5.1 INTRODUCTION

In the previous chapter, the use of computer games as educational tools was investigated. The pedagogical and gameplay foundations of a ‘good’ educational game were also examined and it was determined that a fine balance needs to be established between the educational and gameplay content of the game. Specific considerations to take into account when designing the game were also outlined and ways of addressing these considerations were established.

The educational game was developed taking into account the best practices from previous studies on experiential teaching aids and educational games.

The development consisted of the following interrelated stages:

- Determining the educational content
- Writing the storyboard
- Animating and recording the content
- Programming the game
- Testing and evaluating the game
- Re-animation and re-programming.

This chapter addresses Specific objective 6: Develop a prototype educational auditing computer game taking best practice from the literature study into account (see Section 1.5.2 in Chapter 1). The different stages of development are described in detail in this chapter.
5.2 DETERMINING THE EDUCATIONAL CONTENT

It has to be kept in mind that the primary goal of the game was to educate, specifically auditing education. Therefore, the starting point of designing the game was to establish the educational content and boundaries within which the game was to be designed.

As one of the main objectives of the game was to assist students in realising the big picture (see Chapter 1) behind auditing, it was decided that the game had to aim at giving the students a feel of the complete audit process. This could most likely be achieved by taking students on a ‘virtual audit’. Again, time and resources restrictions had to be taken into account, and therefore the most important elements of the audit process were identified to be included in the game. It was also decided to place the focus of the audit on one specific balance (see Chapter 1) in order to deal effectively with time and resource constraints. The financial line item chosen to focus this study on was the inventory balance, because it is the financial line item that most students can relate to in some way (being customers who buy inventory from various businesses) and it is also very susceptible to multimedia presentation due to its tangible nature. The audit process in general and relating specifically to the inventory balance (see Chapter 1) was studied and the main components to be included in the game were identified by the researcher from the ISAs, as presented in Figure 5.1 below:

Figure 5.1: Components to be included in the educational game (SAICA, 2013b)
In order for the students to be assisted to grasp the big picture of auditing, the following steps of the audit process were included in the educational game: risk identification, assertions, audit planning and substantive procedures. Note that the stage of reporting and pre-engagement was not included in the game, as the game was planned and designed to deal only with the inventory assertion and not a complete audit due to the various design considerations, as discussed in Chapter 4.

The next step was to determine the specific learning outcomes of the written case study question in order to ensure that the main objective of the game, namely to educate the students in the various specific educational content chosen to be included within the scope of the game, would be reached. In Chapter 6 it is described how these same criteria were used to measure the perceptions of the participants regarding their achievement of the learning outcomes in order to determine whether educational value was derived by them through playing the game or completing the case study.

### 5.2.1 Learning outcomes

The below learning outcomes have been established with reference to the AUDT 371 syllabus on the inventory balance and with reference to the content of ISA 315 and ISA 330 (SAICA, 2013b).

At the end of playing the game, the student should:

- have a general understanding of the audit process;
- have a general understanding of how an audit of the inventory balance should work;
- have a general understanding of what the different assertions for inventory mean;
- be able to identify risks at assertion level for the inventory balance;
- have a general understanding of what the principles of audit planning are and how professional judgement should be used in order to plan this;
- have a general understanding of how audit procedures are used to obtain evidence pertaining to specific assertions in performing an audit;
- understand what the nature, timing and extent of audit procedures mean;
- understand that the nature, timing and extent of audit procedures are planned in order to lower risk to an acceptable level while performing the most cost-effective audit possible;
• understand how audit procedures are formulated (examination technique); and
• be able to link the risks identified to assertions pertaining to inventory.

The next step was to formulate a teaching plan that would effectively achieve the pre-defined learning outcomes. This was done with reference to various textbooks and the ISA and with guidance from a CTA auditing lecturer, Prof. Nel, and a CTA programme leader, Prof. Fouché.

5.2.2 The teaching plan

The teaching plan was developed by establishing the principle theoretical knowledge that needs to be transferred to the students per each educational component (identified above) to be included in the game. Listed below are the components and the educational principles pertaining to each component.

5.2.2.1 Risk identification at assertion level for inventory

The following common risks, as identified by Marx et al. (2012) and Jackson and Stent (2012), were addressed:

• Risk that research cost is capitalised as part of inventory value (non-compliance with ISA 37)
• Risk that development cost is not capitalised as part of inventory value (non-compliance with ISA 37)
• Inherent risk that technological inventory is incorrectly valued due to the nature of technology
• Risk that imported inventory is incorrectly valued due to inaccurate conversion between exchange rates
• Risk that inventory presented in financial statements at year-end does not exist because of theft of inventory
• Risk that consignment stock already sold is incorrectly included in the inventory figure at year-end while it does not belong to the entity anymore
• Risk that incoming consignment stock (already purchased, but not yet received) is not included in the inventory figure at year-end
• Risk that goods listed as goods in transit and therefore included in the value of inventory at year-end do not really exist
• Risk that damaged inventory is inappropriately valued
• Risk that encumbered inventory is not disclosed as such in the financial statements.

5.2.2.2 Basic understanding of assertions pertaining to inventory

The assertions are the principles by which an auditor performs his/her duty of auditing a set of financial statements. They are defined by the ISAs and are one of the first concepts taught to students of auditing.

The following assertions as prescribed by the ISA 315 (SAICA, 2013b) were addressed:

RIGHTS: The company holds or controls the rights to all inventory reflected in the financial statements (any encumbrances must be disclosed).

EXISTENCE: All inventory actually existed at the financial statement date (inventory is not overstated by the inclusion of fictitious items).

COMPLETENESS: All inventory to which the company has the rights of ownership is included in the financial statements. All inventory that should have been recorded has been recorded.

VALUATION AND ALLOCATION: Inventory is reflected in the financial statements at an appropriate amount (carrying value) (this means that appropriate adjustments have been made to comply with the requirement that inventory be presented at the lower of cost or net realisable value).

5.2.2.3 The principles of audit planning at assertion level

The audit plan is drafted after the overall audit strategy has been determined and is basically the second step (as noted by Deloitte, 2012) in the audit process. The principles of audit planning are defined in ISA 330 (SAICA, 2013b).

According to SAICA (2013b, p. 2), as advocated by the ISA 330, par 6, “[t]he auditor shall design and perform further audit procedures whose nature, timing and extent are based on and are responsive to the assessed risks of material misstatement at assertion level”.

Chapter 5:
DEVELOPING THE EDUCATIONAL GAME
The simplified approach to teaching audit planning principles as taught in one of the game stages (adapted from Marx et al., 2012 and Jackson & Stent, 2012) are explained in the following paragraphs.

An audit can be planned to incorporate one of the two main commonly accepted audit approach techniques, namely a substantive approach or a combined approach. A substantive approach involves the performance of only substantive procedures to gather appropriate sufficient audit evidence, while a combined approach seeks to place reliance on the internal controls of the audited company in order to be able to perform tests of controls and less substantive procedures. In the long run, it is deemed that the combined approach should be more cost-effective, especially for larger companies with a larger volume of transactions.

Once the type of approach has been planned, attention has to be given to which types of substantive procedures (the nature of the procedures) will be performed. Substantive procedures can consist either of substantive tests of detail or substantive analytical procedures. In general, analytical types of procedures will only be performed when reliance on the internal control of the auditee is justified, while tests of detail will provide more sufficient and appropriate audit evidence when this is not the case.

The next step in audit planning deals with the extent of the procedures performed. The audit planner has to decide whether extensive or limited procedures will be performed. More extensive procedures will be performed, and sample sizes increased, when reliance on internal control is not justified and when the risk pertaining to the assertion/account balance being audited is higher. On the other hand, procedures may be limited when the risk is lower or can be successfully mitigated by reliance on effective internal controls.

A final consideration of planning is the timing of the procedures. Audit procedures may be performed either at an interim date (before the financial year-end of the auditee), when reliance on internal control is justified, or at/near year-end, when reliance on internal control is not justified. Another consideration that has to be taken into account is that when tests of controls will be performed, these should cover the whole period of reliance (in other words, should be performed throughout the year).

5.2.2.4 Audit procedures to gather evidence pertaining to assertions regarding the inventory balance

The following common procedures that can be performed to gather audit evidence regarding the different assertions of the inventory balance, as advocated by Marx et al.
(2012) and Jackson and Stent (2012), are explained below: It has to be noted that only one procedure per assertion was chosen, as the game would have students drag and drop the different verbs, source documents and reasons for the procedures to form one valid procedure per assertion.

RIGHTS: A loan agreement will be inspected in order to establish whether inventory has been provided as insurance for the loan agreement. This will point out whether any inventory is encumbered.

EXISTENCE: Inventory in the warehouse will be counted in order to establish that all inventory included in the year-end figure on the financial statements does indeed exist at year-end.

COMPLETENESS: Analytical procedures will be performed in order to verify that all inventory has been accounted for (for example inventory levels may be compared per year or per month to identify unusual fluctuations).

VALUATION AND ALLOCATION: A sample of inventory sheets and sales invoices after year-end will be extracted in order to establish whether inventory is valued at the lowest of cost and net realisable value.

5.2.3 Question paper and memorandum

The next step was to formulate this teaching plan into a case study question and memorandum that could be used in class to help the students reach the learning outcomes, and which could be effectively used as the base around which the educational game was to be programmed. It was decided that, as the researcher had the choice of either inventing a case or drawing on a real one (refer to Section 4.2.1.3 in Chapter 4), the case would be invented by the researcher and checked for technical accuracy by the supervisor, Prof. Nel, who is also a lecturer at CTA and third-year level and is well experienced in the field of auditing and auditing education. (For the full question paper and memorandum, see Appendix A.)

5.3 WRITING THE STORYBOARD

The story behind the game consists of narrative non-game elements that were dispersed throughout the game and served to contextualise the game. In order to plan these
elements (the stories to be told in-between gaming and the characters who tell the story),
a storyboard was created.

The storyboard was written in order to support the educational content of the game and to
facilitate the creation of the virtual auditing experience. As discussed, an educational
game has to consist of the perfect balance of educational content and gaming content and
the integration of these two elements is the main objective of the storyboard. Introducing
the storyboard and gaming aspects also adds the joy factor to the learning experience and
can act as a catalyst for intrinsic motivation (as explained in Chapter 4). (For the full
storyboard, see Appendix B.)

5.4 ANIMATING AND RECORDING THE CONTENT

All animations were pre-planned according to the need of the storyboard (see Appendix B)
and developed using amateur animators and the software Anime Studio Pro 8. All
recordings were pre-planned according to the needs of the storyboard and developed
using amateur voice artists and the software MAGIX sound mixer and basic recording
hardware.

It was decided that sound should be added to the game in order to make the game more
interactive and communicative. Therefore, background music (produced by an amateur
musician who agreed that his instrumentals may be used as part of the Audit Recall It
soundtrack), supportive sounds and character voices were added to the game.

5.5 PROGRAMMING THE GAME

The initial prototype game was programmed using Delphi 7 software and was done solely
by an amateur programmer under the supervision of the researcher. The programmer was
provided with the storyboard and question and answer sets to guide his programming. All
user screens and interfaces were designed by him in order to maximise the usability factor
of the game, while programming the storyboard in analogical order.

5.6 TESTING AND EVALUATING THE GAME

After initial programming, the game was tested and evaluated firstly by the researcher and
secondly by having a test group of students play the game. All clichés in the gameplay
were identified and communicated to the programmer.
5.7 RE-ANIMATION AND RE-PROGRAMMING

All comments from the testing and evaluation stage were considered and the following improvements were made to the prototype:

- The first version of the game was programmed using Delphi 7 software, which left some room for improvement in terms of the functioning and appearance of the game. The next version of the game was therefore designed using Rad Studio 3 Delphi xe3.

- The first prototype contained a separate user interface for each screen, which could be confusing to players navigating the game. It was decided that the next version of the game would have one user interface with a scrollable storyboard in analogical order, from where gameplay would be controlled.

- The first prototype contained little guidance as to the order in which gameplay would take place. It was decided that the second version would contain gameplay hints that appeared as players hovered over buttons and that buttons would be enabled and disabled as the player progressed through the game.

- It was decided that the introduction video was too long and could frustrate players, therefore it was decided that a short introductory video would be played as the player entered the game environment and the original introduction video would only be available for watching after the player has accessed the main menu interface.

- The initial version of the game included sound clips in order to convey the story to the game player. It was decided that in order to make the gameplay more transparent and less confusing as well as to regulate the tempo of the gameplay, all sound clips would be supported by written texts that could be read and re-read by the player if so desired.

5.8 SUMMARY

This chapter provided an overview of how the educational computer game was developed. The best practice principles regarding gameplay (discussed in Chapter 4) and educational theory (discussed in Chapter 3) were taken into account in the design of the case study question and memorandum. This was then converted into the storyboard, which integrated the educational content into a story on which the end product game was based. All the animation, programming, sound recording and synthesis were developed by making direct use of the storyboard. The prototype resulting from this process was tested.
firstly by the researcher and secondly by a test group of students. Any clichés or recommendations discovered in this way were noted and the prototype was re-programmed a few times in order to take these into account. The end product was therefore an educational game that can be used as a teaching aid in undergraduate auditing education.

This chapter addresses Specific objective 6: Develop a prototype educational auditing computer game taking best practice from the literature study into account (see Section 1.5.2 in Chapter 1).

The next chapter provides an overview of the research methodology that supported the experiment as well as a discussion of the results of the experiment by way of statistical analysis.