

Exposing students to a simulation of the online platform used by the South African revenue service

A simulation of an online tax platform

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Abstract

Purpose – Students completing their tertiary education at a university may be equipped with theoretical knowledge with little to no practical experience. In order to bridge this gap in practical skills, a computer simulation was developed based on the e-filing platform of the South African Revenue Services (SARS). Students were exposed to this self-developed computer simulation to answer the question: to what extent will the e-filing simulation improve students' confidence to practically apply their theoretical knowledge?

Design/methodology/approach – The research applied a pre–post questionnaire research method to gauge the students' ability to apply their theoretical knowledge to a practical scenario before and after the simulation.

Findings – From the results, it is apparent that the students were inspired with confidence in getting to terms with the application of their theoretical knowledge in a real-life scenario. The computer simulation provided the platform for learning to take place in a practical environment without the risk of errors that would translate into real financial consequences.

Originality/value – The contribution of this research can be found in a teaching intervention that may support the training of future tax professionals in practical application skills. The contribution can be extended to the enhancement of education in the field of taxation, particularly with the results' showing that the students experienced high levels of increased confidence in their application of theoretical knowledge to real-life scenarios.

Keywords Taxation, Teaching interventions, Computer simulation, E-filing, Tertiary students

Paper type Research paper

Introduction

As the world is currently within the grasp of the Fourth Industrial Revolution, the use of the digital space is of vital importance. For this reason, the learning environment, where students prepare themselves for the real world, must adapt accordingly. For this study, an alternative experience of real-world interaction was identified as a possible solution and presented to students in the form of a computer simulation teaching intervention.

A computer simulation can be defined as a representation of reality in a digital environment, where the user manipulates data in order to learn principles, procedures, concepts and values (Barton and Maharg, 2007; Gibson *et al.*, 2006). In order to support learning in a socio-economic system, the taxonomy of computer simulations (Maier and Grobler, 2000) classifies the current research as a modelling-oriented simulation and, more specifically, as a feedback-oriented continuous simulation (see Figure 1).

Two issues need to be addressed when considering the use of simulations in a teaching environment. The first issue is to ensure that the simulation is a representation of the real world. The second issue is to establish whether the simulation is a useful tool when



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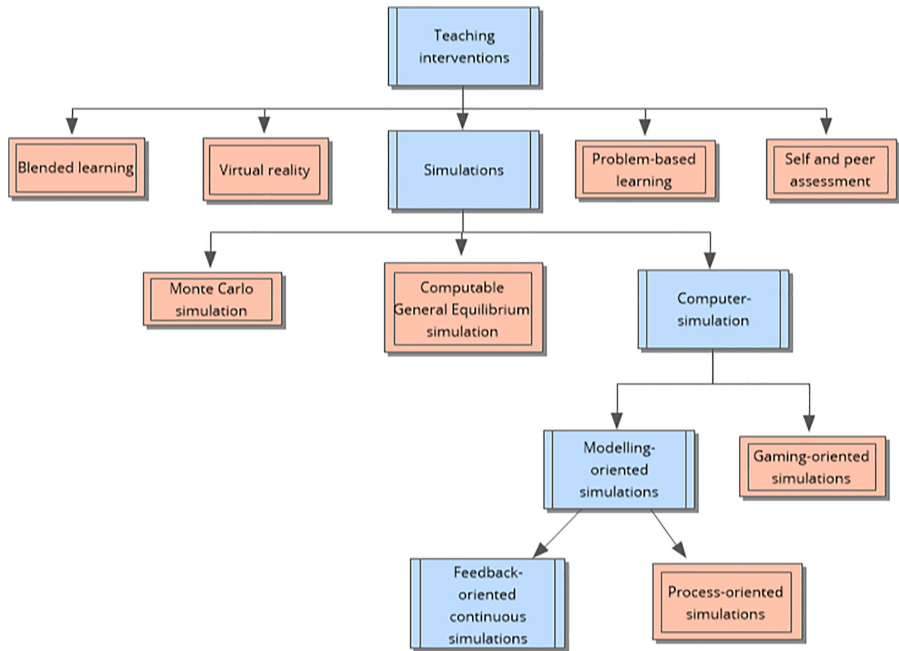


Figure 1.
A presentation of a computer simulation as a teaching intervention

Source(s): Best and Schafer, 2017; Bonga-Bonga and Perold, 2014; Fogarty and Goldwater, 1996; Haar, 2021; Hill, 2016; Hill and Du Preez, 2021; Jain *et al.*, 2010; Maier and Grobler, 2000; Marriott, 2004; Meng and Siriwardana, 2017

confronted with the complex concepts and values of the real-life environment. Both issues are addressed and embodied through the current research, leading to the research question: **to what extent will the e-filing simulation improve students' confidence to practically apply their theoretical knowledge?**

The research followed a quantitative approach and made use of pre- and post-questionnaires. A prequestionnaire was administered before the e-filing simulation and the postquestionnaire afterwards. The participants were postgraduate students registered for a taxation module in the Department of Taxation.

The first contribution of the research is that the simulation is based on the real-life e-filing platform (for tax compliance in South Africa) and therefore extends the training of future tax professionals to incorporate practical skills. The second contribution is thus the enhancement of education in the field of taxation. The confidence acquired by taxation students through the e-filing simulation in practically applying their theoretical knowledge to a real-life scenario was extensively improved.

In the next section, the literature around teaching interventions and simulations is explored. A description of the research method is then given, followed by the data analysis, a discussion of the results, and a conclusion.

Literature review

Various teaching interventions have been explored and studied by researchers, all with the goal to improve teaching, increase student success, and deliver educational content more efficiently (Ilic *et al.*, 2015). The various teaching interventions are shown in Figure 1.

The current research focuses on simulation as a teaching intervention where an artificial representation of the real world is presented in a noninvasive way to evaluate practical situations (Barton and Maharg, 2007; Fricke and Lux, 2015). Such a teaching intervention offers the benefits of enhancing students' critical thinking, their content knowledge and their self-confidence (Cant and Cooper, 2017).

The first recorded use of simulations can be traced back as far as 1777 with the "needle experiment" (Goldsman *et al.*, 2010). The slow development of manual simulations continued until 1910 when the first flight simulator was developed and brought into use for the training of pilots (Henry, 2018; Kincaid and Westerlund, 2009). During the late 1940's, with the development of computers, the use of the Monte Carlo simulation method was expanded, and the first general-purpose simulator was built. In 1964 Tocher constructed the activity-cycle diagram (ACD) that became the cornerstone for teaching simulations in the United Kingdom (Goldsman *et al.*, 2010). During the 1970's, flight simulators changed to computer-generated simulators with more technology and processing power (Henry, 2018). Teaching and training with simulations were further introduced in the field of medicine, leading to the development of simulations in computer-based games for this purpose (Kincaid and Westerlund, 2009). Computer-based games further developed to the extent that several branches of the military are exploring the use of simulation games for training purposes. The use of simulations is rapid expanding to fields such as maintenance, law enforcement, healthcare, transportation, athletics, crane simulations and emergency management scenarios (Henry, 2018; Kincaid and Westerlund, 2009).

The use of simulations is interdisciplinary and is premised on the representation of reality, mainly with the objective to teach. Barton and Maharg (2007), for example, confirmed the idea that simulations could be used to teach problem-solving. Furthermore, simulations aid in integrated learning and can be adapted to fit the purpose – to represent the desired business environment and the desired scenario (Jain *et al.*, 2010; Kolb and David, 2014; Mainemelis *et al.*, 2002). Indeed, Maier and Grobler (2000, p. 136) point out: 'Just as a pilot learns to fly with a flight simulator, one can learn to manage a company with the help of a management flight simulator.' Simulations offer an advantageous intervention for teaching and learning, with extended growth benefits for both students and facilitators.

Some of the benefits of using simulation-based training are as follows: first, the training is authentic and a replica of a real-life scenario. Students can therefore train in an environment that is risk-free and where the event can be repeated to obtain the skills necessary. Second, the simulation may assist in gaining insights into the different variables of the system with the purpose to find the highest performance setting (Future learn, n.d.), Third, the simulation will provide accurate and immediate feedback (Hurix digital, 2023). Finally, the simulation is cost-effective. Once developed, the simulation can be repeated without additional acquisition costs (Hurix digital, 2023).

The disadvantages of simulations may include, among others, the cost of maintaining and updating the simulation, the misconception that the simulation is perfect but in real life there is always room for errors (Knilt, 2022), time-consuming training and the need for the assistance of a supervisor in simulation training (Future learn, n.d.).

A simulation may be carried out in various forms, depending on the objective of the simulation project. In the field of taxation, there are mainly three forms of simulation: the Monte Carlo simulation, the computable general equilibrium simulation and computer simulations (see Figure 1). Fogarty and Goldwater (1996) applied the Monte Carlo simulation in tax education; the simulation was described by Johansen *et al.* (2010) as a collection of computational techniques for the solution of mathematical problems.

Meng and Siriwardana (2017) define the computable general equilibrium simulation as an economic model that has the ability to reveal information on the whole economy

and on detailed industries. [Bonga-Bonga and Perold \(2014\)](#) made use of a computable general equilibrium simulation in researching the effect of a reduction in value-added tax on the South African economy when either a flat rate or a progressive tax system is applied.

[Haar \(2021\)](#) aptly describes computer simulations as dynamic models that are capable of representing complex systems. [Marriott \(2004\)](#) used computer simulations in researching how to best assist accounting educators in overcoming some of the challenges they face in teaching by providing educators with a simulated educational setting. Computer simulations may indeed prove to be a great tool for teaching new concepts and exposing individuals to a real-world platform in a safe environment; these simulations are thus a powerful tool for learning, with great potential for formal educational use ([Akilli, 2007](#)).

Three aspects comprise computer simulations, namely the underlying model, the human–computer interface and various functionalities ([Maier and Grobler, 2000](#)). [Maier and Grobler \(2000\)](#) developed a taxonomy for computer simulations by dividing them into modelling-oriented simulations and gaming-oriented simulations (as seen in [Figure 1](#)). The current research applies the modelling-oriented simulations, which can be divided further into feedback-oriented continuous simulations and process-oriented simulations. The e-filing simulation used for the research can be described as a feedback-oriented continuous simulation. The main goals of this type of simulation are learning, problem-solving and gaining insights, and the achievement of these goals is virtually undoubted ([Maier and Grobler, 2000](#)).

Due to the ever-changing nature of taxation, changes in tax systems and tax legislation are often necessitated. These changes lead to continuous development in education and in the extended profession. New employees may find this constant change challenging. [Best and Schafer \(2017\)](#) highlight how tax practitioners often note that new staff lack certain core skills in carrying out their duties. Computer simulations may be the solution to this challenge in the teaching and learning environment of taxation, and [Summers \(2006\)](#) in fact confirms that computer tax simulations do have a material impact on the educational side of tax policies.

In the USA, [Best and Schafer \(2017\)](#) developed a computer simulation with the objective of providing students with realistic corporate tax return experiences. In this simulation, students were given the role of an accountant at an accounting firm and were provided with relevant information to complete a return (they were also required to consult with the client for additional required information). Students were provided with a skills assessment questionnaire prior to and after the simulation to gauge their experience, their ability to think critically and their level of comfort in performing a similar exercise (completion of a corporate tax return) in future. Significant improvements (in critical thinking, in preparedness to work in a professional environment and in ability to calculate taxable income) in postquestionnaires were noted, indicating that students did learn through the simulation. Furthermore, according to [Best and Schafer \(2017, p. 74\)](#), students provided excellent feedback after being exposed to the simulated environment. Examples of feedback comments given by students after this exposure are follows:

I like how the project had a real world feel to it.

I liked the way it made you go through all the steps of preparing a corporate tax return and simulated the real process of having incomplete information and meetings with supervisors.

I liked that it resembled what we may see outside of the classroom. ([Best and Schafer, 2017, p. 74](#))

Method

The South African Revenue Service (SARS) employs the e-filing platform to empower taxpayers to conduct their tax affairs online. It is the interface of SARS with taxpayers. The services rendered on this platform include, among others, the submission of tax returns, SARS issuing assessments and the lodging of an objection to or an appeal against a decision made by SARS. The computer simulation used in this research is a representation of the e-filing platform, built from screenshots from the e-filing platform itself. The e-filing system was deemed appropriate to simulate, as students will encounter this platform in real life and to illustrate to them how the knowledge obtained during the course is applied in a real-life scenario. In the simulation, postgraduate taxation students were exposed to the simulated SARS e-filing platform to afford them the opportunity to apply the Income Tax Act (58 of 1962, which contains the guidelines for calculating the normal tax payable by taxpayers in South Africa) and the Tax Administration Act (TAA) (28 of 2011, which guides the tax administration and tax compliance of taxpayers in South Africa) in a simulated real-world environment which mimics the platform that the students will encounter when they commence their professional careers.

The simulation was developed by one of the researchers (who is also a tax practitioner), in cooperation with a computer programmer. The researcher provided the programmer with extensive screenshots and explanations of what the real-life e-filing platform looks like and how the interactions between the platform and the end-user take place. The development of the simulation took several months, during which both the researcher and the programmer worked continuously to refine the final product. The simulation was therefore based on the real-life e-filing platform and the validity and reliability of the simulation can be confirmed. The researchers who presented the session to the two groups are chartered accountants who regularly use the e-filing system and could also confirm the validity of the simulation.

The e-filing simulation was rolled out to two postgraduate taxation groups in the Department of Taxation, at the University of Pretoria, South Africa. Both groups were enrolled for the same module in taxation in the specific academic year. The students were selected for the simulation, as they would move into the work environment in the following year. The students also had extensive knowledge of taxation as they had already completed three years of undergraduate studies in taxation at tertiary level before being accepted for this postgraduate module. All the students forming part of these two postgraduate groups acted as participants to the current research.

The simulation was conducted after both groups had engaged with the theoretical content necessary to complete the e-filing simulation: on 25 June 2021 for Group 1 and on 27 September 2021 for Group 2. The simulation was presented online, using desktop computers or laptops.

Before the commencement of the simulation, the students were invited to participate in a prequestionnaire to gather information regarding their presimulation TAA knowledge and their confidence in applying that knowledge. Before the commencement of the prequestionnaire, students were given the opportunity to consent to their participation or withdraw from the research. After the simulation, it was requested that the students complete a postquestionnaire. Students were informed that the completion of the pre- and post-questionnaires was voluntary. They were, however, encouraged to complete both questionnaires, and it was explained to them that their feedback would indicate whether they had benefited from the session and that the feedback would be used to improve the simulation in the future. Furthermore, students were asked to create a unique username to ensure anonymity in the questionnaire, and the unique usernames were used to link the pre- and post-questionnaires.

Students were informed that the teaching intervention session would be a simulation of the e-filing interaction on behalf of a fictitious taxpayer for the 2021 years of assessment.

Students were given a set of facts and supporting documents for the fictitious taxpayer. The steps listed below were to be followed.

1. Calculate the normal tax due/refundable.
2. Complete and submit the income tax return on the simulated SARS e-filing platform.
3. Check the simulated original assessment issued by SARS against their own calculation.
4. Upload supporting documents to the simulated SARS e-filing platform.
5. Object to an additional simulated assessment issued by SARS.

The simulation was only available on a desktop computer or laptop. Some students used two devices during the session; for example, a laptop for participating in the simulation and a smartphone for remotely joining the live session for interaction and instructions. Other students used one device and moved between tabs as needed. The fact that the simulation was only developed for a desktop computer or laptop is one of the limitations identified by the researchers for improvement in the future, where the platform will be converted for use on a mobile device (smartphone or tablet) as well.

Students were awarded marks for completing the simulation and for attending the online session. They were also encouraged to ask questions during the sessions. However, no marks were awarded for completing the pre- and post-questionnaires, as these were voluntary.

When the computer simulation commenced and the link to the simulated SARS website was provided for students to access the simulation, the simulation continued as outlined below.

1. Students calculated the normal tax due by or refundable to the fictitious taxpayer.
2. Students completed the tax return for the fictitious taxpayer and submitted it on the simulated platform. The session was interactive, and students could post a question in the chat box at any time.
3. Once the original assessment was issued on the simulated platform, students had to compare their calculations to the assessment and identify any differences or errors.
4. Students were made aware that 'SARS' had requested supporting documentation, which the students then independently uploaded onto the simulated platform.
5. 'SARS' then issued an additional assessment on the simulated platform, disallowing one of the deductions claimed. Students had to object to this additional assessment.

Once all five steps of the simulation were completed, the link to the post-questionnaire was posted in the chat box.

The only responses that were included in the data analysis were responses where students had completed both the pre- and post-questionnaire. Of the 232 registered students, 172 completed both questionnaires, resulting in a 74% response rate.

Results and discussion

The data collected through the pre- and post-questionnaires were downloaded from *Qualtrics* and analysed by frequency and by applying cross-tabulations.

The data analysis is structured in such a way as to be able to gain an understanding of the change in students' confidence when applying theory to practice. Before analysing the knowledge component, one needs to understand the exposure students previously had to the actual e-filing platform. Students were thus asked if they had ever visited the platform. The responses revealed that 48.8% of the students had visited the platform before; 45.9% had

never accessed the platform; and 5.2% were not sure if they had ever visited the platform. Subsequently, to get a more detailed understanding of what functionality the students had previously visited or used on the actual platform, those who answered 'yes' to the previous question were asked to select all [1] of the functions they had visited or made use of. The results are summarised in Figure 2, showing that 70.2% of students who had previously been exposed to the platform (48.8% of the total respondents) had completed a tax return, while only 39.3% had submitted a tax return on e-filing. This data lead to the conclusion that the students in fact had limited exposure to the functionalities of the actual e-filing platform.

Although the majority of students had not had extensive practical exposure to the actual e-filing platform, all of the students had been exposed to theoretical training regarding the TAA in their current course content. To gauge students' confidence in their own theoretical knowledge, the students were asked to rate their knowledge of the TAA. Figure 3 provides the results to this question: the majority of students felt that their knowledge of the TAA was average (51.2%), above average (35.5%) or even far above average (5.8%). Only 7.6% of the students rated their knowledge as below average (6.4% as somewhat below average and 1.2% as far below average). The results therefore indicate that 92.5% of the students had confidence in their theoretical knowledge of the TAA.

To gain an understanding of students' perceptions of the practical usefulness of the e-filing simulation, students were asked, in the prequestionnaire, if they believed that the simulation would assist them in applying their theoretical knowledge of the TAA in a practical scenario. The same question was asked again once the students had been exposed to the simulation. The responses are summarised in Figure 4. It is clear from the data that the students did believe that the simulation would assist in enhancing their theoretical knowledge, and their perceptions only changed slightly once they were exposed to the simulation.

A cross-tabulation (refer to Figure 5) was also performed on the above questions to show how the expectation of change in confidence prior to the simulation agrees with the actual reported change post the simulation. 93.0% of the students expected an improvement prior to simulation, while 90.7% reported an improvement post the simulation. Therefore, not all the students that expected an improvement reported an improvement. However, 86.6% of the students who stated they expect an improvement also reported an improvement in confidence post the simulation. 5.8% of the students were uncertain if they would experience an

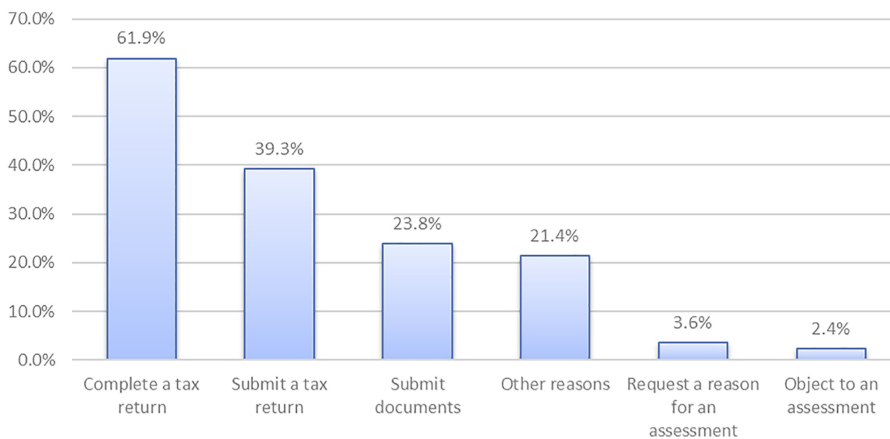
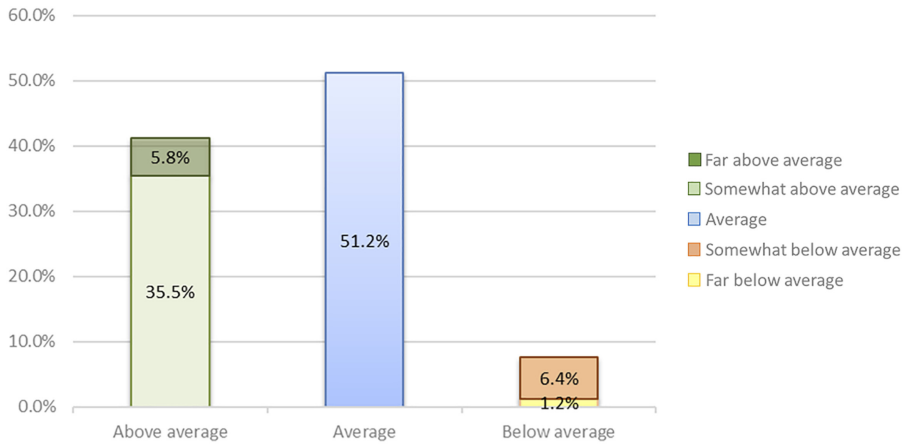


Figure 2. E-filing functions visited or performed

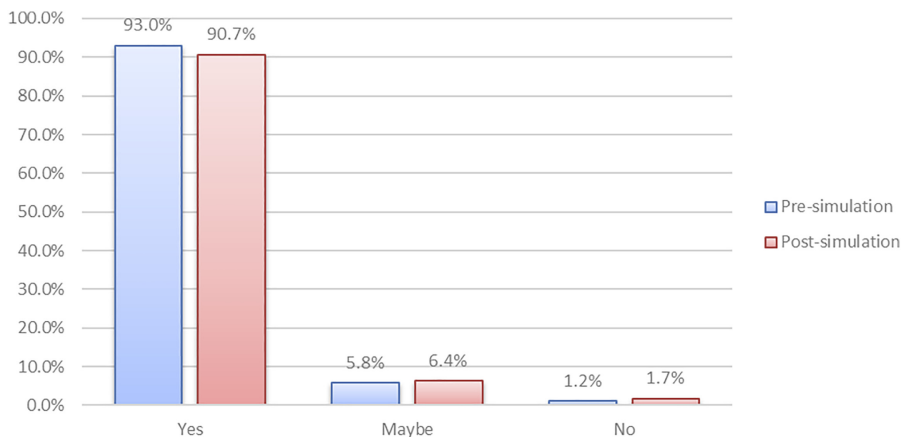
Source(s): Authors' own

Figure 3.
Students' ratings of
their own theoretical
knowledge of the TAA



Source(s): Authors' own

Figure 4.
Perceptions of
improvement in
applying theoretical
knowledge



Source(s): Authors' own

improvement. However, 3.5% of the students were uncertain prior to simulation and these students then reported an increase in confidence post the simulation. 0.6% of students who did not expect an improvement, then reported an improvement post the simulation.

A Fisher-Freeman-Halton's exact test was used to determine if there was a significant association between expectation of a possible improvement and reported improvement after the simulation. The results indicate that there is a statistically significant association between these two variables at a 1% level of significance ($p = 0.004$).

Once the students had been exposed to the simulation, they were asked for their feedback on how they had experienced the simulation; this feedback was overwhelmingly positive. The results (included in Figure 6) were that 91.9% of the students indicated that their experience had been good (68.0% extremely good and 23.8% somewhat good); 6.4% indicated that their experience had been fair (neither good nor bad) and just 1.7% indicated that their experience had been bad (1.7% somewhat bad and 0.0% extremely bad).

Despite the positive responses to the simulation, it is important to gauge whether it was valuable to the students' actual learning. The questions in the postquestionnaire therefore asked whether the experience had enhanced the students' TAA knowledge and whether they believed that the simulation would help them with practical real-life scenarios. The results of these questions are summarised in Figure 7. Of the respondents, 86.7% were positive that the simulation enhanced their TAA knowledge, and 98.3% indicated that the simulation would indeed assist them in future practical situations. These results confirm the conclusion from Best and Schafer (2017) that a simulation can improve preparedness to work in a professional environment. The results also support the goals of a simulation through their indication that learning and gaining insights using simulations are virtually undoubted (Maier and Grobler, 2000).

Further confirmation of the positive value of the simulation for the students can be found in the following comments received from the students:

Thought it was a fantastic learning experience.

This will make learning much better because we get to see where we will apply the things we learn.

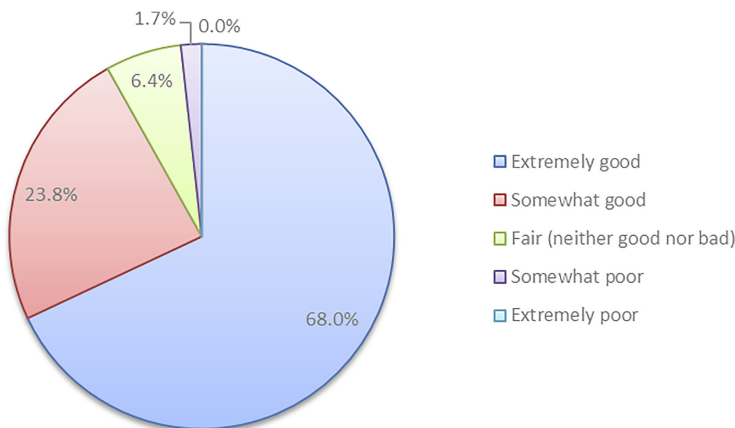
The experience was enjoyable to see how to apply the theory in a practical way.

This was really such a great learning opportunity as I could see how everything fits in together.

		<i>Confidence in applying theoretical knowledge to practical scenarios improved?</i>			TOTAL
		Yes	Maybe	No	
<i>Do you think that your confidence will improve if you are exposed to a simulation?</i>	Yes	86.6%	4.1%	2.3%	93.0%
	Maybe	3.5%	1.7%	0.6%	5.8%
	No	0.6%	0.6%	-	1.2%
Total		90.7%	6.4%	2.9%	100.0%

Source(s): Authors' own

Figure 5. Cross-tabulation – confidence in applying theoretical knowledge



Source(s): Authors' own

Figure 6. Experience of using simulation

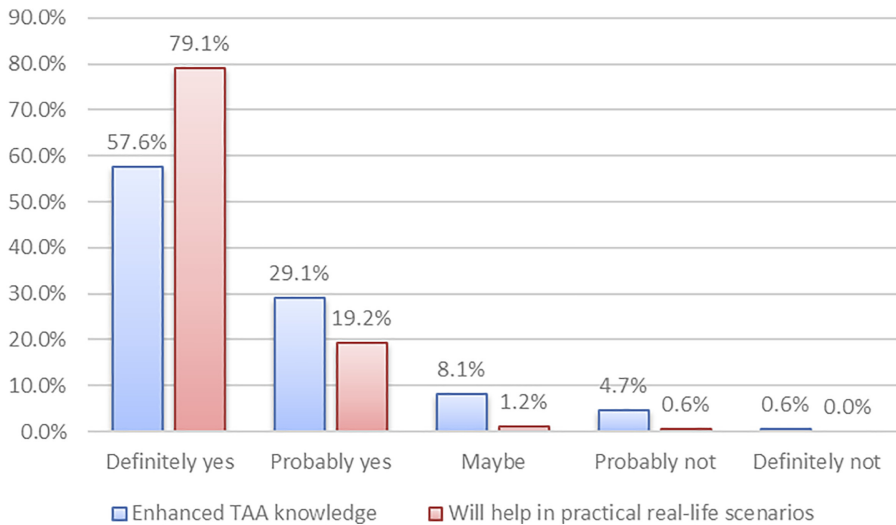


Figure 7.
Value of simulation to actual learning

Source(s): Authors' own

Ultimately, a comparison was drawn between the students' confidence levels in applying their knowledge of the TAA before (prequestionnaire) and after (postquestionnaire) their exposure to the computer simulation. The results of this comparison are included in the cross-tabulation in Figure 8, in which it is apparent that after the simulation, 101 students (58.7%) felt that their confidence had definitely improved and 55 students (32.0%) felt that their confidence had probably improved. This means that 90.7% of the students felt more confident after the simulation.

Prior to the simulation, 111 students (64.5%) had a lack of confidence in practically applying their knowledge. After being exposed to the simulation, 100 (sum of the shaded area) of these 111 students felt that their confidence had improved. This means that 90.1% of the students who had lacked confidence ultimately felt that their confidence had improved (or 58.1% of all students). A Fisher-Freeman-Halton's exact test was used to determine if there was a significant association between confidence in practical application prior to the simulation and reported confidence after the simulation. The results indicate that there is a statistically significant association between these two variables at a 1% level of significance ($p = 0.003$).

Improvement in confidence and in general understanding of the TAA is also apparent in the following comments received from the students:

Absolutely loved this experience. It was amazing to see how our work is actually applied. I now know that I am able to help myself and my family members to submit their e-Filing.

As soon as I say to anyone that I'm studying to be a CA(SA) they ask if I can fill out their tax return, after today I feel like I could definitely help them!

This was extremely helpful and made e-Filing less daunting.

The experience was great and I felt like it was real, like when you are in a company assisting clients.

I enjoyed working on the platform and think that exposure to the practical application adds value to my learning experience. I found the simulation to be very beneficial to apply my theoretical knowledge to a practical scenario. I really enjoyed the session.

		<i>Did confidence in practical application improve post-simulation?</i>					TOTAL
		Definitely yes	Probably yes	Maybe	Probably not	Definitely not	
Confidence in practical application pre-simulation	Far above average	1.7%	0.6%			0.6%	2.9%
	Somewhat above average	22.7%	7.6%	1.2%	1.2%		32.6%
	Average	31.4%	19.8%	2.3%	0.6%	0.6%	54.7%
	Somewhat below average	2.9%	4.1%	1.7%			8.7%
	Far below average			1.2%			1.2%
	TOTAL	58.7%	32.0%	6.4%	1.7%	1.2%	100.0%

Source(s): Authors' own

Figure 8. Cross-tabulation of change in confidence in applying the TAA before and after the simulation

Conclusion

The current research asked: to what extent will the e-filing simulation improve students' confidence to practically apply their theoretical knowledge? The results indicate that the confidence of students improved extensively through the use of the e-filing simulation, leading to the students' feeling confident enough to advise family and friends on the functionalities available on the actual platform.

From the results, it is apparent that the students were inspired with confidence in getting to terms with the application of the TAA in a real-life scenario. The computer simulation provided the platform for learning to take place in a practical environment without the risk of errors that would translate into real financial consequences.

The contribution of the research is therefore confirmed, as it highlights a possible teaching intervention to support the training of future tax professionals in practical application skills. A further contribution is thus the enhancement of education in the field of taxation, particularly with the results' showing that the students experienced high levels of increased confidence in their application of theoretical TAA knowledge to real-life scenarios.

As a final conclusion, the results of this study confirm that the use of simulations – more specifically, computer simulations – in the field of taxation is of vital importance, as the future follows a digital pathway. The education environment can gain substantial benefits by further investigating the use of computer simulations in the training of taxation professionals.

Notes

1. Students were able to make multiple selections, meaning that the percentages cited do not add up to 100%.

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