

SERIOUS ABOUT GAMES

*Special kinds of video games
can revolutionise teaching and
learning – and the Western Cape
game development industry can
deliver them.*

Author
Nicholas Hall, CEO, IESA

Co-authors
Mandy J Watson and Adoné Kitching



Introduction

Why should you care about video games?

Globally, games are a \$100bn dollar industry (bigger than film or music) with nearly 2 billion people playing games on various devices.

Consumers of digital video games in South Africa are increasingly diverse. Across all demographics of race, gender and household income, more people are playing games on their PCs, consoles and mobile phones than ever before. Likewise, the local game development industry has – over the last 20 years – become increasingly sustainable, productive and globally competitive.

In short: South Africans like to play video games, and they know how to create them. But, crucially, games also offer the opportunity to move beyond entertainment into the realms of learning and social change.

Enter: **serious games**.

The Serious About Games initiative – launched in 2016 by the Cape Innovation and Technology Initiative (CiTi), supported by Interactive Entertainment South Africa (IESA), Cape Craft and Design Institute (CCDI), 67 Games and funded by the Western Cape Provincial Government's Department of Economic Development and Tourism (DEDAT) – signals a commitment to supporting not only the South African game development industry, but also the serious games sector. As an introduction to this initiative, this report provides a definition of the concept of serious games and illustrates their value as tools for education, as well as for attitude and behaviour change. We are especially concerned with the potential for serious games to address prevalent social challenges throughout South Africa, and particularly in the Western Cape.

The report also provides an overview of the national and provincial game development industry, in order to show that the skills and infrastructure required to develop high-quality serious games already exist locally. We also consider the makeup of the local audience, and point out the implications of demographic trends for the development of serious games. The report closes with next steps to consider when setting out to develop a serious game.

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An introduction to serious games

Why games?

As most players of games already know, well-developed games have a knack for creating an immersive experience that eclipses other forms of entertainment. They permit escapism, and offer environments in which players feel comfortable to explore complex challenges and situations safely and – should the topic addressed in the game be controversial – without experiencing social stigma.

In these aspects alone, games make great tools for learning. But – unlike books and television, which also permit escapism – games are immediately interactive. In their direct engagement with players (which motivates them to continue playing and therefore learning) and in their offering of real-time feedback for players' decisions and actions, well-developed games help players assimilate and accommodate new information rapidly and often. This interactive learning is usually used for entertainment purposes, as players work to attain and develop new in-game skills and techniques that will ultimately enable them to beat 'boss' characters and advance the game's storyline.

Crucially, however, immersive interactivity may be harnessed for out-of-game learning purposes, which are commonly gathered under the umbrella term of 'serious games'.

What are 'serious' games?

The term 'serious games' can be tricky to define, mostly because it's still a relatively new concept in video game development and study.

In helping us define serious games, however, it is important to note what serious games are not. Serious games are not mere simulations or

gamifications of tasks or everyday experiences. Simulations and gamifications can be interactive electronic experiences, but they are not necessarily games.

Serious games are still recognisable as video games, but they differ from other games in that they are not made solely for entertainment or for financial gain (e.g. games on mobile phones that require micro-transactions to play). The intention of serious games, in contrast, is to educate; generate academic data (such as scientific or medical information); to enact social change by enabling attitude, perception and behaviour modification; and/or to assist with physical or psychological rehabilitation.

Are simulators serious games?

Simulators are a form of game-based learning that is designed to replicate a real-world situation as accurately as possible, to allow players to learn and practice skills without putting themselves, others, or expensive equipment at risk. Simulators, or simulation software, are thus used for the training of pilots and astronauts, surgeons, and engineers. Serious games, in contrast, usually use imaginative, often fantastical environments to accomplish their goal. They are a form of escapism with an underlying altruistic intention.

The pitfalls of gamification

The concept of gamification is often conflated with games and game-based learning. Despite its name, gamification is not about video games. Instead, gamification refers to the practice of using game systems or concepts to make an experience that is not a game more enjoyable, or to motivate a person (e.g. a consumer or customer) to accomplish tasks that otherwise would be avoided or done reluctantly. The most common form of gamification is the awarding of badges or experience points to users of non-game digital platforms, and the creation of leaderboards for these platforms to show users' rankings and 'progress' compared to their peers.

Gamification taps into a deep-seated desire to receive rewards and recognition. It taps into what psychologists call 'extrinsic motivation', which is the desire to do something to receive a reward or so as not to disappoint a mentor figure, which could lead to punishment. Extrinsic motivation, it must be said, is not limited to gamified platforms: in fact, many badly-developed games also resort

to these tactics – such as focusing gameplay on hard-to-attain achievements or collectibles to keep gamers playing – often because their bottom line depends on gamers staying around long enough to watch ads or in coercing them to make in-game purchases to continue playing or power up. It is worrying that extrinsic motivation, whether in games or gamified platforms, can set up environments in which addiction can flourish. Susceptible gamers may no longer enjoy the game they're playing but will nonetheless feel compelled to continue because they want to prove their superiority on the leaderboards or can't fight off their desire to collect all in-game achievements.

Gamification is thus not an effective tool for teaching or behaviour modification, chiefly because gamification is designed to coerce people into doing a task they otherwise would probably not do. An unintended consequence of this is that people participating in gamified activities often figure out shortcuts to achieving the reward goal, which may bypass the game developer's intended outcomes entirely. Gamification focuses users not on the

positives that an experience may offer – such as enjoyment for the sake of enjoyment, which sets up an ideal condition for learning – but rather on getting past the experience as quickly as possible.

Categorisations of serious games

Serious games, like all video games, come with a variety of distinguishing and defining characteristics. Before one begins seriously to discuss, design, or assess serious games, one must become familiar with these various characteristics, and how they affect the content and format of the game (refer to Table 1).

Clearly, there are as many approaches to serious games as there are issues to be addressed. For all serious games, however, the game's objectives and target market need to be understood clearly during its design phase. This then needs to be balanced with creating an appealing, attractive and enjoyable experience.

Characteristic	Examples
1. Platform	Personal computer (PC), Sony PlayStation, Microsoft Xbox, Nintendo Switch, cellular phone (e.g. Apple iOS, Android), etc.
2. Subject Matter	Sustainable development, World War II, physics, Shakespeare's works, water systems, etc.
3. Learning Goals	Language skills, historical facts, environmental awareness, etc.
4. Learning Principles	Rote memorisation, exploration, observational learning, trial-and-error, conditioning, etc.
5. Target audience	High-school children, nurses, law students, general public, pre-school children, military recruits, entrepreneurs, etc.
6. Interaction mode(s)	Multiplayer, co-tutoring, single-player, massively multiplayer, tutoring agents, etc.
7. Application area	Academic education, private use, childhood development, professional training, research, etc.
8. Controls/Interfaces	Gamepad, mouse and keyboard, Wii balance board, touchscreen, virtual-reality headset, etc.
9. Common gaming labels/genre	Puzzle, action, role play (RPG), card game, quiz, platformer, etc.

Table 1. Categorisations of serious games

This table is adapted from <http://www.eludamos.org/index.php/eludamos/article/viewArticle/vol4no1-2/146>

Examples of serious games

At this point, talking about serious games in the abstract is of limited use. The best way to understand what serious games are and what they are used for – as well as how they are funded and why – is to look at examples of recent successful serious games.

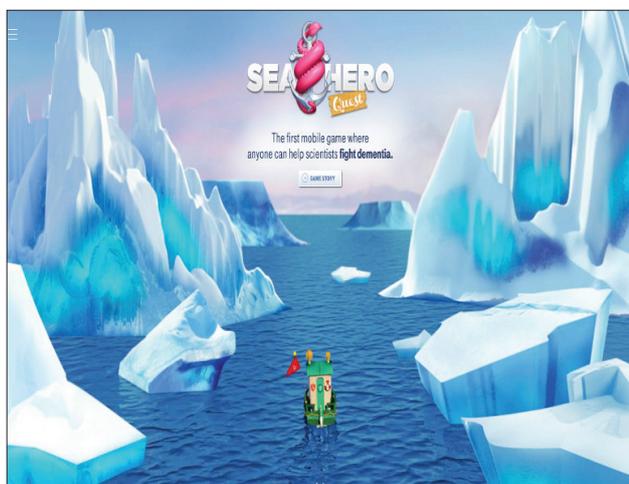
Sea Hero Quest

Q RESEARCH

<http://www.seaheroquest.com>

One of the first symptoms of dementia – a growing problem worldwide – is problems with spatial navigation. To generate data about how the brain solves navigation challenges, scientists and spatial-navigation experts from Alzheimer's Research UK, University College London, and the University of East Anglia partnered with UK game developers Glitchers to develop *Sea Hero Quest*. In the game, which is funded by Deutsche Telekom and is available for iOS and Android devices, players take on the role of a young man who tries to help his seafaring father find his memories, which have been lost due to dementia.

Players are tasked with navigating a boat through water courses and around obstacles to reach waypoints and shoot flares. Increasingly complex and confusing environments present new challenges for players, whose movements are logged by the game. With permission, this data is sent back to the researchers, along with a few personal details such as age and gender, to add to the data set that is available for evaluation by researchers. This is especially useful, as two minutes of gameplay is estimated to generate the equivalent of five hours of research data gathered via one-on-one consultation. Using this metric, six thousand years' worth of data has already been gathered from more than two million people worldwide – an otherwise impossible task.



Breakaway

★ ATTITUDE CHANGE

<http://breakawaygame.com/play.php>

Breakaway is a web-browser-based, Flash-powered game that is aimed at boys between the age of nine and 14, in which the players find themselves as part of a soccer team that is trying to reach a tournament final. Making choices related to gender equality affects the team's progress – positive choices result in the player eventually winning the game. *Breakaway* was developed by students at the Emergent Media Center at Champlain College in the US in collaboration with behaviour-change experts from the Population Media Center and was funded by the United Nations Development Programme and the United Nations Population Fund, as part of the UNiTE Campaign To End Violence Against Women.

Measurable results included a significant change in attitude when players were asked whether girls could play soccer. Behavioural change was also effected, chiefly because players are led to make their own decisions, intentionally framed by constraints in the game, and the results of those choices immediately become apparent. The game has been played in over 185 countries and has resulted in the creation of mixed-gender children's soccer camps for the first time in places like El Salvador and the Palestinian Territories, because children's exposure to the game has resulted in a cultural shift to an understanding that girls are equal to boys and just as competent as soccer players.

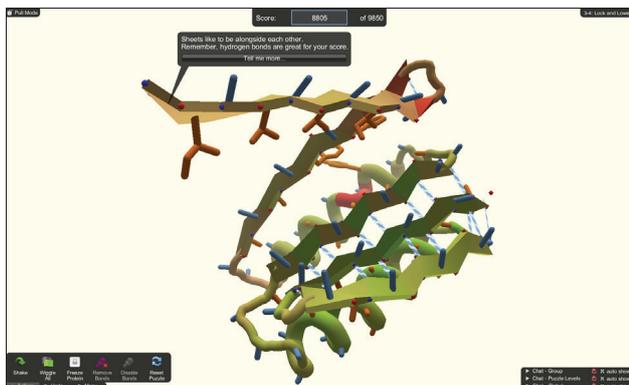
Foldit

RESEARCH

<http://fold.it/portal>

Foldit is a puzzle game for Windows, Mac OS, and Linux computers that is based on the concept of protein folding. Essentially, every type of protein folds into a unique shape at which it is at its most stable; understanding how a protein will fold is the main key to knowing how to target it with drugs. Although simulations can be run by computers to determine the optimum folded shape of proteins, the human brain's three-dimensional pattern-matching and spatial-reasoning abilities are superior to machines. The game's developers regularly release new puzzles based on specific proteins and diseases and the highest scoring results are then analysed by researchers.

Foldit was developed in 2008 by the Center For Game Science at the University of Washington's Department of Computer Science and Engineering, in collaboration with the University of Washington's Department of Biochemistry. Currently, the game is still being used to generate data for researchers. In 2011, it resulted in a major scientific breakthrough when players were able to model the enzyme for Mason-Pfizer monkey virus (M-PMV) retroviral protease, which causes HIV/AIDS in monkeys. It took the best players 10 days to come up with a solution, which had plagued researchers for 15 years. *Foldit* has also assisted with diseases such as tuberculosis, influenza, and cancer. (A secondary research goal of the game is to help with the designing of new proteins that can be used to treat diseases.)



A similar game that uses human-devised solutions to puzzles to aid in research is **Decodoku** (<http://decodoku.blogspot.ch>), a mobile game for iOS and Android that was developed by physicist James Wootton from the Department of Physics at the University of Basel. The game presents puzzles that tackle quantum error correction and the answers, which are superior to computer-generated attempts, are helping Wootton with his research into 'methods that allow information to be encoded and then decoded again using quantum mechanics'.

Dig Rush (Therapy)

Therapy

<http://www.amblyotech.com/product.html>

Dig Rush was created through a partnership between Amblyotech and Ubisoft, a AAA-game developer (the gaming equivalent of a large Hollywood studio) known for its *Assassin's Creed* series, using inventions patented by doctors from McGill University. *Dig Rush* is used as a therapy for amblyopia, more commonly known as lazy eye. The game requires the player to use 3D glasses to force each eye to see different elements of the game on the screen, which increases visual perception. The game, which is primarily available for tablets but is also presented on phones and computers, is only available on prescription, as it is specifically configured for each player based on the severity of the patient's disease. Additionally, the game helps patients avoid the stigma of having to wear an eye patch, which research has demonstrated isn't very effective anyway, and results in an environment that makes the therapy feel entertaining.



Minecraft in Education

At Micklefield School, an independent girls' primary school in Cape Town, Keshma Patel, a Microsoft Innovative Educator, uses Minecraft as a teaching aid to augment school subjects. In one class, her learners were tasked to work together to build the school within the massively popular 'sandbox' adventure game Minecraft, which required physically measuring the school with a trundle wheel, checking their results using Google Earth, and doing calculations to convert one metre squared in the real world to one block in the in-game environment. As a result, Patel's learners are realising how skills and information they learn in school classes and online can be applied in the real world.

Understanding game-based learning: what makes for a good serious game?

Many well-developed games (both games for entertainment and serious games) create conditions in which 'intrinsic motivation' – the desire to do something because it is enjoyable – flourishes. Gamers play not just to receive a reward, but because the experience is engaging, often because it balances challenges and skills into a state that is 'pleasantly frustrating' and offers a sense of autonomy to the player. This is the ideal state in which to facilitate learning, because players feel that they are being challenged but that they are also developing the skills to match the challenge. If either of these conditions fall out of balance then players either become frustrated because they cannot solve the problem, or bored because they match challenges too easily.

The balance between entertainment and education is thus important in serious games. One must first create an immersive, escapist, risk-free experience for gamers to practise and master skills, and then learn how to apply them – initially within the game and then in the real world. It is key for a game, throughout the course of its gameplay, to teach players concepts and systems, whose mastery can be tested via increasingly difficult challenges within the game. If gameplay and learning environments are implemented badly then the outcome, at the very best, would result perhaps only in the memorisation of material, and not the acquisition of skills.

It can be useful to use existing tried-and-tested methodologies for knowledge transfer and attitude change when first designing serious games, and to marry these with already-established game mechanics. *Breakaway*, for example, used the Sabido Methodology to tell its story, which was devised by Miguel Sabido in the 1970s for soap-opera storytelling in Mexico. Sabido Methodology later spread to other countries tackling social issues and stigmas, in which positive, negative, and transitional – or uncertain – characters are used to sway audience opinion or enact behavioural change on serious subject matters. In Sabido narratives, transitional characters are the eyes of the audience within the story and have ambivalent opinions about the choices that the good and bad characters make, but are ultimately written to work towards a desired behaviour, which the audience then tends to take on board as its own behaviour.

Whatever format it is applied to, Sabido Methodology advises that content be balanced to be 70% entertaining and 30% educational, which is key to keeping consumers engaged without making them feel as if they're being assaulted with an educational message. Sabido storylines also give audience members a non-threatening context for discussing topical issues with peers without feeling stigmatised, which ultimately results in social acceptance of issues.

How can serious games be applied locally?

1. Tackling social problems

Serious games are an ideal mechanism for tackling social problems in the Western Cape, such as drug addiction, gangsterism, racism, homophobia, xenophobia, gender equality, and abuse against women and children, as well as generating awareness and behaviour change related to social issues such as recycling, water conservation, and electricity usage.

Many of the Western Cape's social problems can be tackled using game concepts based on *Breakaway*'s gameplay model, or through choose-your-own-adventure-style text adventures (which would work on older model phones, reducing data costs). This would allow players to learn about consequences through making active storyline choices and giving them a safe way to discuss issues with their peers. These are, however, only two viable methods of creating a serious game, which is why it's important for funders to partner with a development studio that understands how best to interact with a specific target market.

As is indicated by examples such as *Sea Hero Quest* and *Breakaway*, games are also viable methods for gathering data about players, including behaviour patterns, opinions, and even how players solve problems presented to them. This can help funders and developers understand more about problems they wish to address, and can be achieved by monitoring what players do in the game remotely through the gathering of data that is sent back to the developers or researchers. (This, of course, opens up privacy issues that have to be acknowledged and addressed responsibly.) Data can also be gathered physically by observing how people play the game at a community gaming event, as well as what conversation is sparked among the players after they have experienced the game.

2. Advancing research in science and technology

The Western Cape is home to four universities, each known for their pioneering academic research. The province is also home to the fastest supercomputer in Africa (at Cape Town's Centre for High Performance Computing), which is made available to qualifying academics to help them process data from their research. Previously, many researchers had to partner with institutions overseas that had supercomputer facilities as South Africa didn't have the infrastructure to cope with their needs. (It did have supercomputers but they weren't powerful enough.) But now, researchers are able to complete their work closer to home. Serious games could help in the creation of new research, by allowing more researchers, who previously wouldn't have had a mechanism to deal with large volumes of data, to generate more easily information for new kinds of academic projects.

3. Supplementing education

Schools are increasingly incorporating devices, such as notebooks and tablets, in their curricula, but are often hampered by badly-designed educational apps that don't do a very good job of helping children to learn new skills and master them. There is lots of scope for developing serious games that teach skills that will be required in the future knowledge economy, as well as creating content that is localised for South Africa's many cultures and languages.

The Cape Innovation and Technology Initiative (CiTi) launched Africa's first EdTech cluster in 2017, and will also explore how game-based learning can be applied in education.

4. Advancing medical therapies

The Western Cape has been a pioneer in medical breakthroughs and innovations, such as the first heart transplant and the first penis transplant. Additionally, the headquarters of nearly half of the country's medical-device manufacturers are based in the province. As a result, the Western Cape Department of Economic Development and Tourism, in partnership with the national Department of Science and Technology, is investing up to R600 million in the development of the Cape Health Technology Park, which will be based in Pinelands in Cape Town. *Dig Rush* is an excellent example of the kinds of therapeutic serious games that could be developed as a result of the province's investment in medical innovation.

5. Advancing innovation

The Western Cape, and Cape Town in particular, is focused on becoming the continent's entrepreneurial and technological-innovation hub through the efforts of initiatives such as Silicon Cape and CiTi (the Cape Innovation and Technology Initiative). In fact, this ecosystem has resulted in the exponential growth of the games-development sector relative to the rest of the country. (This is discussed in detail later in this document.) This ecosystem fosters incubation of all sorts of startups that require innovative ways to generate data and scale impact, such as through the means of serious games.

The local game development industry and audience

A short history of game development in SA

Game development in South Africa is a young industry, but is growing, and growing consistently. Over the last three years, Make Games South Africa (MGSA) and Interactive Entertainment South Africa (IESA) have established a baseline assessment of the status of game development in the country through annual industry surveys.¹ The results of these surveys indicate that revenue generated by the South African game development industry has increased from R29.7M in 2014 to R100M in 2016. This spike results, in part, from the release of locally developed, internationally acclaimed titles such as *Stasis* (August 2015) and *Broforce* (October 2015). But the results of the 2016 MGSA and IESA survey also show that 103 games were released commercially in that year. The increase in revenue therefore also points to the growing strength of the industry in general.

The genesis of commercial game development in the country can be traced to the release of *Toxic Bunny*, by Celestial Games, in 1996 (see sidebar). While more commercial studios emerged in the 2000s, it was only a decade later that the independent (or 'indie') game development scene really picked up. In 2016, nearly two thirds of respondents to the MGSA and IESA survey indicated

that they had been operating for five years or less. (Countries like the United States, the United Kingdom and Japan, in contrast, have enjoyed active game development industries since the 1980s.) On the one hand, the relative immaturity of game development in South Africa means that the industry still has to endure some growing pains. On the other hand, this creates an opportunity for evolution and innovation.

Toxic Bunny

Toxic Bunny, released in 1996 by Celestial Games, is considered to be the first commercially successful game made in South Africa. It is a side-scrolling action platform game, in which the player explores a planet covered in decaffeinated goo as the titular character Toxic. The game originally sold over 100 000 copies, and was re-mastered and re-released as Toxic Bunny HD in 2012.

Drawing largely on the results of the MGSA and IESA surveys, the following sections in this report provide an overview of the South African game development industry both at national and provincial scale.

The current state of South African game development studios

Recently, the game development industry has begun to mature, which has resulted in smaller studios merging with larger, more sustainable studios. Thus a comparison of MGSA and IESA industry survey results indicate a sharp decline in the number of active game development studios in the last two years, from 40 in 2014 to 31 in 2015. (See the side bar on page 8 for a roundup of influential figures in the local industry, and the side bar on page 9 for a roundup of the biggest studios in South Africa.)

The Western Cape has always been home to the highest number of full-time game development studios in South Africa. In recent years, it has also become a preferred destination for studios relocating from other provinces. RetroEpic Software, for instance, was started in KwaZulu-Natal in 2007, but has since relocated to Cape

¹ The reports are available here:

2014 - <http://www.iesa.org.za/wp-content/uploads/2016/12/MGSA-2014-Industry-Survey-Results.pdf>

2015 - <http://www.iesa.org.za/wp-content/uploads/2016/12/MGSA-2015-Industry-Survey-Results.pdf>

2016 - <http://www.iesa.org.za/wp-content/uploads/2016/12/IESA-2016-Industry-Survey-Results.pdf>

Town where the studio develops both independent and commissioned games.² The popularity of the Western Cape as a destination for game developers is primarily attributed to the strong local gaming community (both professional and hobbyist), and to the presence of a strong film and creative arts industry, which offers potential crossover in terms of skills and support.

Cape Town is particularly popular with South African indie game developers. Of the 17 studios based in the Western Cape, 15 are located in Cape Town. The other two are located in George and Somerset West, with George being an interesting case, as it has been the incubator for a handful of successful studios. Jason Reid, the founder of Fuzzy Logic, has cited George's local culture, gaming community and scenery as the main aspects as to why the studio established itself there.³

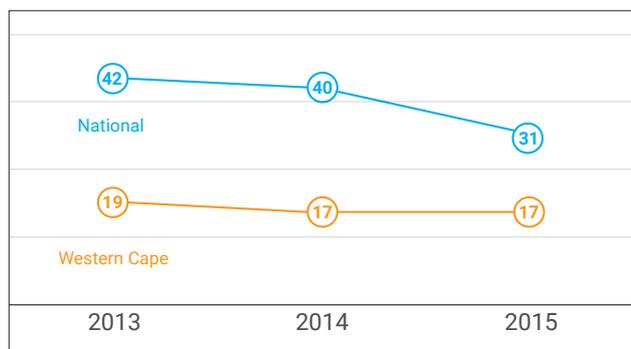


Figure 1. Number of active development studios (IESA 2016)

Nick Hall (Interactive Entertainment South Africa)

As South Africa's leading digital entertainment lawyer, Hall has provided legal and business advice to some of South Africa's largest and most successful game development studios. He is the founder and CEO of Interactive Entertainment South Africa (IESA), a non-profit organisation established to help grow the local games industry through lobbying and policy advocacy.

Regina Kgatle (Educade and 67games)

Kgatle, an engineer and innovator by trade, founded the non-profit organisation Educade, which builds and rents out standalone arcade machines for educational purposes. Regina also launched the 67games initiative, which aimed to collect and distribute 67 educational games for Mandela Day in 2016. Her work in serious games has been recognised both locally and internationally.

Influential figures in the South African game development industry

Danny Day (QCF Design)

Some consider Day to be the 'father' of the indie game development movement in South Africa. He was instrumental in establishing Game.Dev and Make Games South Africa – both very successful online game development communities. He is also an award-winning game designer. (Desktop Dungeons, which Day co-created, won the global Independent Games Festival Award for Excellence in Design in 2010).

Evan Greenwood (Free Lives)

Greenwood is the founder and CEO of Free Lives, and the mind behind South Africa's best selling consumer games. He also contributes to the industry by way of 'design salons' to discuss game design and by allowing smaller studios to attend local gaming expos via the Free Lives stand. Free Lives also sponsored the South African Game Jam in 2016, which gave professionals and hobbyists alike an opportunity to collaborate, hone their skills, and receive recognition for their work.

Hanli Geysler (University of the Witwatersrand)

Geysler is the Head of Department and convenor for the University of the Witwatersrand's degree courses in Game Design, which have been recognised internationally for their rigor and quality. Geysler also has been instrumental in bringing international events like AMAZE – an experimental games expo first held in Germany – to South Africa.

Luke Lamothe (24 Bit Games)

Lamothe is one of South Africa's most experienced game developers. He has been active in the industry since 1999, with the founding of i-Imagine. Today his company is one of the most successful service based companies in the industry doing work with major international intellectual properties.

² <http://www.retroepic.com/about-us>

³ <http://www.brainstormmag.co.za/features/12767-start-story-mode>

Job availability and distribution

There has been a consistent, albeit slow, growth in the number of jobs available in the games industry in South Africa. The MGSA and IESA surveys show an increase of 16% in permanent positions offered by local game development studios between 2014 and 2015. The Western Cape has always offered more than half of the jobs available in the local industry, and this proportion continues to grow. The survey results also indicate that – over the last three years – the number of full-time jobs has increased, while the number of part-time/contract jobs has decreased. This suggests that studios have more sustainable cash flows and that they are willing to hire. Overall, the number of full-time and contract jobs combined have increased most in the Western Cape (see Figure 2).

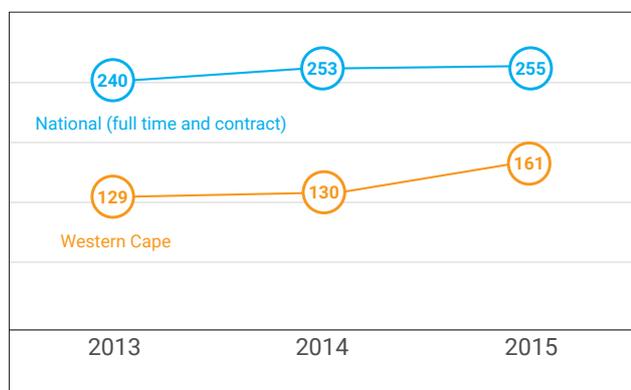


Figure 2. Number of jobs, full time and contract (IESA 2016)

White males currently still dominate the game development industry in South Africa. While the results of the 2016 IESA survey show promising trends regarding the participation of women and people of colour, transformation in the industry will remain a concern in the coming years. In the 2016 survey, respondents indicated that only 14% of their employees were female, and only 13% were people of colour.

The lack of racial diversity in the industry can be attributed to the legacy of apartheid in South Africa, which still underlies differentiated levels of access to infrastructure and education. Black students applying for game development programmes are often unable to meet the entry requirements, or are simply unable to afford tuition and the cost of living that accompanies tertiary education.⁴ Indie game development is also a costly endeavour, since studios or individuals may go years without

generating revenue from their work. This means that developers with limited resources are less likely to explore this option, and will instead pursue more financially viable careers.⁵

Nonetheless, the survey results show that the skills necessary to develop high-quality games are available in the local industry, and that they are beginning to be retained. Along with increased diversity, the need to bridge the gap between entrants and the old guard by ensuring less attrition to better-paying sectors will remain a major concern for the South African game development industry.

Biggest game development studios in South Africa

24 Bit Games (Johannesburg)

As the largest studio in Johannesburg, 24 Bit Games focuses on providing services work to major international clients, including Disney and Unity.

Formula D (Cape Town)

This studio exclusively creates serious games content, and also focuses on making large-scale installation experiences for museums and other educational facilities.

Free Lives (Cape Town)

This is South Africa's largest and most successful indie studio, best known for its hit game Broforce. The game was re-skinned as Expendabros, which served as the official tie-in game for the Expendables 3 film. Free Lives works exclusively in the games for entertainment sector developing its own intellectual property.

Fuzzy Logic (George)

This studio primarily focuses on services work, creating content and applications to be delivered through Augmented Reality.

Sea Monster (Cape Town)

Originally an animation studio, Sea Monster now does services work for clients both in South Africa and abroad. It is one of the few studios actively creating serious games.

⁴ <http://www.polygon.com/features/2016/2/3/10781618/the-game-industry-of-south-africa>

⁵ <http://www.mweb.co.za/games/view/tabid/4210/Article/27696/What-the-2016-IESA-survey-reveals-about-South-Africa-s-gaming-industry.aspx>

Potential barriers to entry for hobbyists

South Africa has a comparatively large hobbyist game development community. This is important for the growth and maintenance of the industry's eco-system, because hobbyists are a great source of new employees and potential new studios.

In 2016, IESA included hobbyists as respondents to their industry survey, the purpose of which was to identify barriers to entry that prevent hobbyists from switching to game development full time. While 96.2% of hobbyist respondents indicated that – given the opportunity – they would like to work full-time in the game development industry, the lack of income associated with establishing an independent studio and the perceived poorer salaries associated with the game development industry were cited as key reasons for not making this shift. Additional reasons included the fear of not having a sufficient portfolio of work to approach established studios; the perceived low number of job opportunities in South Africa; and the low number of studios available to approach.

The results of the survey show that many respondents perceived opening their own studio as the only way to enter the industry formally. Many were not aware of the extent of established studios in the industry with a capacity to hire. A common opinion held among respondents outside of Cape Town was that the formal industry is very tightly knit, and that the only way to get full-time employment at an established studio was to know someone already working at a studio.

The different sectors of South African game development

IESA generally breaks down the game development industry in South Africa into three core sectors:

- Entertainment (games played purely for enjoyment)
- Advertising (games made to promote a brand or product)
- Serious games (games made and played in the interest of education awareness, research, etc.)

In the 2016 survey, the majority of studios at the national level identified games for entertainment as their primary sector. This may be attributed the low levels of revenue generated from local game sales, and the consequent need for local game development studios to cater to global markets. Studios in the

Western Cape follow this national trend. In the province, however, the percentage of studios that identify serious games as their primary sector (18.75%) is higher than the national percentage (11%).

The South African game development industry generated R100M in revenue in 2015. According to the results of the MGSA and IESA surveys, the Western Cape has consistently generated much of this income. In 2015, the province accounted for 77% of the national value.

The results also indicated that locally-sourced income accounts for only 19% of the industry value. And, of that 19%, the sale of games for entertainment in the South African market only accounts for 0.07% of the industry's revenue. That means that local gamers do not buy local games. Rather, the bulk of locally sourced income is derived either from services work in the games for entertainment sector, or from serious games, which follows a similar business model.⁶

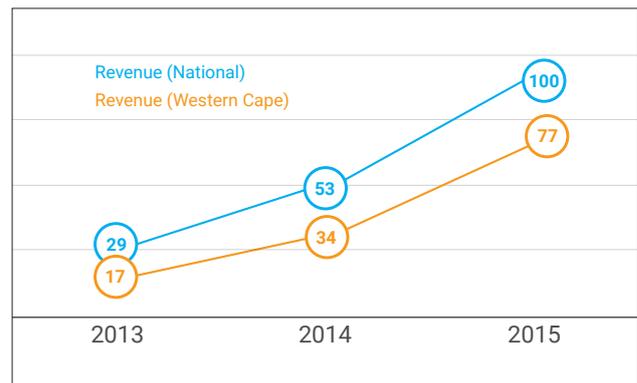


Figure 3. Revenue in South African rands (millions)

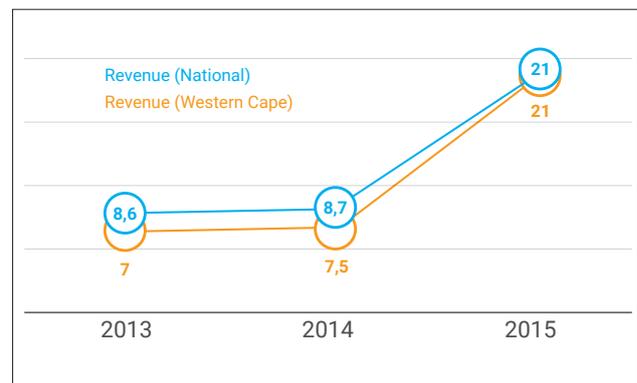


Figure 4. Revenue from serious games (R millions) (IESA 2016)

⁶ A studio is contracted by a client to develop a serious game.

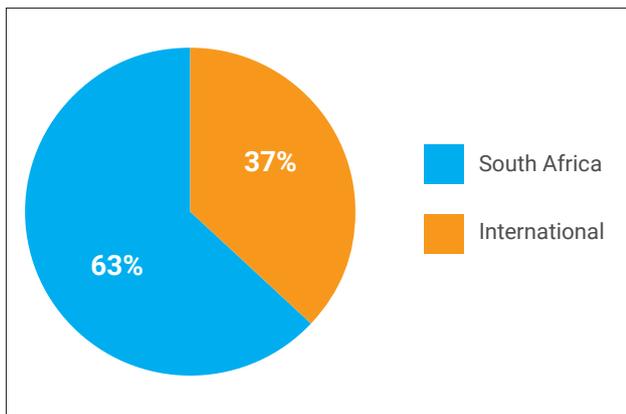


Figure 5. Source of revenue for serious games

While the serious games sector makes up a relatively small portion of the overall industry, it is encouraging to see that it is following the national trend of steady growth (particularly between 2014 and 2015). In 2015, serious games also contributed 11.2% more to the overall industry value than it had in 2014. In contrast to the games for entertainment sector, the serious games sector receives 63% of its income from local sources (see Figure 5).

This may be due to the nature of serious games, which necessitates a deep understanding of local realities and therefore also requires the involvement of a local studio.

Areas for growth in the local industry

IESA has identified the services and serious games sectors as key areas to ensure continued growth in the local game development industry.

Services work

Outsourced development work for larger international studios is particularly well-suited to the South African industry. There are several factors that make the country appealing as a destination for game development contracts.

- South Africa has already established itself as a destination for high-quality work, thanks to the efforts of several key players in the local industry, which have worked for major IP holders in the US and European markets.
- Sharing similar time zones with Europe means accessing these markets is potentially easier, especially for clients that want to exercise a high degree of control, as project management becomes less of a logistical issue. While the time difference is much larger between South Africa and the United States, the 10-hour difference between South Africa and the West Coast of the

United States also allows for easy co-ordination (as teams can meet fairly conveniently in the mornings and evenings).

- The fact that English is spoken with a neutral accent in South Africa has also been identified as a positive aspect to the local industry. Despite the global presence of the games industry, English remains the language of choice for businesses dealing within the global industry.
- Low living costs and a weak currency compared to the US dollar and euro means development costs can be five to 10 times cheaper in South Africa than elsewhere, especially when compared to more developed game development economies.

The one aspect where South Africa fails to compete effectively is with regard to government subsidies. Canada and the United Kingdom offer significant rebates and tax credits to game development projects pursued in their respective jurisdictions. South Africa could cement its place as one of the leading destinations for game development services work if sufficient incentives are put in place to encourage more foreign contracts.

Serious games

- The serious games sector has had the most success at efficiently monetising local sources of income.
- Because serious games help deal with social issues, of which South Africa has many, it is easier to get buy-in from key stakeholders in government and local corporates. Many corporates are starting to realise the value of serious games, both for internal training and for fulfilling their corporate social investment (CSI) obligations.
- Because the client pays for most serious games, getting the capital to start serious games projects tends to be easier than in the games for

Serious games released in SA in 2015

Howzit (*Sea Monster*)

The aim of Howzit is to demystify the world of real estate by giving players the keys to property success. By choosing their property, street, and home, players become part of a virtual community where they are able learn about investments and bonds.

Team C4 (*Formula D*)

Part game, part recruitment tool, Team C4 measures the player's literacy and numeracy, as well as problem-solving and language capabilities. The data is then made available to recruiters and potential employers, which allows prospective job seekers to be placed in positions that align with their skillsets.

entertainment sector. This also allows for easier access to the market, as studios do not need to use loans or company reserves in order to embark on a serious games project.

- There is potential for local developers to start creating products for the African market. While there are a number of games that target other African countries or issues within other African contexts, they are produced by foreign developers. There is a great opportunity for the maxim 'African solutions to African problems' to be fulfilled.

Where to from here?

While serious games in South Africa currently represents a small portion of the overall game development industry, the sections above have shown that this sector is growing. In the coming years, the serious games sector will benefit from a local development ecosystem that – despite its relative youth – consists of increasingly successful and sustainable studios, a growing jobs market and an active hobbyist community. The Western Cape in particular will continue to be a breeding ground for exciting developments in the games industry. That said, in order to support the growth of the serious games sector, it is necessary that game developers with the skills to design and build fun, interactive experiences begin to collaborate with those who understand the significant socio-economic challenges faced in the country.

The purpose of the Serious About Games Initiative is to foster such collaboration, and to serve as a catalyst for more sustained investment in the development of serious games.

The local game-playing audience

When thinking about the consumption of games in South Africa, it is important to recognise that play happens across diverse socio-economic contexts. Gamers in this country are diverse in terms of race, gender, income and platform preference. Given the significant disparity between rich and poor,⁷ gamers in South Africa game on platforms of various levels of sophistication, from state-of-the-art PCs to simple feature phones. This reality should be a major concern for the development and distribution of serious games, as these games are likely to be targeted at resource-constrained populations.

Drawing on PricewaterhouseCooper's (PwC) Entertainment and Media Outlook⁸ and Vizeum's Consumer Connection Survey, the following sections provide an overview of the local game audience both at national and provincial scale.

Consumer market trends

In 2016, Newzoo, a leading international market research organisation for the games industry, valued the global games industry at US\$99.6B. The Middle East and Africa (ME&A) region, of which South Africa forms part, generated US\$3.2B in revenue, accounting for 3.2% of global value.⁹ In 2015, South Africa ranked as the 49th largest games market in the world, accounting for 0.12% of the global market. This implies that there is room for growth in the gaming consumer market across Africa.

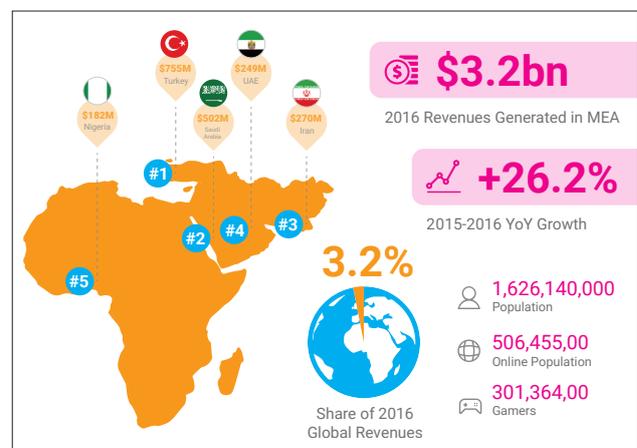


Figure 6: Middle East and Africa games revenue (Newzoo 2016)

The latest Entertainment and Media Outlook study focuses on the years 2015 to 2019. PwC estimates that the consumer market for games was R2.7B in 2015. (It must be noted that the PwC report includes spending on advertising, so the figure is slightly inflated.) According to Newzoo, however, South African consumers spent roughly R1.5B on games in 2015 – this is a more accurate figure, as it only accounts for revenue generated through the sale of games.

The PwC report identifies the 'Casual/Social' sector, consisting of micro-transaction-focused Facebook and mobile games, as having the biggest share of the market. This is followed by the 'Traditional' sector, which consists of PC and console games, both as physical and digital media. The majority of 'Casual/Social' income comes from mobile games

⁷ <http://data.worldbank.org/indicator/SI.POV.GINI?end=2011&locations=ZA&start=2011&view=bar>

⁸ <https://www.pwc.co.za/en/assets/pdf/entertainment-and-media-outlook-2015-2019.pdf>

⁹ http://resources.newzoo.com/hubfs/Reports/Newzoo_Free_2016_Global_Games_Market_Report.pdf

(identified as 'apps' in the report). In the 'Traditional' market, physical sales of games still dominate, though it is on the decline, in comparison to digital (downloaded) sales.

Mobile phones constitute the largest platform for games in the country, accounting for R1.109B in market value. Consoles are the second largest platform, accounting for R785M in market value. Finally, PCs account for a market value of R529M.

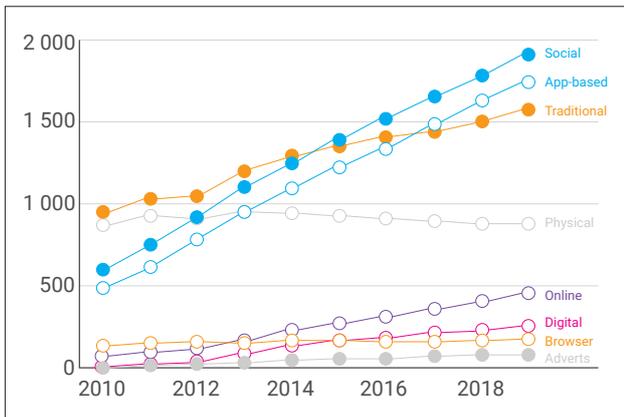


Figure 7: Video game market by platform (R millions)

Mobile and PC sales are showing healthy signs of year-on-year growth, while console sales seem to be slowing down.

Away from these valuable insights, though, neither the PwC nor Newzoo data offer insight into the consumer market for serious games in particular. It is likely that serious games have a relatively small consumer market, because clients fund their development and they are usually distributed among target audiences for no charge.

Consumer market demographics

Vizeum's Consumer Connection Survey gives us some insight into the demographics of the consumer market for games in South Africa. According to the results of the survey (in which the findings from a sample of roughly 6000 respondents were extrapolated to the national population), 11.4 million people play games on PC or console, while 5.8 million play mobile games. In line with national demographics, most (around 80%) of PC and console gamers are black. The survey data shows that a similar trend is evident among respondents playing mobile games.

Of the respondents playing games on PC or console, 56% were male and 44% female. Among respondents playing mobile games, female gamers represented a slightly higher proportion (54%) than male gamers (46%).

Thirty-one per cent of respondents playing games on PC/consoles are between the ages of 15 and 24. The age groups 25-34, 35-49, and 50+ each represent roughly 20% of the rest of the PC/console gaming population. The results show a similar trend among mobile game players, of which 36% are between the ages of 15 and 24. Here, the age group 24-35 represents 35% - a larger proportion than among PC/console game players. Only 7% of mobile game players are 50 and older.

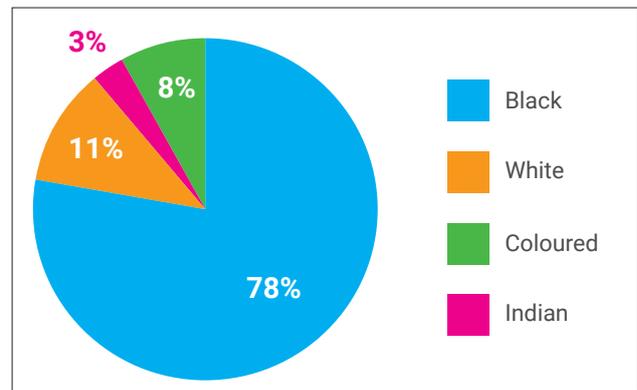


Figure 8: PC/Console gamers race demographics

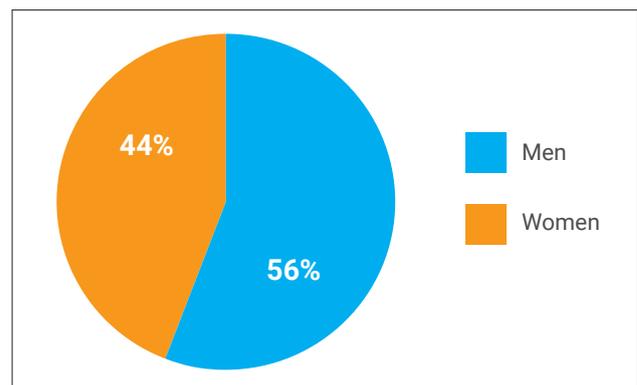


Figure 9: PC/Console gamers gender by percentage

Vizeum's Consumer Connection Survey also offers insight into the employment status of PC or console gamers, as well as respondents who play mobile games. In both instances, the highest percentage of respondents are working full time (37% and 47% respectively). Among PC or console gamers, 12% of respondents are currently unemployed and are looking for a job, while among respondents playing mobile games, this percentage is 13%.

The results of this survey indicate interesting trends in the demographics of gamers in South Africa. It shows that the primary consumers of games are not necessarily white teenagers, as the popular trope goes. Rather, gamers in South Africa are predominantly black, and almost half are female. This reality should be factored into the development of both games for entertainment and serious games in the country.

Going forward with serious games

In the preceding sections of this report, we have defined serious games, explored their potential for addressing prevalent challenges in the Western Cape, and shown that the skills and capabilities needed to create serious games exist in the local game development industry, which – given the right support – will continue to grow. We have also shown that the local game audience is diverse – not only in terms of race, gender and income, but also in terms of their access to gaming infrastructure. The development of a serious game, therefore, is a viable investment for private companies, government departments, or civil society organisations looking to encourage learning or bring about social change.

But realising the power of serious games, and the strength of the local industry, is only the first step. Now, your serious game needs to be made. Here are a few points to keep in mind when setting out to create a serious game. Whether you're a stakeholder commissioning a serious game or a game developer making a serious game, these tips will apply to you.

Partner up

Collaboration is a crucial part of the serious games development process, and should be central to your approach. While game developers are good at designing engaging experiences, they need guidance on how best to deal with the serious subject matter explored through the game. Likewise, while researchers have a good handle on the issues tackled in a serious game, they need guidance on how to best to utilise game mechanics to meet the objectives of learning or behavioural change. The community developing around the Serious About Games initiative will offer a place for interested stakeholders to access information and connect with potential partners.

Know your issue and intended outcomes

In order to make an impactful serious game, you

need to be clear about its purpose. Do you wish to catalyse social change? Are you looking for research data? It is imperative that you develop a deep understanding of the issue that the serious game is intended to address, as well as the context within which it will be played. Stakeholders commissioning a serious game should provide adequate briefs, and commit to a process of exploration and testing with game developers to ensure that the game fulfils its purpose.

Know your player

Understanding the audience that will interact with your game is a critical part of the development process. Instead of making assumptions about the ways in which players will engage with your game, initial research and player-testing with game prototypes will allow you to develop an experience that is engaging, coherent and contextually relevant. Here, game literacy and access to game infrastructure are important considerations.

Time is money

Knowing what it costs to develop a serious game will ensure that stakeholders have realistic expectations of the process. For game developers, this means knowing how to scope a project in line with a budget, and how to put together a robust business plan. For stakeholders commissioning serious games, this means creating better alignment between project objectives and project budgets in consultation with game developers. Often-overlooked costs, such as those involved with the post-release maintenance of a game, should also be considered during the planning and negotiation process. Additionally, you will need to have a plan in place for the game to reach players once it is released. This may require working with other partners to market the game or to organise community gaming events, depending on the game's purpose and target audience.

How much do games cost to make?

In 2013, Flappy Bird – the wildly popular, but fleetingly available mobile game – was made by a single developer over a number of days. It is estimated that a game similar to Flappy Bird, if it were developed by a game development studio, would cost upwards of £5000 (around R80 000 in today's money). In contrast, another popular, but more complex, mobile game, Clash of Clans – released in 2012 – cost upwards of £250 000 (roughly R3 250 000) to develop. These cases show that, when thinking about game development budgets, the quality and scope of the game are major factors to consider.



Resources

Local and international serious game institutions and events

Many events and institutions share information on global trends in serious games. While serious games are in the emerging phase in South Africa, these can serve as a platform for game developers to learn and, potentially, showcase games that come out of the region.

Games for Change

Website: <http://www.gamesforchange.org>

Games for Change is an organisation that is tasked with facilitating the creation and distribution of social impact games with a focus on humanitarian and educational efforts. Games for Change also hosts the Games for Change Festival every year in New York (around July) and provides an excellent platform for people interested in serious games to collaborate network and learn.

Games for Health Europe

Website: <http://www.gamesforhealthurope.org>

Games for Health Europe is a professional community and organisation in the field of applied health games. It provides community support, knowledge and business development efforts to use cutting-edge games, game technologies and innovations improving health and care. Games for Health Europe hosts a conference every year around October.

The Serious Games Institute

Website: <http://www.seriousgamesinstitute.co.uk>

The Serious Games Institute is a division of Coventry University in the United Kingdom. It is a centre for excellence in serious games-applied research, business and study. The Serious Games Institute set up a branch in South Africa in collaboration with North-West University in 2012, which closed in late 2016. (<http://www.nwu.ac.za/sgj/home>).

International Game Developers Association – Serious Games Special Interest Group

Website: <http://www.igda.org/group/serious>

The International Game Developers Association (IGDA) is an international professional association for game developers. The Serious Games SIG serves as a focal point for discussion and debate on Serious Games for developers, academics, and others with an interest in the field from the members of the IGDA. Members and non-members can sign up for the IGDA newsletter: <http://multibriefs.com/briefs/igda>.

Serious Games Summit

Website: <http://www.gdconf.com/conference/sgs.html>

The Serious Games Summit is a breakaway event focused on Serious Games that is held in San Francisco at the Game Developers Conference (or GDC), the largest professional game industry event, held in early March annually.

Serious About Games

Website: <http://www.seriousaboutgames.co.za>

Serious About Games is building South Africa's biggest community of individuals and organisations passionate about the power of games for social impact and education. Watch their website and social media channels for events and other initiatives.

Additional resources

Michael Sutton has curated a list of 45 game-based learning journals publishing research on serious games, immersive learning, gamification etc.: <http://www.slideshare.net/michaeljdsutton/game-based-learning-journals-v3>

The International Journal of Serious Games publishes original papers of significant and lasting value in all areas related to design, development, deployment and assessment of digital serious games, including theoretical and business approaches to serious games. <http://journal.seriousgamessociety.org>

Gamasutra is the leading website dealing with 'the art and business of making games' and regularly publishes articles and updates on serious games: <http://www.gamasutra.com/topic/serious>

Jane McGonigal's books, particularly *Reality is Broken: Why Games Make Us Better and How They Can Change the World* (2011).