

# *A professional development model to facilitate teacher adoption of interactive, immersive digital games for classroom learning*

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## **Abstract**

The benefits of using digital games in the curriculum are well documented in literature. Most teachers who use digital games use short-form drill-and-practice learning games rather than the kinds of games most students would choose to play in their free time. The use of more interactive, immersive digital games (IDGs) in classrooms tends to be sporadic, dependent upon the enthusiasm and ingenuity of individual teachers. Previous studies have indicated that many teachers have concerns about using digital games in classrooms and have difficulties knowing how to best use digital games. This qualitative study presents a professional development model for teachers that was inductively derived through analysing in-depth, semi-structured interviews with 13 educators who have used digital games in the classroom. Implementing this model can help teachers develop attitudes and skills necessary to meaningfully use interactive, IDGs in their classrooms. Evidence suggests that a mentor should have a strong understanding of how to use digital games effectively in classrooms, work with small cohorts of teachers to collegially plan the use of digital games within a unit of class work, trial the unit of work with a small number of enthusiastic teachers, and then implement it with the remaining teachers. This approach is based on interviews with educators who have successfully mentored teachers in their schools to use interactive, IDGs in their classrooms. These educators encountered little resistance from their teaching colleagues. Their approach further supported teachers who were open to the possibilities of using digital games in their classrooms.

## **Introduction**

This paper describes the development of a professional development model, which assists cohorts of teachers to use digital games in their classrooms. The model is derived from the experiences of games-using educators who have successfully mentored their teaching colleagues to use digital game-play in their classrooms. It provides a process for games-using educators to support their teaching colleagues to use rich and immersive digital games (IDGs) effectively in their classrooms and encourages teaching colleagues to collaboratively assess the best ways digital games can be used to further student learning.

**Practitioner Notes**

What is already known about this topic

- Digital games can be beneficial for student learning.
- Whilst there are pockets of innovation, use of immersive digital games is not widespread in mainstream classrooms.
- Barriers exist to teachers using digital games in the curriculum.

What this paper adds

- A professional development model designed to increase the use of digital games for student learning within individual schools.
- The model has three stages in the process: collegial planning, trying it out and spreading the infection.
- The model encourages teachers to value and use interactive, immersive digital games in their classrooms and minimises common barriers to using digital games.

Implications for practice and/or policy

- Educational institutions should consider using games in learning mentors who work with small cohorts of teachers to identify opportunities to use digital games in the curriculum.
- Successful mentors will not be teaching in a classroom full-time, will have a strong knowledge of how digital games can be best used in the curriculum, and will focus on responsively supporting teachers.

**Literature review**

Games are a significant part of students' lives. Brand and Todhunter (2015) note that 91% of Australian children aged five to fourteen play digital games, games which can feel as real and meaningful to the player as everyday experiences (Schell, 2015). Digital games have the potential to be used by educators to build rich, shared experiences between classmates upon which learning can be based (Stieler-Hunt & Jones, 2015b). For example, in previous work (Stieler-Hunt & Jones, 2015b) we describe how educators adapted a scuba diving entertainment game *Endless Ocean* (Nintendo, 2007a) for use in a primary school classroom (see vignette one, Stieler-Hunt & Jones, 2015b). The game and the way it was used in the classroom gave students a strong understanding of ocean environments and the creatures that live in them, built students' conservation attitudes, motivated students to complete ocean-related assessment tasks, and fostered a feeling of shared experience amongst students.

Digital games are a tool that teachers can use to improve student outcomes across many areas. Boyle *et al.* (2016) performed a systematic literature review of 143 studies and explored empirical evidence of impacts and outcomes of computer games and serious games in educational settings. They found that games are successfully being used for knowledge acquisition, skill acquisition, affective and perceptual goals, behaviour change, and cognitive and physiological outcomes. de Freitas (2018) explains that the literature exploring the benefits of games as learning tools is fragmented across disciplines. She argues that there are a relatively small number of studies that publish randomised controlled trials, and the majority of them tend to be health-based interventions. Results from a selection of randomised controlled trial studies report benefits to the use of games in classrooms that include increased accuracy and speed for calculations (Miller & Robertson, 2011); improvement in communication skills, resourcefulness and adaptability (Barr, 2017); improvement in attitude towards school (Miller & Robertson, 2011); and an increase in psycho-social preparedness for avoiding coercion in relationships (Arnab *et al.*, 2013).

The effectiveness of a game will depend on its fitness for purpose and how it is used within the learning context. For example, in previous work (Stieler-Hunt & Jones, 2015b) we describe how teachers used the game *Wii Fit* (Nintendo, 2007b) in a P-1 multi-age class (ages four to six) to understand the benefits of daily exercise and to improve their manners and social skills (see vignette three, Stieler-Hunt & Jones, 2015b). *Wii Fit* is not a game that teaches improving manners and social skills. The teachers purposefully used the time students spent waiting in line to use the game as an opportunity for students to show how they could improve their manners and “nice talk.” Following a play session, the teachers would conduct a debrief with students relating to the exercise and social skills component of the play session. This example illustrates that opportunities abound for the use of IDGs in classrooms but they are not always easy to recognise.

Being a relatively young field, there are ambiguities regarding taxonomies of digital games used in classrooms (Barbas, 2016). There is a need to develop a common language around types of games used in classrooms. “Edutainment” is a term commonly used to describe short-form drill-and-practice learning games, games that are mostly based on acquiring knowledge through repetition (Okan, 2003). Examples of edutainment games are *Math Blaster* and *Dr Brain* (Barbas, 2016). Edutainment games may not meet learner expectations (Takeuchi & Vaala, 2014), tend to facilitate lower levels of learning (Rice, 2007), and are less likely to enhance learning (Hsu, Liang, Chai, & Tsai, 2013). Boyle *et al.* (2016) indicated that although they were the most commonly used, it was also the most “pedestrian” (p. 187) use of games in classrooms. More complex and engaging games have been designed for classrooms (Hsu *et al.*, 2013; Romero & Barma, 2015). Examples include *Lure of the Labyrinth* (Maryland Public Television, 2009) and *Orbit* (Jones, Stieler-Hunt, & Rolfe, 2013). Games like these are also classified as “serious games,” games created for a primary purpose beyond entertainment (Sawyer, 2002). “Entertainment games”, games created for entertainment purposes can also have applicability for classroom learning (Barbas, 2016; Romero & Barma, 2015). These are not as frequently used and their potential for mainstream learning remains largely untapped (Takeuchi & Vaala, 2014). In this paper, we will use the term IDGs (Stieler-Hunt & Jones, 2017) to refer to digital games that are more likely to involve the player in deep exploration and have them participate in activities distinct from didactic instruction (Takeuchi & Vaala, 2014). The use of IDGs in classrooms includes the repurposing of entertainment games as well as using more complex and engaging serious games designed specifically for classrooms.

There are varying accounts on the extent that digital games are being adopted in classrooms. For example, Proctor and Marks (2013) and Takeuchi and Vaala (2014) report high adoption rates whilst Bourgonjon *et al.* (2013) and Hamari and Nousiainen (2015) report low adoption rates. The studies reporting high adoption rates explained that teachers were mostly using “instructional games” (Proctor & Marks, 2013, p. 176) and “short-form,” “educational games” (Takeuchi & Vaala, 2014, p. 5). Therefore, it is unlikely that the adoption rate of IDGs in classrooms is high.

Two key barriers to using IDGs in the classroom are negative attitudes towards the use of IDGs in classrooms, and teachers’ difficulties in using IDGs in classrooms.

### *Negative attitudes towards the use of IDGs*

Within society-at-large there are various concerns about IDGs including addiction (De Vet, Simons, & Wesselman, 2014), portrayal of minorities (Archer, 2016), representation of gender and gender roles in games (Friedberg, 2015) and portrayal of violence (Greitemeyer & Mügge, 2014). Consequently, there are varying reports on teachers’ attitudes towards the use of IDGs in classrooms. Although there seems to be a trend towards acceptance (eg, Emin-Martinez & Ney, 2013; Hsu *et al.*, 2013; Li & Huang, 2016; Proctor & Marks, 2013; Ray, Powell, & Jacobsen, 2014; Takeuchi & Vaala, 2014), there are still reservations regarding relevance (Ray *et al.*, 2014; Romero & Barma, 2015) and many teachers do not believe IDGs have a place in classrooms

(Bourgonjon *et al.*, 2013; Dickey, 2015). Gerber and Price (2013) and Hsu *et al.* (2013) indicate that many teachers are unaware of the potential student learning opportunities games can provide. For example, Romero and Barma (2015) found that participants did not consider that games could be relevant to classrooms. Further, adopters have concerns that their teaching colleagues will not approve (Emin-Martinez & Ney, 2013; Gerber & Price, 2013; Stieler-Hunt & Jones, 2017).

In previous work (Stieler-Hunt & Jones, 2015a, 2017), we introduced the term “believers” to describe educators who are persuaded that using digital game-play in the classroom can be beneficial for learning. For some the term “believer” may indicate faith without question. We do not use this term to indicate that “believers” promote the use of IDGs in classrooms uncritically, as even in religion, “believers” are diverse, some accept their religion uncritically whilst others question it and are encouraged to question it by those around them. We found that this is the same of games in the classroom. This term resonated with the data due to the strength of conviction exhibited by both the “believers” and “non-believers.”

#### *Difficulties of using IDGs in classrooms*

Knowing the best ways to use IDGs in classrooms is complex and requires substantial effort (Hsu *et al.*, 2013; Li & Huang, 2016). Even teachers who use games in their classrooms admit that finding suitable games and incorporating games into curriculum can be difficult (Kenny & McDaniel, 2011; Stieler-Hunt & Jones, 2015a; Takeuchi & Vaala, 2014). Studies call for teachers to learn about effective use of IDGs to further advance the use of IDGs in classrooms (Beavis *et al.*, 2014; Hsu *et al.*, 2013; Kenny & McDaniel, 2011; Perrotta, 2013; Takeuchi & Vaala, 2014).

Ray *et al.* (2014) and Kenny and McDaniel (2011) found that many pre-service teachers doubted their own ability to successfully implement IDGs. Dickey (2015) concludes that the interplay between the teacher, the IDGs and the students is what controls the quality of the learning environment. Therefore, if teachers do not understand how to use IDGs effectively in their classrooms, it will be difficult for teachers to use them as a tool to create a productive learning environment. Bourgonjon *et al.* (2013) and Ketelhut and Schifter (2011) recommend that those educating teachers on how to use IDGs in classrooms provide specific examples of how IDGs can be used to increase quality and effectiveness of teaching and learning.

A large-scale study (Hamari & Nousiainen, 2015) with in-service teachers ( $N = 1668$ ) recommends the use of personalised instruction and guidance from teachers with pedagogical knowledge on effective classroom-use of IDGs. Similarly Ray *et al.* (2014) recommends that support from content and pedagogical experts be provided to teachers wishing to use IDGs in their classrooms. Gerber and Price (2013) argue that if IDGs are to be “fully employed” (p. 61) in classrooms, community must be built around the use of IDGs in classrooms. Further, Emin-Martinez and Ney (2013) explain that a top-down one-size-fits-all approach is unlikely to advance the use of IDGs in classrooms. Kenny and McDaniel (2011) state that whilst top-down support is necessary, it is insufficient on its own and personal support is also required.

#### *Models of continuing professional development*

Effective professional development improves teachers’ classroom practices, teachers’ attitudes and beliefs, and/or student learning outcomes (Guskey, 2002). In her important work on models of continuing professional development (CPD), Kennedy (2005, 2014) theorises that the purposes of CPD models fall in a spectrum that range between transmissive and transformative. A transmissive approach will focus on providing knowledge about a topic but will be devoid of the teaching context of the participants (Kennedy, 2005, 2014). A transformative CPD model requires the development activities to be oriented to collaborative problem identification and collaborative activity that further develops participants’ understandings through professional

Table 1: Participants' work experience in the education sector

Participant pseudonym	Schooling sector	Schooling level taught	Number of years working in education	Professional role	Urban /Rural school setting	Specialty
1. Jennifer	Government	Primary	3	CT	Urban	No specialty
2. Damion	Non-Government	Secondary	20	CT	Rural	Information & communication technologies
3. Ashlee	Government	Primary	30	CT	Urban	Distance education
4. Linn	Government	Primary	15	CT	Urban	Distance education
5. Milly	Government	Secondary	18	CT & TA	Urban	Multimedia
6. Jinny	Government	Primary	9	CT	Urban	No specialty
7. Miles	Government	Secondary	7	CT	Rural	English
8. Minnie	Government	Primary	29	CT & TA	Rural	Health & physical education
9. JC	Government	NA	23	TA	Urban	Special education
10. Bernita	Government	Secondary	30	CT	Urban	Mathematics and science
11. Esta	Government	Primary	22	TA	Urban	Head of curriculum
12. Grant	Government	Primary	3	CT & TA	Urban	No specialty
13. Steven	Government	Primary	5	CT & TA	Urban	Special education

CT: classroom teacher, TA: teacher advisor.

inquiry (Kennedy, 2014). Due to the barriers associated with using games in the classroom, a transformative approach to professional development is more likely to be effective than a transmissive approach. The purpose of this study is to provide a model that can be used by experienced, “believer” educators to assist cohorts of teachers to use IDGs in their classrooms. The model, based on insight from interviews with IDG mentors, aims to address both the complexity and difficulties associated with using IDGs in classrooms, and colleagues’ concerns towards using IDGs in classrooms.

## Method

Our research employed an inductive grounded theory approach (Corbin & Strauss, 2008) in which we conducted in-depth, semi-structured (one to two hour) interviews with 13 educators (eight female, five male). Teachers from a wide range of backgrounds (see Table 1) were represented in our sample and a variety of different types of games were used. The participants were not a part of a broader games-in-learning project. The number of years working in the field of education varied between 3 and 30 years. There was a mix of primary and secondary school teachers, classroom teachers and teacher advisors, teachers in rural and urban schools, and teachers with a variety of specialty areas.

Grounded theory studies explore the data for emerging themes, rather than testing preconceived hypotheses (Auerbach & Silverstein, 2003). Therefore, the model was derived solely from our research data, without reference to the literature. The literature was compared to the findings post-analysis (Corbin & Strauss, 2008).

A loose interview guide was used however the topics discussed were also flexible to develop a thorough understanding of educators’ experiences (Minichiello, Aroni, & Hays, 2008). The interview guide prompted participants to describe their motivations for beginning to use digital games in their curriculum, the planning processes they used, the games-based units of work they implemented, how successful they think the unit of work was, and the role they predict digital games having in the future of education.

The interviews were conducted between 2010 and 2012 with further contact in 2015 to discuss findings and applicability with participants. All participants were from Queensland, Australia. A convenience sample was used with most of the educators responding to an invitation sent to a games-in-learning email list. Several participants were identified from the authors’ professional networks. We stopped interviewing participants upon reaching theoretical saturation for our key research categories. That is, new participants were no longer giving new information about the research concerns, key categories had considerable depth and breadth, and the relationships between concepts were clear (Auerbach & Silverstein, 2003; Corbin & Strauss, 2008).

Interviews were audio recorded and transcribed. NVivo Computer-Assisted Qualitative Data Analysis Software (NVivo Qualitative Data Analysis Software, 2012) was used to manage the audio recordings, transcriptions and analysis process. We analysed data progressively during collection (Corbin & Strauss, 2008). The development of the model discussed in this paper resulted from applying a range of analytical strategies including attribute coding, open-ended coding, theming the data, (Saldaña, 2012), constant comparison, the conditional/consequential matrix and the Paradigm (Corbin & Strauss, 2008); and concluded after reaching theoretical saturation (Corbin & Strauss, 2008).

## Findings

The frustration felt about teaching colleagues’ resistance to the use of IDGs was a theme woven through almost all interviews, starting with the first participant (see Stielor-Hunt and Jones (2017)). Only two participants, Esta and Minnie (pseudonyms), encountered little resistance from

colleagues. Their interviews were conducted during the second half of the interview process (interviews eight and eleven). These participants had both successfully mentored their teaching colleagues to use IDGs in their classrooms, and so their interviews were particularly pertinent. Several participants had, to varying degrees, unsuccessfully attempted to mentor colleagues and their experiences provided a valuable contrast to those who had been successful in their efforts.

Additional key categories and concepts also emerged from this data (eg, see Stielor-Hunt & Jones, 2015a, b; Stielor-Hunt & Jones, 2017) however the focus of this paper is on professional development carried out by a mentor. We begin by analysing the attributes of the successful mentor. Then, we explore the professional development process employed. Finally, we explore the effects of the professional development process.

#### *Attributes of the successful mentor*

Successful mentors were responsive to teachers and used techniques that addressed teachers' concerns and issues. Esta (primary school head of curriculum) reflects on how she has supported teachers:

... it's about saying... there's support here... it's just getting teachers to kind of refocus their energies... revisiting some of the, the values of using games, getting out the hardware, setting it up, having those discussions.

Further, Esta described herself as a "one-person cheer squad," encouraging staff in her school to use IDGs in meaningful ways in their classrooms.

... I'm excited about games all the time... and it's something that... I talk about a lot with staff...  
(Esta)

By contrast, Miles explained that his mentoring attempts were less successful. His approach was to do the teaching for teachers who did not feel confident, rather than address their specific needs.

I actually supported every single class with it and would go in and do like the intros to the unit... I think they still felt, "oh, if I couldn't teach it, what's the merit in it?"

Esta was clearly a "believer" in using IDGs in the classroom and proactively sought opportunities for the school's educators to use IDGs in the classroom.

What is a really immersive experience that we can give kids?... It has to be games because, other than going out into an environment, this is the next best thing... (Esta)

Both successful mentors (Esta and Minnie), had school administration support. Neither worked full-time in the classroom, and both had a leadership role within their schools. Esta had a full-time formal leadership role within her school that required her to support teachers with curriculum and pedagogy. As such, she did not have daily classes to teach. She also indicated that the school administration were extremely supportive of her games-in-learning role. Esta said administrators were "never negative, never in the way, supportive." Minnie worked part-time (a day and a half per week) in a small, rural primary school (enrolments approximately 250 students across P-7) as a physical education teacher. She also had prior experience as a district-wide ICT facilitator. Minnie became an informal leader within her school by volunteering

to help colleagues on her non-work days with projects that matched her special interest areas (eg, games-in-learning, dance).

These attributes were deemed important because teachers reporting unsuccessful attempts at professional development indicated that they had inadequate support from school administration and were unable to provide adequate support to teachers due to their own teaching commitments. For example, Bernita indicated that her school administration did not support her work with games:

I was always in trouble [with administration]. It was not easy... For a long time there was a lot of opposition to anything like that [games] in the classroom.

Miles indicated that he was unable to provide adequate support for teachers because of his full-time teaching commitments.

### *Professional development process*

The data suggested three phases in the professional development process: collegial planning, trying it out and spreading the infection.

#### Collegial planning

Successful games-in-learning mentors began working with their colleagues during curriculum planning and engaged in a collegial planning process.

Before school even started... she [the teacher] approached me and said, "... Is there any way that we can [work together on a games unit]?" ... We did this Inspiration thing [planning document that] ... had a central thing [theme]... and [we worked out] this is what we can do... (Minnie)

Unsuccessful mentors tended to "plan for" rather than "plan with" the other teachers in their cohort. Secondary school English teacher Miles explains that he made modifications to an existing unit of work that he had used in previous years and expected the other teachers to follow it.

... we had to change it [the games unit of work] a bit for other people... so they could actually teach it and understand what was going on... they didn't enjoy teaching it.

Miles then explained that after the experiences of these teachers they would not be implementing it again. He commented that,

It's sad to see it go... because I've put a lot of work into it.

Successful mentors worked with the classroom teachers to look beyond the content of the game to identify potential learning opportunities. For example, Esta describes how she worked with a group of her colleagues teaching P-1 (4–6 year olds) to purposefully plan a unit about healthy bodies and social skills using the game Wii Fit.

... we had to work together to come up with... how we would embed that into the P-1 curriculum... we were also interested in... the social skills area... We were really interested in using this gaming experience to model manners...



Many IDGs are made to be played in the home, not in a classroom with so many potential players. The mentors helped teachers resourcefully adapt their chosen IDGs to optimise its use in the classroom. For example, Minnie explained that whilst using a scuba-diving game, the students played in “diving groups” to communicate and solve problems together. Group-play also enabled students to have more game-time. The entire class played one shared save-game which built a shared class experience. This resulted in all students being invested in the shared game’s progress. Minnie describes the emotional investment of the class,

... and when this group got back to the boat and, you know, the white dolphin had come.  
<Children were exclaiming> “We’ve got it! We’ve got it!” Everything stopped!

Successful mentors also worked with their teachers to consider how to provide quality play experiences for all students. This contributed to building a shared experience for the entire class which in turn built a sense of community between class members. Techniques for providing quality play for all included game-play rosters, rotational activities, and playing in pairs or groups and possibly allocating rotating roles within groups. There was not a one-size-fits-all approach as it depended on the nature of the game, the class context and the curriculum being studied. For example, Minnie’s class used the yoga section of a one-player game *Wii Fit* by having a student at the front of the room using the *Wii Balance board* game controller and the other students “practising” the same yoga pose behind that student,

... one person out the front... and we just kept swapping children around but the whole class could work as one...

Successful mentors also had teachers consider what artefacts students could create based on their game learnings. Creating artefacts gave students an extra purpose for playing the IDG. Esta describes how students playing *Viva Piñata* (Rare, 2006) applied their game learnings about eco-systems to create an action plan for their local waterway,

The major piece of assessment... was an action plan around the field study... [of] Lake <<name removed>>... all of the things that we were getting out of the field study, were actually being reinforced from the game.

The mentors also explained that teachers need to develop pedagogical strategies for sharing control with students. Minnie describes how she decided to accept that students were accessing a section of the game that was not completely relevant,

I knew they’d snuck onto something and I just left it after that, ‘cos I figured they will work out what they think is appropriate or not.

### Trying it out

In Esta’s school, there was more than one class implementing the unit of work. Esta described the process that she followed to roll out games-based learning units across the year level. Following collegial planning, the unit of work was trialled with one or two teachers.

When we did that particular unit we actually had teachers trialling it... We tend to try things because we want to make sure that what we are doing is worthwhile... so we tend to like paddle

around, try something out, take it to... the degree that we are really excited about but with one or two classes... (Esta)

In the trying it out phase, Esta purposefully selected which educators she would work with. She aimed to initially lead the teachers who were willing to use IDGs in their classroom. Levels of comfort and enthusiasm were ascertained during the collegial planning process. Although Minnie did not have large cohorts of teachers working with the same year level of students, she did explain that, like Esta, she began working with teachers showing an interest in using IDGs in the classroom.

That's the key to have [teachers that are] even slightly interest[ed]. (Minnie)

During this phase, the mentors responsively supported participating teachers. Support included co-teaching, regular discussion and reflection, help with setting up equipment, and the mentor occasionally teaching the teacher's class to model a teaching technique.

I guess it's about saying, "there's support here... I can come and do some modelling with your kids". (Esta)

### Spreading the infection

After trialling the IDG based unit of work, Esta explained that if the unit was deemed successful, the mentor worked to further embed the unit in the curriculum for that year level.

so we tend to... try something out... and then it... spreads further afield. (Esta)

Similarly, Minnie indicated that once the students and teachers saw how others were using IDGs in their classrooms, this provided motivation for others to want to use IDGS also.

... the kids are motivated to do it and the teachers... it's like an infectious disease. (Minnie)

### *Effects of the professional development process*

Successful mentors reported that their professional development approach to using IDGs in classrooms meant that teachers at their school were open to the possibilities of using IDGs in their classrooms.

I've never really had resistance to any of the ideas that I've kind of put forward... (Esta)

Whereas unsuccessful mentors that did not use this approach or did not have the identified successful mentor attributes indicated that their colleagues were quite closed to using IDGs in the classrooms.

No matter how much research... no matter how much you can tell them they still resist. (Miles, secondary school teacher)

It has been negative to me professionally, like your own, your teaching partners will stop talking to you.... (Linn, primary school teacher).

## Discussion

Analysis of the data led to developing a professional development model that aims to assist cohorts of teachers to use IDGs in the classroom. A graphic representation of the model is provided in Figure 1. The top section lists the attributes of a “successful” mentor; the middle section identifies the three phases used in the professional development process: collegial planning, trying it out and spreading the infection; and the bottom line highlights that the effect of using this model is producing open colleagues.

The model describes the successful games-in-learning mentor as a responsive “one-person cheer squad,” which reflects the passion and enthusiasm displayed by successful mentors. Successful mentors reminded, led and supported other educators in their schools to use IDGs in their classrooms whilst offering encouragement, and sensitively and proactively responding to issues or concerns raised by the educators they supported. Further, successful mentors had the following attributes: had school administration support, did not work full-time in the classroom, had a formal or informal leadership role, was a “believer” in using IDGs in the classroom, proactively sought opportunities for school’s educators to use IDGs, and supported teachers in a responsive manner.

### *Professional development process*

Three phases were identified in the professional development process: collegial planning, trying it out and spreading the infection. Additional considerations and characteristics that arose from the data are listed underneath the phases in Figure 1. These lists are indicative of key themes appearing in the data; it is not an exhaustive list. Collegial planning has the most extensive list because this phase establishes the foundation for purposeful and considered implementation in the following phases and the data indicated that participants who did not engage in a collegial planning process failed to convince their colleagues that IDGs could be useful in the classroom.

## Professional development model to assist cohorts of teachers to use digital games

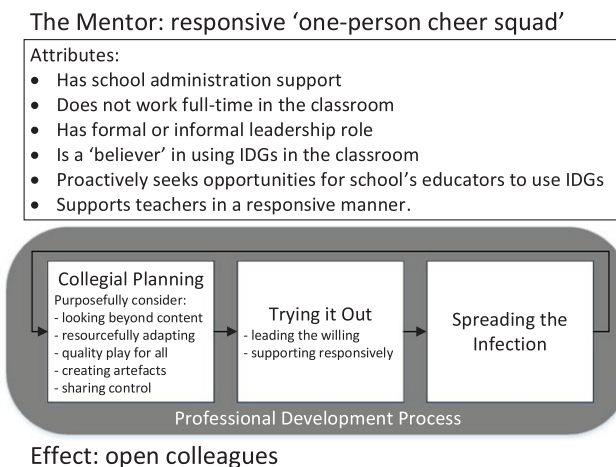


Figure 1: A professional development model to assist cohorts of teachers to use digital games in their classrooms [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

## Collegial planning

To maximise success, the model suggests that a cohort of teachers engage in a collegial planning process which involves working together and sharing responsibility to develop a scheme of action for using IDGs as a meaningful part of classroom learning.

Further, it suggests that the mentor help classroom teachers look beyond content by seeking ways to use IDGs to make conditions more conducive for learning (eg, social emotional outcomes), engage with curriculum intent or change attitudes. For example, in an earlier study, one of our participants used a scuba diving game so that students would learn about oceans, develop conservation attitudes and feel a sense of belonging with classmates (see vignette one, Stieler-Hunt & Jones, 2015b).

The model also suggests educators resourcefully adapt IDGs to suit their school environment and facilitate quality play for all students. The adaptations and strategies employed depend on the nature of the IDG, the context of the class, the curriculum being taught and the level of access to the required gaming technologies. We observed that resourceful adaption by teachers could enhance learning experiences and build a sense of belonging within the class.

Creating artefacts involves producing a digital or non-digital product related to one or more aspects of game-play or game learnings. Creating artefacts helps students bring their game learnings into the non-game world and create a product that demonstrates and articulates their in-game learnings. Further, it can provide motivation for students to optimise their in-game learnings.

Sharing control includes accepting that the teacher does not always need to be “in command” of the class whilst encouraging students to feel responsible for their learning. Strategies for sharing control include accepting that students may sometimes engage in off-task activities, requiring students to complete tasks based on the IDG with completion of these tasks being the students’ responsibility, establishing up-front agreement with students regarding length of play sessions, and helping students understand where the game fits within their broader context of learning.

## Trying it out

After the collegial planning phase, a limited trial of the unit of work is conducted. During this time, the mentor and educators implement and evaluate the unit of work featuring IDG(s) with a small number of classes before attempting to spread its use further. The mentor works with educators demonstrating the strongest desire and enthusiasm to implement the unit of work. The mentor responsively supports the educators during the trial.

## Spreading the infection

The final phase of the process involves the remaining educators implementing the unit of work that has been revised based on feedback from the previous phase. During this phase, the mentor uses the enthusiasm and successes of the trial to extend the use of the IDG(s) to other teachers in the school. Although “spreading the infection” is an evocative phrase; it was used to honour participant voice and acknowledges that our participants found that once the trying it out phase had been implemented, they encountered no resistance to implementation from colleagues.

## *Effects of the professional development process*

Our findings suggest that this process is likely to result in open colleagues, where teachers from mentors’ schools are receptive to using IDGs in their classroom.

This professional development process may result in open colleagues because it addresses the two key concerns associated with using IDGs in classrooms identified in the literature review:

negative attitudes towards the use of IDGs in classrooms and the difficulties associated with using IDGs in classrooms.

The professional development model addresses confusion and negative attitudes towards IDGs through collaborative, collegial planning with all teachers implementing the unit of work; staggered implementation within a cohort of teachers; and using a mentor who is respected and supported by school administration and staff. The approach of this model focuses on cohorts of teachers using IDGs. There has been little focus of games professional development programmes for complete cohorts of teachers in the literature, although the interventions described by Chee, Mehrotra, and Ong (2015) and Emin-Martinez and Ney (2013) featured participants from the same school, presumably so that colleagues could support each other in the implementation process. Further, Gerber and Price (2013) recommend that community be built around the use of IDGs in classrooms. Given the negative attitudes and confusion towards the use of IDGs in classrooms, successful professional development programmes that focus on complete cohorts of teachers may be needed for the use of IDGs in classrooms to become mainstream. The professional development model addresses teachers' potential reservations towards the use of IDGs during the collegial planning phase. It features staggered implementation with the most willing teachers going first, so that implementation issues can be addressed and the less willing teachers can benefit from the experiences of the preceding teachers.

The model addresses difficulties associated with using IDGs in classrooms by providing expert guidance and personal support for teachers. The model proposes expert guidance from an educator who understands how digital games can be used successfully in classrooms and the mentor personally supports the teachers in a responsive manner. This type of approach fits with recommendations in the literature for personalised instruction from experts (Emin-Martinez & Ney, 2013; Hamari & Nousiainen, 2015; Kenny & McDaniel, 2011; Ray *et al.*, 2014).

The purpose of this professional development model is transformative, as defined by Kennedy (2005, 2014). Transformative professional development begins with collaborative problem identification and is followed by collaborative activity that further develops participants' understandings through professional inquiry (Kennedy, 2014). Within the model, collaborative problem identification occurs during the collegial planning phase; the teachers collectively decide that IDGs could be effectively used for students to develop the required knowledge and understandings. Throughout the collegial planning phase, the teachers continue working collaboratively to decide how to best use IDGs to support student learning. The trying it out phase supports professional inquiry using the first teachers as a test-case so that other teachers in their cohort can learn from their reflections on their experiences.

## **Conclusions**

Arguably, the most significant barriers to using IDGs in the curriculum are negative opinions of nearby teaching colleagues and teachers not knowing how to best use IDGs in classrooms. The professional development model presented in this paper is an approach for helping all teachers make the most of the opportunities IDGs can offer learners, beginning with one mentor who understands how IDGs can be used effectively in the curriculum. It maps out how to provide opportunities for teachers to work with IDGs at their own pace in a supportive environment. The model describes both a top-down and bottom-up approach requiring both support from the school administration team and the ideas and capabilities of groups of teachers. Therefore, it does not rely on the ingenuity of just one teacher in a school.

With increasing demands on schools, it may be difficult to find a mentor with adequate skills and expertise. Therefore, we suggest schools that successfully set up a games-in-learning mentoring programme based on our model, consider acting as “mentors” for other schools in their local area. The full contribution of IDGs to learning and schooling will not be realised until all teachers are comfortable and enthusiastic about embracing the affordances of IDGs. This professional development model can help build the capacity of cohorts of teachers to use IDGs in their classrooms. As this model was inductively derived from existing practices of 13 educators, we invite other researchers to test it with cohorts of teachers.

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### Statements on open data, ethics and conflict of interest

This research received ethics approval by the University of the Sunshine Coast’s Human Research Ethics Committee (ethics approval number: S10279). Due to re-identifiable nature of this data, the data is unable to be shared with other researchers. The authors of this study have no affiliations or involvement in any organisation or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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