

PlayTax: ‘Gamifying’ international tax teaching

John Taylor*, Ann Kayis-Kumar**, Kathrin Bain***

School of Taxation & Business Law, UNSW Australia

Abstract

This paper reports on the development and implementation of an on-line computer game, *PlayTax*, which was used in the UNSW Business School course International Business Taxation (TABL2756 and TABL5583) for the first time in Session 1 2016 as means of teaching general principles of outbound international tax planning. The idea for developing *PlayTax* was the product of the confluence: general awareness by course staff of the pedagogic value of interactive and problem based approaches to learning; survey data of employers which indicated a clear preference for students with ‘soft skills’; a UNSW Business School policy of promoting teaching approaches which encourage critical thinking and analysis and utilise digital technology; and the positive experience and expertise of School of Economics in the UNSW Business School in developing and using an on-line computer game in teaching first year microeconomics.

PlayTax provides an applied learning experience for students, who are made responsible for determining international business decisions. These decisions enable students to establish operations across multiple jurisdictions, make capital funding decisions, and determine their product pricing strategy – including the possibility of developing an e-commerce presence. Importantly, international tax rules overlay these business decisions, and act as decision-making parameters. The overall aim of *PlayTax* is to raise student awareness of some outbound international planning principles and to get students to think critically about the structuring issues involved in international tax planning.

The paper begins by outlining the background context in which the game was developed. It then discusses the existing academic literature on the use of gamification in teaching where it notes a gap in the existing research on the issue of whether student responses to gamification are related to their learning styles. The paper then provides an in-depth discussion of the game itself: the process of developing and implementing *PlayTax*; lessons learnt from the pilot testing; and the effect of the game on student performance in an assessment task. The paper concludes with an overall evaluation of the game and discusses plans for adjusting the game and proposed future developments.

* Professor, School of Taxation and Business Law, UNSW Australia.

** Lecturer, School of Taxation and Business Law, UNSW Australia.

*** Lecturer, School of Taxation and Business Law, UNSW Australia.

1. Introduction

This paper reports on the development and implementation of an on-line computer game, *PlayTax*, which was used in the UNSW Business School course International Business Taxation (TABL2756 and TABL5583) for the first time in Session 1 2016 as means of teaching general principles of outbound international tax planning. The idea for developing *PlayTax* was the product of the confluence: general awareness by course staff of the pedagogic value of interactive and problem based approaches to learning; a UNSW Business School policy of promoting teaching approaches which encourage critical thinking and analysis and utilise digital technology; survey data of employers which indicated a clear preference for students with ‘soft skills’; and the positive experience and expertise of School of Economics in the UNSW Business School in developing and using an on-line computer game in teaching first year microeconomics.

The paper begins by outlining the background context in which the game was developed. It discusses the existing academic literature on the use of gamification in teaching, where it notes a gap in the existing research on the issue of whether student responses to gamification are related to their learning styles. Empirical studies examining whether gamification improves learning outcomes are also relatively limited, and have produced mixed results. The paper then provides an in-depth discussion of the game itself: the process of developing and implementing *PlayTax*; lessons learnt from the pilot testing; and the effect of the game on student performance in an assessment task. The student response to *PlayTax* appears to be consistent with the current existing literature – that is, it yielded mixed results. Whilst it appears to have improved student performance in some areas of the course, it did not yield as positive a response as was originally anticipated. This paper therefore concludes by providing an overall examination of the game and examining potential reasons for these mixed results, as well as discussing plans for adjusting the game and proposed future developments.

2. Background

The course International Business Taxation is a one semester course taught by the School of Taxation and Business Law in the UNSW Business school as part of an undergraduate major in Taxation in the Bachelor of Commerce degree and as part of the Master of Commerce and Master of Professional Accounting (Extension) degrees.

For several years part of the assessment in the course has been an ‘Outbound International Tax Planning’ assignment. The assignment requires students to advise an Australian company which is seeking to make a direct investment in a foreign jurisdiction which the student selects. Students are required to explain details of the client’s business and of the investment proposal. The investment proposal must raise issues in two or more specified areas relevant to international taxation. Students are required to state whether their company is closely held or widely held and what the composition of shareholding in the company is. In particular, students are required to state whether or not a majority shareholding is or is not held by Australian resident entities. Students are required to advise the client as to how the investment proposal should be structured so as to achieve the best overall tax result given the company’s overall tax objectives and given the wishes of significant shareholders in your company. Students are advised that their research into the tax laws of the foreign jurisdiction need not go beyond the information contained in the CCH International Tax Planning Manual or country tax summaries contained on the IBFD Tax Research Platform. In addition, students are required to indicate to the client the areas in which the client should obtain the advice of a practitioner in the foreign jurisdiction as to the effects.

Prior to 2016 students were advised of possible tax planning strategies for outbound international tax planning by in class presentations either by UNSW lecturers or by guest presenters (typically international tax partners in Big 4 Professional Services firms).

Over a period of years academics from the School of Economics at UNSW Business School had developed an on-line computer game called Playconomics which they used to teach first year micro economics. This approach had proved to be very successful and popular with students and had won awards for the School of Economics team. Following discussions with these academics and their program designers we decided to collaborate with them to develop an on-line computer game, to be called PlayTax, which we hoped to use to teach general principles of outbound international tax planning.

Developing PlayTax involved multiple meetings with the academics from the School of Economics and with programmers and game designers. Time constraints and the difficulty of explaining concepts to people from a non-tax background meant that the initial scenario that we had planned had to be simplified. Moreover we found that we had to make several simplifying assumptions which did not reflect reality. These simplifying assumptions are detailed in the below section 0.

3. Gamification literature

The literature on gamification as a method of teaching and learning is relatively young, with few well-established theoretical frameworks currently available.¹ This section first outlines the existing theoretical literature on gamification, then explores two key issues examined in this literature; namely, whether gamification enhances learning outcomes and academic performance; and, whether students perceive gamification favourably.

3.1. The theoretical literature on gamification

While the use of games for serious purposes has been applied in military, educational and business settings for millennia,² the term ‘gamification’ is a relatively new one³ and refers to the emerging trend to use of consumer software that takes inspiration from video games in sectors spanning business, organisational management, in-service training, health, social policy and education.⁴

This paper is most relevant to the ‘game-based learning’ and the ‘serious games’ branches⁵ of the gamification of education. In this context, the term ‘gamification’ is used to mean “*the use of game design elements in non-game contexts*”⁶; “*the phenomenon of creating gameful experiences*”.⁷ It facilitates “*a serious approach to accelerating the experience curve of the learning, teaching complex subjects and systems thinking*”.⁸

As such, in the learning and teaching setting, gamification and simulation games aim to create an immersive world and an engaging journey to make the players feel like the activity has direction and meaning.⁹ This immersive world enables students to be the decision-makers in an artificial

¹ Hamari J, Koivisto J, and Sarsa H, ‘Does Gamification Work? – A Literature Review of Empirical Studies on Gamification’ (Conference paper presented at the 47th Hawaii International Conference on System Sciences, Hawaii, USA, 6-9 January 2014), 6.

² Halter E, *From Sun Tzu to Xbox: War and Videogames* (Thunder’s Mouth Press, New York, 2006).

³ The term ‘gamification’ was used in 2003 by Nick Pelling, a game developer: Marczewski A, *Gamification: A Simple Introduction* (Andrzej Marczewski, 2013), 3; but likely coined in 2008 by Rajat Paharia: Deterding S, Dixon D, Khaled R, and Nacke L, ‘From game design elements to gamefulness: Defining gamification’ (Conference paper presented at the 15th international Academic MindTrek Conference: Envisioning Future Media Environments, Tampere, Finland, 28-30 September 2011), 9.

⁴ Caponetto I, Earp J and Ott M, ‘Gamification and Education: A Literature Review’ (Conference paper presented at the 8th European Conference on Games Based Learning, Berlin, Germany, 9-10 October 2014), 50.

⁵ Deterding, Dixon, Khaled and Nacke, above n 3, 10.

⁶ Deterding, Dixon, Khaled and Nacke, above n 3, 10.

⁷ Koivisto J and Hamari J, ‘Demographic differences in perceived benefits from gamification’ (2014) 35 *Computers in Human Behavior* 179.

⁸ Kapp KM, *The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education* (John Wiley & Sons, 2012), 13.

⁹ Grejdanus W, ‘Gamification and Literature: A Study of the Motivational Impact of Gamification as a Method of Teaching English Literature’ (Masters Thesis, Linnaeus University, 7 January 2015), 26.

environment, and helps them to learn the consequences of these decisions.¹⁰ This underlies the emerging popularity of gamification in education,¹¹ on the basis that it supports and motivates students, so can in turn lead to enhanced learning processes and outcomes.¹²

The theoretical literature emphasises that gamification is supposed to be challenging and focused on problem solving rather than the mechanics of the game.¹³ This element of problem solving is a key part of these games.¹⁴ However, the theoretical literature¹⁵ on motivation highlights two key features; first, a task must not be too hard or too simple to properly engage players;¹⁶ and second, rewards can have the opposite effect on the motivation of players if they are not perfectly tuned to the actual activity.¹⁷ Accordingly, a deeper analysis of the impact of gamification is needed because the perceived effectiveness of gamification may not translate into enhanced learning outcomes.¹⁸

3.2. Does gamification enhance learning outcomes?

The guiding question in the gamification literature is: “*does gamification work?*”¹⁹ This is generally measured by reference to behaviour-related outcomes, with studies yielding both positive and negative results.²⁰

Even though there is an extensive base of publications evaluating the effectiveness of simulation games,²¹ and several theories that can help with this task,²² there is not enough empirical evidence from experiments to confirm the impact of gamification on learning outcomes.²³ Rather, existing research finds that the educational impact of simulations is subjective at best and has no correlation at worst.²⁴

There is little empirical support for the proposition that simulation game performance is a suitable proxy for learning.²⁵ There is some research suggesting that simulation games are more effective in engaging students’ interest²⁶ while others find that there is no statistically significant difference in the effectiveness of simulation games compared with the traditional mode of class delivery.²⁷ Accordingly, more evidence on the effectiveness of gamification in the education sector is needed,

¹⁰ Sitzmann T, ‘A meta-analytic examination of the instructional effectiveness of computer-based simulation games’ (2011) 64(2) *Personnel Psychology* 489; Dobrescu LI, Greiner B and Motta A, ‘Learning economics concepts through game-play: An experiment’ (2015) 69 *International Journal of Educational Research* 23, 26.

¹¹ See, for example, Domínguez A, Saenz-de-Navarrete J, De-Marcos L, Fernández-Sanz L, Pagés C and Martínez-Herráiz JJ, ‘Gamifying learning experiences: Practical implications and outcomes’ (2013) 63 *Computers & Education* 380.

¹² Kapp, above n 8.

¹³ Greijdanus, above n 9, 28.

¹⁴ Greijdanus, above n 9, 27.

¹⁵ For a detailed theoretical framework on motivation see Greijdanus, above n 9, 10-21, and references cited therein.

¹⁶ Greijdanus, above n 9, 27.

¹⁷ Greijdanus, above n 9, 36.

¹⁸ “*The simulation algorithms are opaque, thus the outcomes of the simulation are not easy to understand and interpret by the players*”: Bellotti F, Berta R, De Gloria A, Lavagnino E, Antonaci A, Dagnino FM and Ott M, ‘A Gamified Short Course for Promoting Entrepreneurship among ICT Engineering Students’ (Conference paper presented at the 13th International Conference on Advanced Learning Technologies, 15-18 July 2013, Beijing, China), 32; see also, Caponetto, Earp and Ott, above n 4, 50.

¹⁹ Hamari, Koivisto and Sarsa, above n 1, 3.

²⁰ Hamari, Koivisto and Sarsa, above n 1, 3.

²¹ Dobrescu, Greiner and Motta, above n 10, 27, and references cited therein.

²² See further, Tennyson RD and Jorczak RL, ‘A conceptual framework for the empirical study of instructional games’, in: O’Neil HF and Perez RS (eds.) *Computer games and team and individual learning* (Oxford, UK: Elsevier, 2008), 39.

²³ Sitzmann, above n 10; Gosen J and Washbush J, ‘A Review of Scholarship on Assessing Experiential Learning Effectiveness’ (2004) 35(2) *Simulation Gaming* 270; Dobrescu, Greiner and Motta, above n 10, 27.

²⁴ Gosen and Washbush, above n 23; Dobrescu, Greiner and Motta, above n 10, 24.

²⁵ Gosen and Washbush, above n 23, 272.

²⁶ Manero B, Torrente J, Serrano Á, Martínez-Ortiz I and Fernández-Manjón B, ‘Can educational video games increase high school students’ interest in theatre?’ (2015) 87 *Computers & Education* 182. However, Manero et al also find that a guest speaker is more effective at engaging students’ interest than simulation games.

²⁷ Wrzesien M and Alcañiz Raya M, ‘Learning in serious virtual worlds: Evaluation of learning effectiveness and appeal to students in the E-Junior project’ (2010) 55(1) *Computers & Education* 178.

because while simulation games may present a cost-effective alternative,²⁸ it remains unclear whether these games are appropriate substitutes for traditional lectures from a pedagogical perspective.²⁹

Further, the development process of simulation games has two key drawbacks.³⁰ First, the preparation of simulation games requires a substantial time commitment for the final product to be effective.³¹ This presents the most significant barrier to using simulation games.³² As outlined by Kapp, creating a simulation game that is both engaging and educational requires a substantial time commitment to develop, from the overall theme to story narrative and scoring method.³³

Second, the literature suggests that business simulations are less efficient at teaching terminology, basic concepts and principles compared to traditional face-to-face lectures,³⁴ suggesting that gamification may be better suited to enhancing – rather than replacing – lectures.³⁵ This highlights gamification may only be a complimentary learning tool preferred by some students,³⁶ rather than presenting a ‘silver bullet’ to enhance learning outcomes. Nonetheless, the theoretical literature suggests that, by enhancing motivation, gamification has the potential to outperform more traditional instructional methods.³⁷

Accordingly, the motivational potential of these ‘serious games’ is a key component in determining whether they are effective. Relevantly, modern motivational theory places part of the responsibility for motivation on the person tasked with the activity, i.e. the student. This brings to the fore the importance of active engagement³⁸ and motivation originating from the students themselves.³⁹

3.3. Do students perceive gamification favourably?

In general, students’ perception of gamification is found to be a positive one; with increased motivation, engagement and enjoyment.⁴⁰ Studies making these empirical claims are often gaging students’ experiences of, and perceptions towards, various learning tools within a single course.⁴¹ However, academics such as Anderson and Lawton note that the existing anecdotal evidence and

²⁸ Dobrescu, Greiner and Motta, above n 10, 24.

²⁹ Dobrescu, Greiner and Motta, above n 10, 24.

³⁰ For completeness, there is some – albeit dated – literature suggesting that gender bias may exist in that male students may be more interested in digital games: see, Lucas K and Sherry JL, ‘Sex differences in video game play: A communication-based explanation’ (2004) 31(5) *Communication Research* 499; Venkatesh V and Morris MG, ‘Why don’t men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behaviour’ (2000) 24(1) *Management Information Systems Quarterly* 115. However, this literature is over a decade old and this position is likely no longer the case, as suggested by more recent studies: Dobrescu, Greiner and Motta, above n 10, 26.

³¹ Lean J, Moizer J, Towler M and Abbey C, ‘Simulations and games: Use and barriers in higher education’ (2006) 7(3) *Active Learning in Higher Education* 227, 231; Greijdanus, above n 9, 29.

³² Lean, Moizer, Towler and Abbey, above n 31, 231; Chang J, ‘The Use of Business Gaming in Hong Kong Academic Institutions’, in: Butler J and Leonard N (eds.) *Developments in Business Simulation and Experiential Exercises* (Statesboro, GA: Georgia Southern University Press, 1997), 218.

³³ Kapp, above n 8, cited in Greijdanus, above n 9, 29.

³⁴ Faria AJ and Wellington WJ, ‘A survey of simulation game users, former-users, and never-users’ (2004) 35(2) *Simulation and Gaming* 178, 191; Lean, Moizer, Towler and Abbey, above n 31, 227 and references cited therein; Clarke E, ‘Learning outcomes from business simulation exercises: Challenges for the implementation of learning technologies’ (2009) 51(5/6) *Education & Training* 448, 450, and references cited therein.

³⁵ “Clearly cases, games, and simulations offer learners a richer and more robust view of the workplace environment than the traditional lecture, but it is also clear that even the lecture has a place in the learning cycle.”: Saunders PM, ‘Experiential learning, Cases, and Simulations in Business Communication’ (1997) 60(1) *Business and Professional Communication Quarterly* 97, 110.

³⁶ Dobrescu, Greiner and Motta, above n 10, 26.

³⁷ Sitzmann, above n 10, 510.

³⁸ Sitzmann found that users in the simulation game group outperformed the comparison group, especially when they had unlimited access to the simulation game: Sitzmann, above n 10, 510.

³⁹ Greijdanus, above n 9, 17.

⁴⁰ Hamari, Koivisto and Sarsa, above n 1, 4.

⁴¹ Dobrescu, Greiner and Motta, above n 10, 24, and references cited therein.

observational studies provide weak evidence for the relative efficacy of alternative pedagogies, so more rigorous experimental design is required.⁴² However, few studies satisfy this criterion.⁴³

Emerging from the literature are three key considerations: first, different player types experience the same affordances differently; second, the novelty effect; and third, an immersive world is only possible with longer usage length. Each will be dealt with in turn.

First, as observed throughout the literature, ‘user qualities’ tend to have an effect on attitudes towards gamification. In some instances, one player’s behavioural response to a motivational affordance may be the opposite of another player’s.⁴⁴ Different player types may experience and react to the motivational affordance of encouraging competition in opposite ways. For example, in a study by Hanus and Fox, the authors found that students taking part in the gamified course had lower motivation which results in poorer academic performance.⁴⁵ This is in line with cognitive evaluation theory, which predicts that tangible rewards undermine intrinsic motivation, whereas praise enhances it.⁴⁶ Despite a plethora of studies noting ‘user qualities’, the gamification literature currently lacks a detailed analysis of how different learning styles; namely, ‘deep’, ‘surface’ and ‘strategic’,⁴⁷ are associated with varying student behavioural responses to gamification.⁴⁸ This is a research gap which the authors will explore in subsequent papers.

Second, some studies caution that students’ positive perception of gamification may be short-term; these positive perceptions could be caused by a novelty effect and diminish over time.⁴⁹

Third, academics such as Hamari, Koivisto and Sarsa note that regular usage is paramount in order to captivate the student’s interest in an immersive world.⁵⁰ This suggests that ongoing interactions are preferable to one-off applications of simulation games.

Accordingly, it is important to be cognisant of these three considerations when designing and evaluating simulation games.

⁴² Anderson PH and Lawton L, ‘*Business Simulations and Cognitive Learning: Developments, Desires, and Future Directions*’ (2009) 40(2) *Simulation Gaming* 193, 206.

⁴³ A notable exception is Dobrescu, Greiner and Motta, above n 10, 24.

⁴⁴ Hamari, Koivisto and Sarsa, above n 1, 6.

⁴⁵ Hanus MD and Fox J, ‘Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance’ (2015) 80 *Computers & Education*, 152, 159.

⁴⁶ Carton JS, ‘The Differential Effects of Tangible Rewards and Praise on Intrinsic Motivation: A Comparison of Cognitive Evaluation Theory and Operant Theory’ (1996) 19(2) *The Behavior Analyst* 237, 241. For a detailed literature review on strategies for enhancing motivation see: Torres van Grinsven V, ‘*Motivation in Business Survey Response Behavior: Influencing motivation to improve survey outcome*’ (PhD Thesis, Utrecht University, August 2015), 46-49 and references cited therein.

⁴⁷ See, for example, Zepke N and Leach L, ‘Improving student engagement: Ten proposals for action’ (2010) 11(3) *Active Learning in Higher Education* 167 and references cited therein.

⁴⁸ For example, the following papers attribute varying learning styles to varying outcomes but do not categorise and elaborate on this concept: Dichev C, Dicheva D, Angelova G and Agre G, ‘From Gamification to Gameful Design and Gameful Experience in Learning’ (2014) 14(4) *Cybernetics And Information Technologies* 80; Caponetto I, Earp J and Ott M, ‘Gamification in Education: A Literature Review’ (Conference paper presented at the 8th European Conference on Games Based Learning, Berlin, Germany, 9 October 2014).

⁴⁹ Farzan R, DiMicco JM, Millen DR, Dugan C, Geyer W and Brownholtz EA, ‘Results from deploying a participation incentive mechanism within the enterprise’ (Conference paper presented at the Conference on Human Factors in Computing Systems, Florence, Italy, 5-10 April 2008), 10.

⁵⁰ Hamari, Koivisto and Sarsa, above n 1, 6.

4. Development of the game

The game was developed over several months with meetings being held with colleagues from the School of Economics, game designers and programmers. The initial meetings were concerned more with the overall objectives and ‘look’ of the game. At these meetings considered: (a) the number of countries that students would have the option of choosing from; (b) the choices they would have in relation to business structure, financing, location of IP, and transfer pricing issues; and (c) the product that students would be developing. The product we chose was called ‘Forever Mind’ which was a device that you could attach to your ear to store your memories so that you never forgot anything.

We found that, at least for the initial pilot several simplifying assumptions were necessary. We also found that we continually needed to explain issues to the programmers that we had taken for granted. We had anticipated that this would be the case with topics like Tax Treaties, Australia’s controlled foreign company (CFC), foreign tax credits (FTC) and transfer pricing rules, but also found that explanations and checking were needed for more basic business issues such as the relationship between sales and cost for transactions between related entities.

A major simplifying assumption that we made in the scenario overall was that the Australian company was foreign controlled and its objective was to maximise after-tax profits (with the tax objective to minimise its global tax). We had originally intended to have an alternate scenario where the company was controlled by Australian residents and that its basic tax objective was to minimise foreign tax. Paying tax in Australia (rather than a foreign jurisdiction) would result in franking credits and the ability to pay franked dividends (of importance to domestic shareholders). The alternate scenario will be the focus of the second version of PlayTax which is being developed for use in Session 1 2017. This is discussed further in section 7 of the paper.

A second simplifying assumption was that all outbound direct investments by the Australian company would be into wholly owned foreign subsidiaries. Investment via foreign branch operations was not permitted. This was partly due to the difficulty of calculating profits attributable to a branch and to the divergent views within the OECD on the old and new versions of Article 7 of the OECD Model. Other simplifying assumptions related to transfer pricing and the source of internet sales and other sales. Students were also allowed to relocate IP from Australia to a foreign jurisdiction without any Australian CGT consequences, which is clearly not reflective of real world tax outcomes. Originally, we were not overly concerned about this, as the CGT consequences of shifting IP would be similar regardless of the foreign jurisdiction selected. Additionally, students are warned in the game that this is an assumption purely for the purposes of the game and that in real world scenarios, CGT would need to be considered. Nevertheless, as discussed in section 5 of the paper, a number of students incorrectly stated in their assignment that IP could be transferred to a foreign jurisdiction without CGT consequences.

In the game, debt funding of foreign subsidiaries was permitted but borrowing by the Australian parent company was not, thus avoiding the possible operation of Australia’s outbound thin cap rules. Attribution under Australia’s CFC rules, foreign tax credits and exemptions for foreign dividends were all taken into account. However, in the case of FTCs, whilst the ‘bottom line’ result of the gross up and credit mechanism was shown, the detailed application of the mechanism was not.

Students were given the choice of locating their manufacturing and IP in one or a combination of four fictional offshore countries: Freeland (a DTA country very similar to the US); Funland (a DTA country very similar to Singapore); Euphoria (a non DTA country very similar to Hong Kong); and Nirvana (a non DTA country very similar to Vanuatu). In addition to each country having different tax rules, they each have different manufacturing capacities and costs. Once students have set up their subsidiaries, they need to decide how to sell the product (either through intersubsidiary sales, independent agents in Australia, online sales, or a combination of these). The final step in the game requires students to repatriate profits from their offshore subsidiaries back to Australia. Once profits have been repatriated, students are advised whether they have achieved the ‘optimal’ result, that is, whether they have maximised their after-tax profit. Whilst we considered making the objective of the

game to minimise tax liability, we thought it was important for students to realise that tax is just one factor that a company will need to consider in their overall strategy. It is possible in the game to achieve a sub-optimal result even if the tax liability is nil, as after-tax profits have not been maximised.

After the basic structure of the game and of the available choices were decided we then developed verbal and algebraic explanations of the costs, sales, expenses, profits, dividends and tax treatment of events that could conceivably arise in the scenarios that were open to students. The programmers then used the algebra we had developed to program the game to produce the results that we intended. Here numerous communication difficulties were encountered resulting in many revisions to the programming. After Build 8 of the game we found that it produced a correct result in what we regarded as the optimal scenario. At that point we decided to use it in a class setting as described in more detail in 5 below. As discussed in section 5 below, the version of the game used in class produced false positives. As a result we and the programmers and our colleagues from the School of Economics decided that further debugging would be necessary. For example, errors were found in the treatment of debt finance and in the treatment of Australian sales by a subsidiary located in a non-treaty country. One issue which will be addressed in future versions of the game was that the game referred to a subsidiary located in a particular country merely by the name of that country. When tax paid by the various subsidiaries was presented this produced the misleading impression that a subsidiary located in a no tax jurisdiction was paying tax in that jurisdiction when in fact it was paying Australian tax. Eventually by Build 11 we formed the view that the game produced accurate results in all the scenarios that we were able to test.

The screenshots below show a selection of stages of the games from Build 11. They demonstrate the variety of decisions students need to make throughout the game, and a sample of results that can occur.

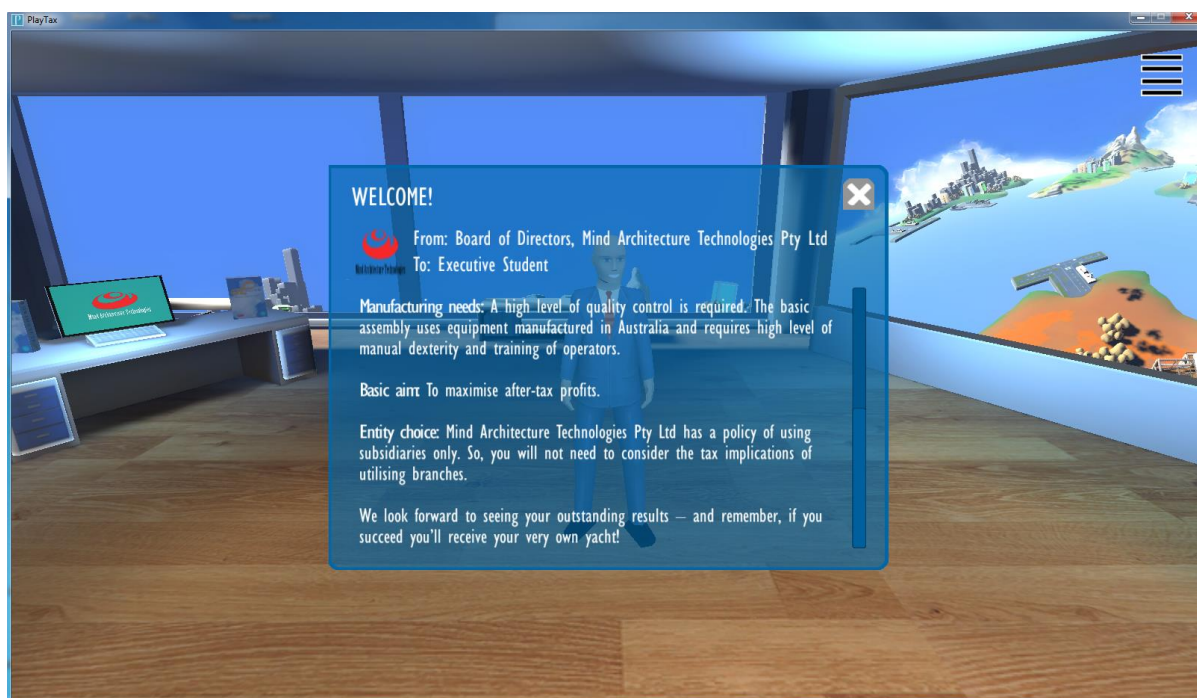


Figure 1: Initial e-mail

When the game commences, students are presented with an e-mail that explains the product they are responsible for manufacturing and selling, and their overall objective.

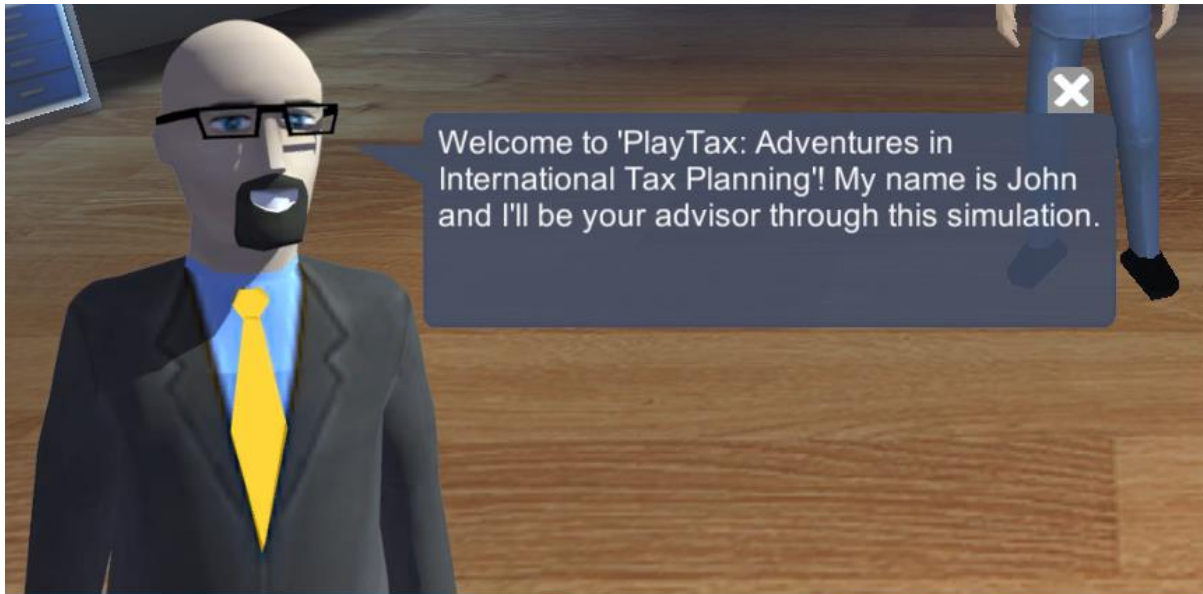


Figure 2: Mentor

After reading the initial e-mail, a 'mentor' appears. From time to time throughout the game, the mentor will appear and give students 'hints and tips'. (For example, reminding students to consider thin capitalisation and CFC rules).

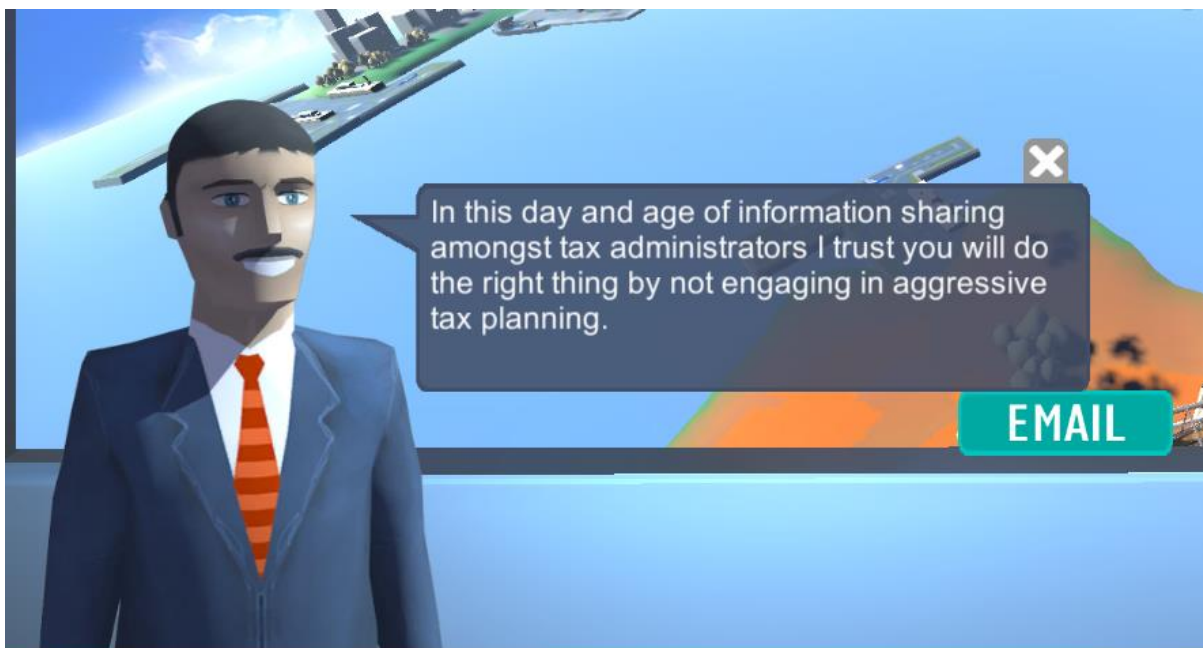


Figure 3: Auditor

Before any decisions are made, an auditor appears – students may be 'audited' if, for example, they breach the CFC rules.



Figure 4: In-game personal computer – Island information

Students are encouraged to access an ‘in-game personal computer’ which provides them with tax characteristics of the various countries (known as ‘islands’) - such as tax treaty networks and withholding tax rates.

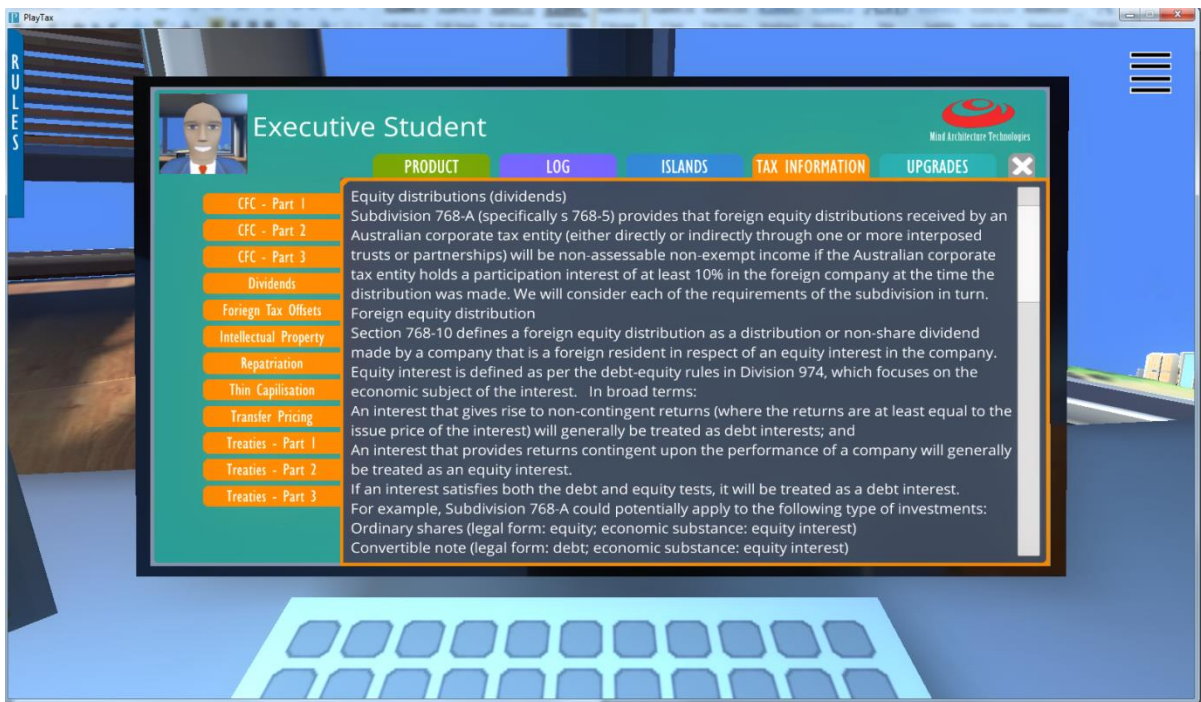


Figure 5: In game personal computer – textbook

Another feature of the in-game computer is that it provides a significant amount of course content. At this stage the content is limited to international tax issues that are relevant for the game.



Figure 6: Tax information for specific islands

Students can select the various islands to see tax information (such as tax rate) and other relevant information (such as manufacturing capacity and costs).

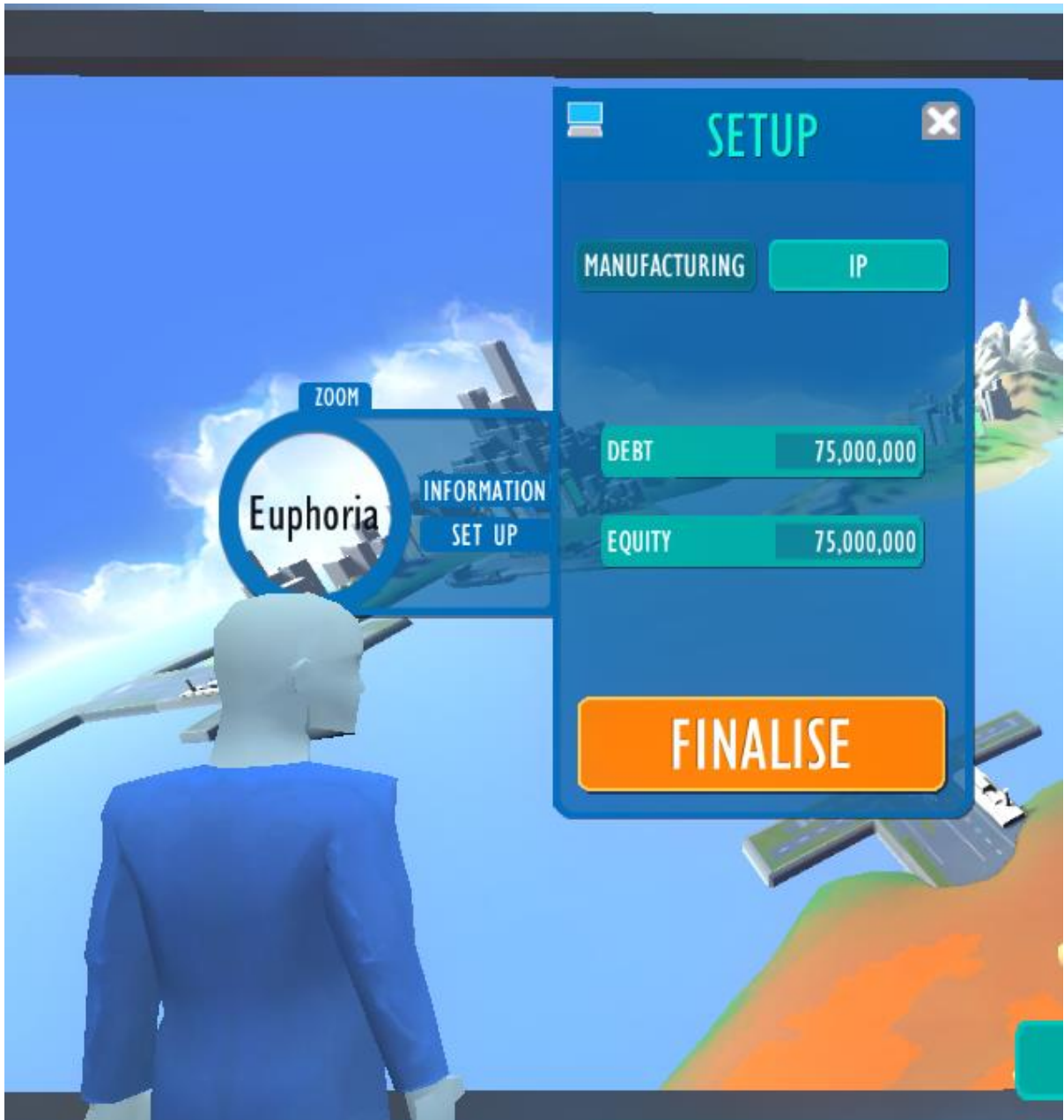


Figure 7: Setting up manufacturing subsidiary

When a student selects which island to set up their manufacturing subsidiary in, they are required to select the debt/equity funding mix.

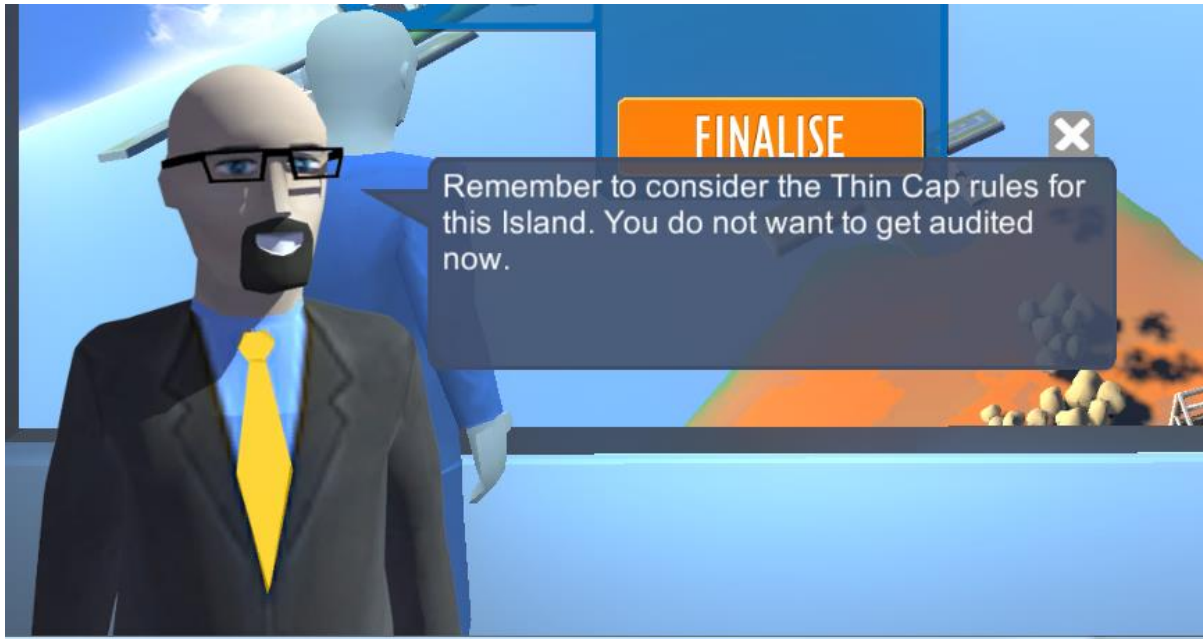


Figure 8: Thin capitalisation warning

Before a student makes a decision as to the level of debt/equity funding, they are reminded to consider the thin capitalisation rules. (Other ‘warnings’ will also appear throughout the game).



Figure 9: Setting up IP subsidiary

Students also select which island will hold the IP. This can either be the same island where the manufacturing subsidiary has been established, or a separate island.

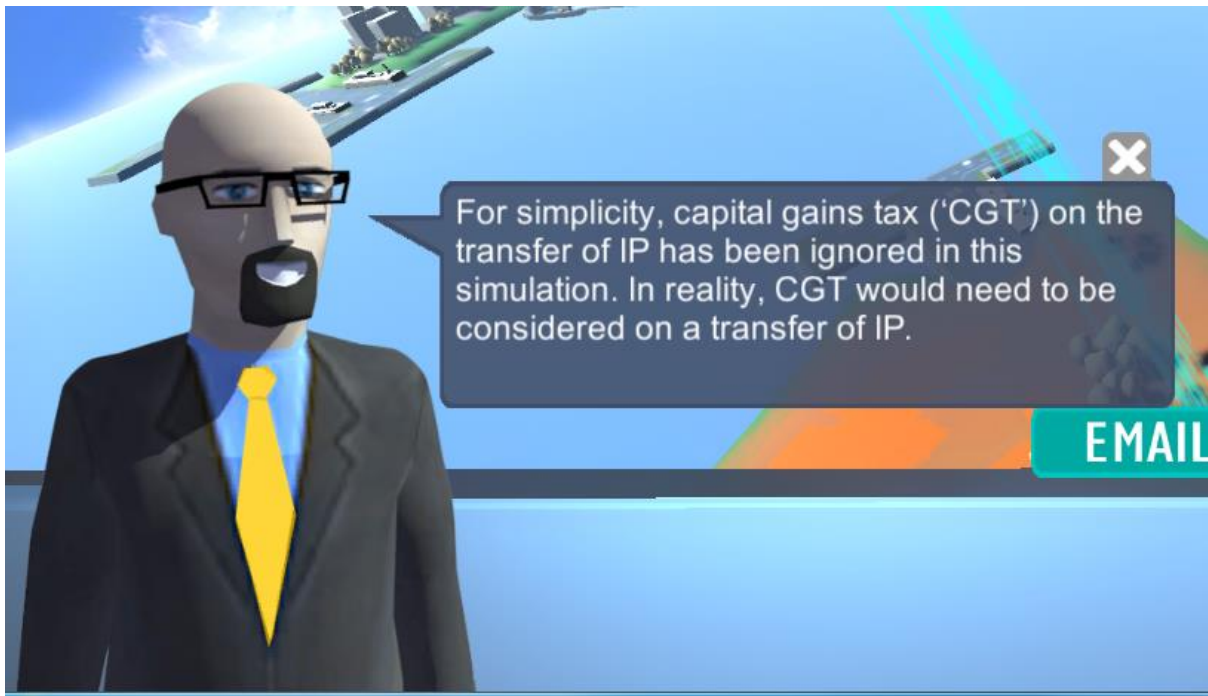


Figure 10: CGT consequences

When students set up a subsidiary to hold the IP, they are reminded that in a non-game scenario, CGT consequences would need to be considered.

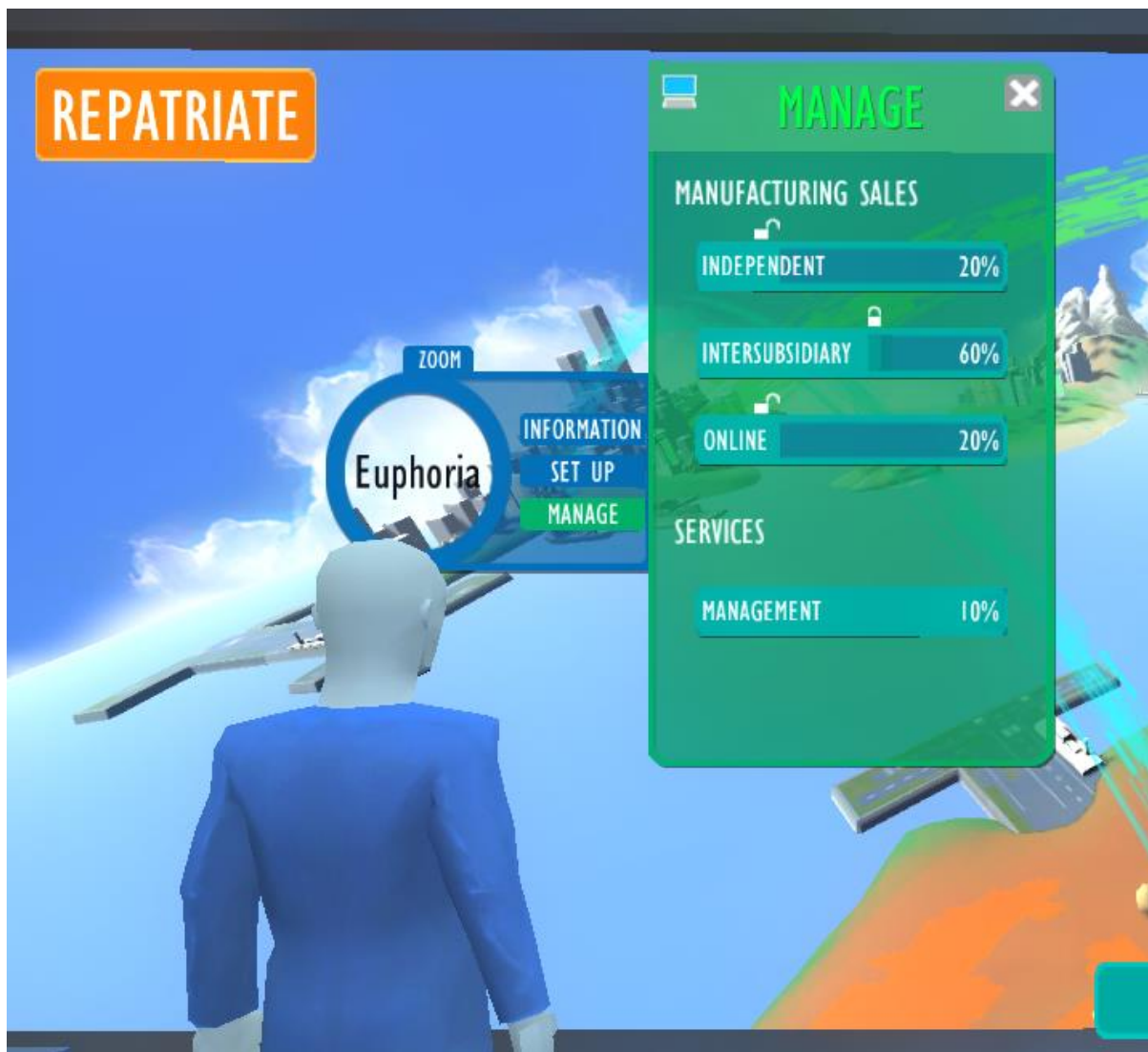


Figure 11: Sales mix

Once both subsidiaries have been established, students need to decide how to sell their product, and whether to charge management fees between subsidiaries.



Figure 12: Repatriation

Once the student is satisfied with their decisions, they can finalise the game by repatriating the profits back to Australia.



Figure 13: Optimal result

Once a student has confirmed that they want to finalise the repatriation, a tax summary report appears, and students are told whether they have achieved the optimal scenario.



Figure 14: Tax summary report

The tax summary report shows income, expenses, and income tax for each subsidiary.



Figure 15: Non-optimal scenario (1)

If a student has not maximised their after tax profits, they are told their scenario is 'not optimal'.

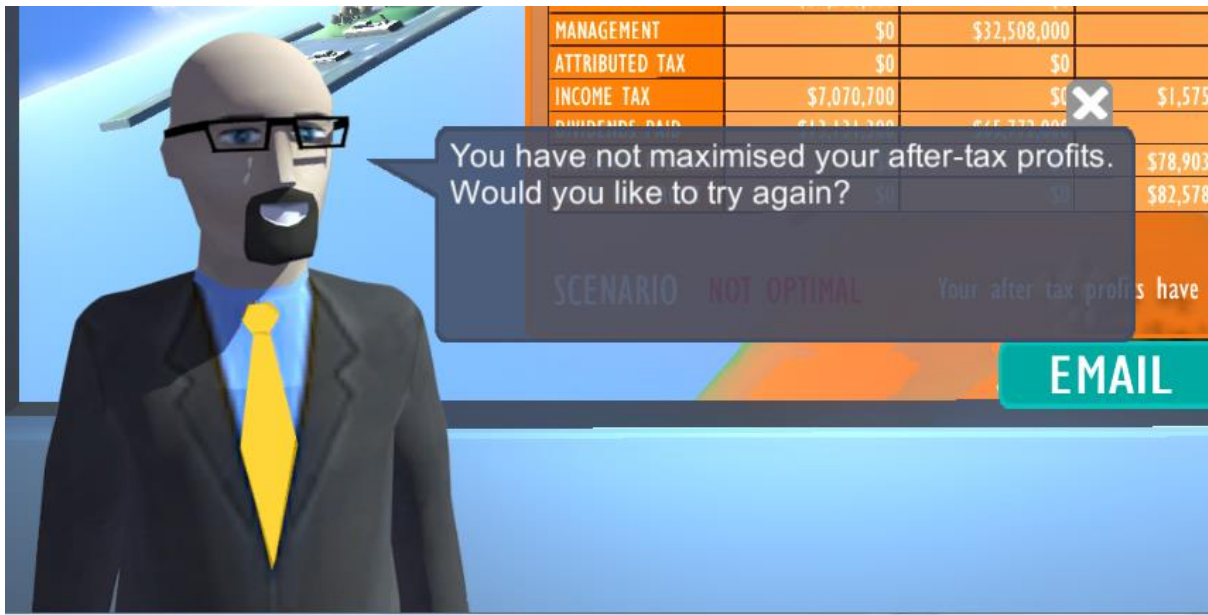


Figure 16: Non-optimal scenario (2)

If students receive a non-optimal result, they are asked if they would like to try again.

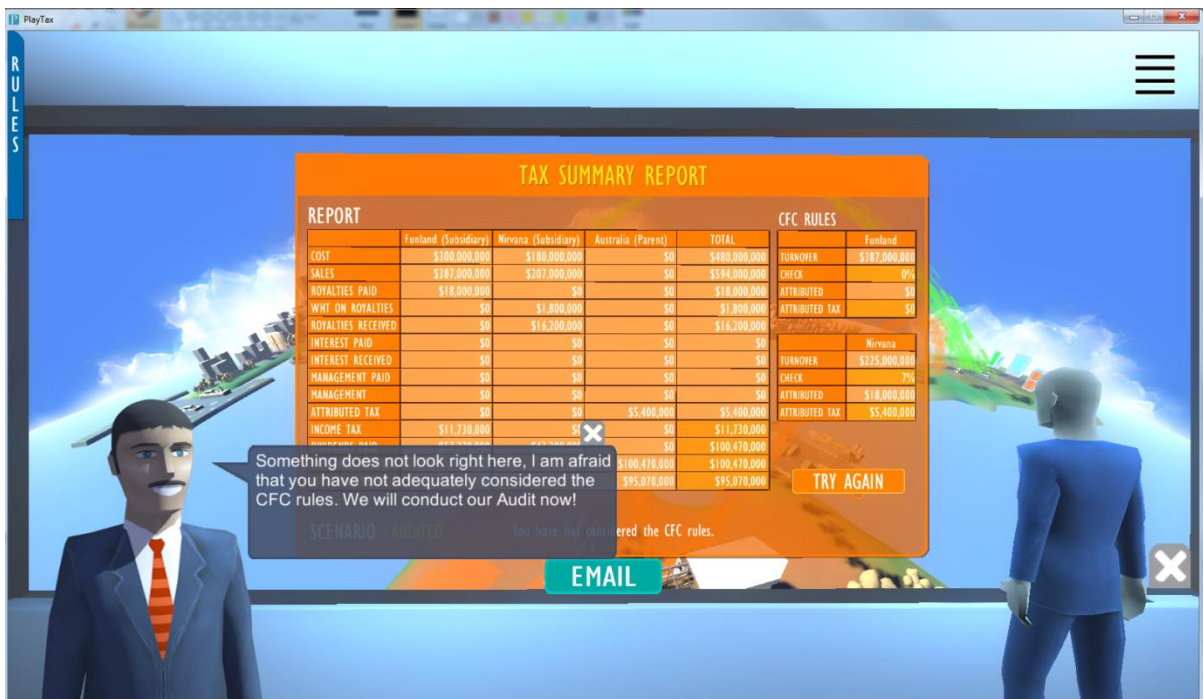


Figure 16: Audited scenario

The tax summary report also shows if income has been attributed under the CFC rules. If this occurs (or if the thin capitalisation rules have been breached), the Auditor will appear to inform the student they are being audited.

5. Lessons learnt from Pilot testing

Due the longer than anticipated time taken to develop the game, rather than allowing students to play it in their own time over Weeks 3 to 10, it was played as an in class activity in Week 11. This proved to be sub optimal as students had to be shown in class what the objectives and rules of the game were and how the various features of the game worked. The version of the game used still had false positives, in particular the game was producing incorrect results where offshore subsidiaries were financed wholly by debt. As false positives were being produced we considered it would be unfair to award marks based on whether students achieved optimal outcomes in the game and instead gave each student who participated in the game 5 marks. After the students had all attempted the game we provided a brief debrief advising what we considered would be the optimal outcome and the reasons why we considered it to be optimal.

Unfortunately we did not implement a formal written evaluation by students of the game as such. However, paper course evaluations (CATEI) were distributed to students as part of UNSW's usual course evaluation process. The CATEI evaluations include a 'comments' section but very few contained comments on the game or in relation to 'simulation games' (case studies used throughout the semester). The comments that were received varied significantly:

Simulation helped with understanding in a true environment

Simulations were helpful and also meetings prior to help identify the main issues.

Some new and creative assessment.

Loved the simulation games – good application

Helped to play games and work as a team

PlayTax was not available until the second last week

The teacher should take us through the course by explaining hard topics, but it just got wasted by boring games – like simulation & online games in the class

Having more discussion about topics rather than so many games wasting lecture time

Clearer instructions on simulation game and report.

6. Effect of the game on students' performance in the assignment

A total of 39 students submitted responses to the assignment in 2016. The average mark for the assignment in 2016 was 18.95/30. In 2015 40 students submitted responses to the assignment and the average mark for the assignment was 18.74/30. There were no significant differences in the assignment question asked or in the information provided to students (other than the on-line game) in 2015 and 2016. In both 2015 and 2016 the assignments were marked on line. The same academic marked all assignments in both 2015 and 2016. During marking comments were made on assignments using the 'comment' function in Turnitin.

Two of the simplifying assumptions made in the game were unfortunately reflected in errors in student assignments. Several students assumed that they could move IP from Australia to another jurisdiction without there being any Australian tax consequences. Comments noting this error were made on 41% of assignments. By comparison in 2015 comments noting this error were made on 25% of assignments. In addition, in 2016, several students assumed that a foreign subsidiary of an Australian company was a permanent establishment of that company. Comments noting this error

were made on 28.20% of assignments. By comparison comments noting this error were made on 12.5% of assignments in 2015.

The game was programmed to indicate when a strategy adopted by students produced attribution of income under Australia's CFC rules. The game identified CFCs, determined whether the 'active income test' had been satisfied, and calculated attributable income. We expected that playing the game would increase students' awareness of issues in relation to these topics. Nonetheless a significant percentage of students made errors of some kind in relation to the application of Australia's CFC rules. Comments noting errors in relation to Australia's CFC rules were made on 58.97% of assignments in 2016. Comments noting errors in relation to Australia's CFC rules were made on 35% of assignments in 2015.

The game was also programmed to differentiate between the forms of unilateral relief from international juridical double taxation in Australian domestic law. Hence the game calculated a foreign income tax offset when profits were repatriated to Australia via interest or royalty payments and treated active foreign branch profits and non-portfolio dividends as non-assessable non-exempt income. However, the offset was not displayed as such, rather the net Australian tax payable (where relevant) was shown. Nonetheless we expected that playing the game might increase students' awareness of issues in relation to these topics. On the contrary one of the highest percentages of errors by students occurred in relation to forms of relief from international double taxation on repatriation of profits to Australia. Comments noting errors in relation to unilateral relief from international juridical double taxation were made on 64.10% of assignments in 2016. Comments noting errors in relation to unilateral relief from international juridical double taxation were made on 45% of assignments in 2015.

In the game in 2016 students were able to determine whether to fund their offshore subsidiaries using debt or equity or a mixture of both. As the stated objective of the game was to minimise global tax the optimal result was produced by 100% equity funding (as Australia would treat the dividends as non-assessable non-exempt income).⁵¹ In 2016 only 2.5% of assignments contained comments noting errors in relation to the effects of debt and equity funding. This was one area where comments noting errors on assignments at 20% of assignments were significantly higher in 2015. This may be explained by the fact that in the presentation by the lecturer on general principles of international tax planning in 2015 the point was made that, where a company is owned by Australian shareholders, the dividend imputation system can mean that shareholders are indifferent between the company paying Australian corporate tax and paying zero foreign tax. In those sessions the point was made that debt funding typically will reduce the foreign tax paid and increase the Australian corporate tax paid. In 2015 comments on this issue also included comments on errors in relation to the foreign income tax offset system and, hence, some of the comments could be classified as relating in part to misunderstandings of unilateral relief from international juridical double taxation provisions.

7. Overall evaluation of the game, Planned adjustments and Future development

Without a specific systematic survey of student responses to the game it is not possible to draw reliable conclusions on this issue. For this reason, as set out below, in 2017 a systematic survey of students will be made following the completion of the game.

The comparison of comments on student assignments in 2015 and 2016 may suggest some areas where the game affected student understanding of a technical issue. In all areas examined there were significant differences between the 2016 and the 2015 error count with the 2016 error count being higher on all areas with the exception of the effects of debt versus equity funding. The area with the

⁵¹ The dividends would be classified as "foreign equity distributions on participation interests" under Sub-div 768-A of the *Income Tax Assessment Act 1997* (Cth).

highest error count in student assignments related to Australia's unilateral relief from international juridical double taxation. It is possible that this was due to the way foreign tax credits were shown in the game with only net Australian tax payable being shown. Another area with a high error count in 2016 concerned errors in relation to Australia's CFC rules. This was somewhat surprising given that game did identify CFCs, applied the 'active income' test correctly and did attribute relevant income to Australia and allowed a foreign income tax offset on attribution. A more granular analysis of the comments made on student assignments in 2015 and 2016 than has been made in writing this paper would be necessary to try to determine whether the significantly higher error count on this issue was related to the game or not. Three areas of error which arguably may be related to the game were: (a) errors in relation to the transfer of IP; (b) the error of assuming that a foreign subsidiary was a PE; and (c) errors in relation to debt or equity funding. As the game allowed students to transfer IP to a foreign subsidiary without adverse Australian CGT consequences it is conceivable that the significantly higher error count on this issue in 2016 may have been attributable to the game giving students the mistaken belief that such transfers could be made without there being adverse CGT consequences. A possible link between students' poorer performance on the PE issue and the game is less obvious but still conceivable. The game only allowed students to set up foreign branches and made no mention of the PE concept at all. It may be that students in writing the assignment were led into assuming that a subsidiary was the optimal choice and then looked Article 7 in tax treaties and assumed that for a source country to tax a subsidiary it had to be a PE of a foreign resident. A gain more granular analysis of the comments made on student assignments in 2015 and 2016 than has been made in writing this paper would be necessary to try to determine whether the significantly higher error count on this issue was related to the game or not. It is also conceivable that the lower student error count on debt versus equity funding issues was related to the game. As the game strongly showed that equity funding of offshore was optimal when the client's objective was to minimise global corporate tax payable it may be that the lower error count on this issue was attributable to fewer students using any form of debt funding at all.

Version 2 of the game is being developed for use in Session 1 2017. We propose that Version 2 will include an additional scenario in which the Australian company is wholly owned by Australian residents with the result that it should be indifferent as to whether it pays Australian corporate tax or pays zero foreign tax in relation to its offshore investment. This will mean that the game will need to take the effects of the Australian dividend imputation system into account. Given the student errors arising from the treatment of transfers of IP in Version 1 we have decided that in Version 2 transfers of IP will have Australian capital gains tax consequences. Also consideration will be given to whether investment in overseas branches will be allowed. If so we will most likely need to adopt the Australian version and interpretation of Article 7 of the OECD Model when the branch is located in a tax treaty country.

For Session 1 2017 our intention now is that the game will be played in students' own time over several weeks (probably from Weeks 3 to 7) with feedback being provided on various student choices either in the game itself or by lecturers either in class or using on-line student feedback functions. To assist students in making more informed decisions the game will contain links to detailed on-line course materials which have been developed for the course. Whilst Version 1 of the game contained some course materials which could be viewed on the 'in-game computer', we were limited to showing the information as simple text, and as such, had to remove items such as diagrams which are often used to illustrate examples. An in-game advisor will remind students to read this material before making relevant choices. Version 1 of the game merely produced a 'pass – fail' result. Students were either told that they had maximised their after tax profits or that they had not. Consistent with the motivational literature we propose to provide progressive feedback which praises students for good choices and informs them of the results of their choice so that the assessment (in the broader sense) is driven by decisions that students make rather than by the end outcome of their choices. We are also considering requiring students to critically reflect on their performance in the game at the end of the semester by, for example, discussing how their decisions in the game changed over time.

A pre class survey of students will be administered to ascertain such information as: (a) the prior experience of students with computer games; (b) the learning style of the student; and (c) the prior

experience of the student with gamified courses. A post game survey will also be administered and relationships (if any) between the student experience of the game and their prior experience of computer games, gamification, and their learning styles will be examined. Student performance in the outbound tax planning assignment will be evaluated based on lecturer comments on student assignments and these results will be compared with the results for 2015 and 2016 as set out in section 6 above.

8. Conclusion

Any new forms of teaching or assessment bring with them both opportunities and challenges – gamification is no different. International Business Taxation was the first course in the School of Taxation and Business Law that used a computer game as a learning tool and a form of assessment, and we experienced numerous challenges throughout the development and implementation of PlayTax.

As outlined in this paper, the gamification literature to date is limited, but the challenges that have been identified by existing literature were consistent with the PlayTax development experience. First, a significant time commitment was required, particularly when it came to explaining the relevant tax rules to the programmers (and developing the algebraic formula). We also did not anticipate the number of different builds that would be required before we were satisfied with the outcome. Each new build required testing to ensure previously identified errors had been corrected. Second, the literature noted that simulations are not necessarily the most appropriate tools to teach course concepts and content. Certainly, the errors in student assessment noted in section 6 of this paper highlights the fact that PlayTax did not improve student knowledge in a number of areas.

PlayTax did not have the positive impact on student performance in assessment that was expected. Whilst the discussion in section 6 of the paper may sound discouraging, we have identified potential reasons why the game did not achieve the desired outcomes. This allows opportunities for refinement in future semesters. We will continue to use PlayTax in Session 1 2017 and are developing an alternative version which changes the overall tax objective. In order to encourage student engagement and improve student performance, the game will be made available earlier in the semester. Students will then have the opportunity to play it throughout the semester as different concepts are explained, with ongoing feedback being provided so students can reflect upon their performance.

The paper has also highlighted the lack of empirical studies in relation to gamification, particularly in relation to differing student learning styles. The student response to PlayTax was mixed, and this is consistent with the existing literature. However, as noted, no formal evaluation by students of PlayTax was conducted. Going forward, surveys will be taken both pre- and post- game in order to gain a greater understanding of the student experience. This will allow us to make alterations to PlayTax in future semesters to better fulfil student needs, and will also contribute to the current research gap in gamification literature.