being organiser, leader, facilitator and mentor.

Keegan (1996:186) observes that evaluation should focus on the quantity, quality, status and relative cost of the learning achieved:

- ☞ In evaluating the quantity of learning one could consider the number of students enrolled, the number of students that passed the final examination, the number of drop-outs and all other aspects of the programme that could be quantified.
- ☞ In evaluating the quality of the learning, one could look at the quality of the learning materials, the extent to which the blended learning approach is a suitable vehicle for educating students in the specific subject and the extent to which education is provided as opposed to instruction.
- ☞ Evaluating the status of the learning could be derived from the extent to which other educational institutions recognise the studies for credit transfer purposes, the acceptance of the qualification awarded as qualifying students to go on to higher level studies and the recognition of the awards by managers in competitive interviews for employment.
- ☞ In evaluating the relative cost of the learning achieved one should determine whether the programme is cost-effective to be presented in blended learning mode as opposed to being presented as a contact tuition programme.

In this study the researcher is concerned with developing a programme based on sound educational principles. It has therefore been decided to extensively evaluate the programme against the principles of good practice as set out in Chapter Three.

2.6 CONCLUSION

It is the opinion of the researcher that the content of the current status of blended learning can be summarised by the view of Ward and LaBranche (2003:23). Their observation is that over the past few years, there has been much discussion about the emergence of online learning. Some speculated that e-learning would lead to the reduction, if not the demise, of face-to-face lectures. However, the way things are actually developing, is that what was once seen as an "either-or" proposition is quickly becoming an "also-and" situation. Blended learning, the convergence of e-learning and traditionally-delivered learning, is one of the fastest growing trends in education, and is definitely here to stay. It provides a deeper, broader and more flexible platform for knowledge transfer, as it extends the learning experience outside the classroom and helps to create learning communities. Ultimately, blended learning provides a way to overcome one of the limitations to face-to-face style learning: that learning has to take place largely in the room, at the time when the presenter is available. Blended learning is a student-centered strategy. Students have more options, more time and more freedom to explore learning. It extends learning before or after the physical learning experience, and enhances learning by taking the student outside of the traditional classroom to take advantage of the power and depth of modern technology.

Modern technology provides a variety of elements that can be used to form part of a blended learning programme. Examples range from more traditional elements like printed material and face-to-face lectures, to modern technology like web-based instruction, video conferencing and a variety of computer-facilitated teaching methods (*cf.* 2.4). The success of a blended learning programme is, to a large extent, determined by selecting the right blend. As Bersin (2003:Online) states: "*The key to blended learning seems to be selecting the right combination of media that will drive the highest learning impact for the lowest possible cost.*" There is no simple way in finding the right blend, however, literature revealed sound instructional design principles as well as guidelines for developing good instructional media (*cf.* 2.5). The

researcher concludes that by following the phases of instructional design and adhering to the development guidelines it will be possible to develop an effective blended learning programme.