

# A Cross-disciplinary Approach to Degree Programs in Video Games

Michael Hitchens<sup>1</sup>, Rowan Tulloch<sup>2</sup> & Adam Ruch<sup>2</sup>

<sup>1</sup> Department of Computing, Macquarie University, Sydney, Australia

<sup>2</sup> Department of Media, Music, Communications and Cultural Studies, Macquarie University, Sydney, Australia

Correspondence: Michael Hitchens, Department of Computing, Macquarie University, Sydney, NSW 2109, Australia. Tel: 61-2-9850-9538. E-mail: Michael.hitchens@mq.edu.au

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## Abstract

Macquarie University, in 2012, introduced two undergraduate coursework programs in the area of video games. These programs are a joint initiative of the Departments of Computing and Media, Music, Communication and Cultural Studies. The programs represent an innovative approach to curriculum structure in this area, combining technical, design and reflective critical practice to produce rounded graduates with a wide knowledge of issues and practices in interactive media. This paper describes the process of designing these programs, the aims and rationales guiding their design and their detailed structure. The central guiding principle behind the programs was that accomplished designers of interactive media, particularly video games, need both a sound technical background and an appreciation of the relationship between users, society and their designs. This is reflected in both the structure of the programs and the pedagogical approaches in the specialist units.

**Keywords:** video games, program structure, design, graduate outcomes

## 1. Introduction

Videogames are an increasingly popular form of entertainment. Long dismissed as a medium with limited appeal and importance beyond a young male demographic, recent years have witnessed a rapid diversification and expansion of the video gaming audience. A recent Australian survey found that the average age of a videogame player is 32, and that females make up 47% of the audience. Videogames are no longer a niche market, but rather a dominant and cultural significant media form (Brand, 2012). In Australia 92% of Australian households have a device for playing video games (Brand, 2012). Videogames have become a significant part of contemporary life, and their impact is only going to increase. An American survey found that the average 8-18 year old spends one hour and thirteen minutes per day playing videogames (Rideout, Foehr & Roberts, 2010). This popularity is however not just limited to younger generations, significant growth of the market for older gamers has opened up, with 43% of Australian aged 51 or over now playing video games. Gaming is quickly becoming the pastime of choice for people of all ages.

Commercially videogaming is a big business, with the skyrocketing sales of games and hardware it is a thriving industry. This is evident not just in the player demographic but the visibility of gaming within society. Long gone are the days of videogaming advertising only being seen in specialist publications, recent advertisements for big budget titles such as *Call of Duty* and *Max Payne 3* have been seen on the sides of buses, giant billboards, and even on television; spaces normally reserved for Hollywood blockbusters. Such expense is not incurred for niche products. The games industry in 2011 was estimated at US\$65 billion and is constantly growing (Bakers, 2011).

With popularity beginning to rival traditionally dominant entertainment forms such as television, film and music, videogames are significant in their own right. However their cultural significance goes well beyond this. The opportunities many videogames provide for audience engagement and creativity radically reconfigures the traditional relationship between the media producer and consumer. Commercially available versions of a DVD of a film or television show, an audio CD or the downloadable equivalents of any of these, rarely if ever, come with any support for users to create content. For videogames, the reverse is true. Many commercial titles ship with tools that allow users to create their own content. This was originally confined to games available on computers, and typically the Windows PC platform. However, it now extends to home consoles, for example with the level design tools in the various Lego based titles such as *Lego Indiana Jones*, *Trails Evolution* and *Little Big Planet*. Such titles invite users, even children in primary school, to become creators in a media form to which they

already feel a considerable attachment. The penetration of the required platforms and tools has brought the invitation, and ability, to create in the videogame space to a vast segment of the population.

There is a long history of students using their knowledge of programming and computer hardware to create videogames. One of the earliest videogames, *Spacewar!*, was created in 1961-2 by a group of Electrical Engineering Students at MIT (Graetz, 1981). Videogame users are well aware that what creates and provides their virtual worlds is a result of both artistic design and significant programming work. It is hardly surprising then, given this history and the increasing popularity of this form, that there is a substantial subset of students interested in programming or media studies who have both experience in playing videogames and a desire for study in this area.

Macquarie University began undergraduate teaching in the area of videogames in 2008 with a single first year unit. The success of that unit, and enquiries about further opportunities both from students studying that unit and others considering university study, led to the introduction, in 2012, of two undergraduate coursework programs in the area of video games. The two programs are the Bachelor of Information Technology – Games Design and Development and a major in the Bachelor of Arts, Interactivity and Games. These programs are a joint initiative of the Departments of Computing and Media, Music, Communication and Cultural Studies. They are far from the first programs, in Australia or elsewhere, to be offered in this area. However, most other such programs of study concentrate exclusively on either the technical, programming or design aspects of videogame creation or on a theoretical media studies approach, without including study in the other area. The programs offered by Macquarie University represent an innovative approach at curriculum structure in this area, combining technical, design and reflective critical practice to produce rounded graduates with a wide knowledge of issues and practices in interactive media.

In the remainder of this paper we will discuss the rationale and structure of the programs and the common elements in the pedagogical approach of their specialist units. In section 2 competing programs are examined and the opportunities presented by them for an alternative approach are identified. In section 3 the rationale and philosophy for the Macquarie programs is discussed. Section described in detail the program structures. Section 5 examines the units and pedagogical approach. Section 6 presents conclusions and discusses the initial response to the programs.

## 2. Programs at Other Institutions

As part of the development of the programs offered by Macquarie University comparable programs, both domestic and international, were examined. The offering of bachelor degrees in the area of videogames is now widespread, with examples being found in a large number of institutions in many countries. While particular attention was paid to the offerings of nearby institutions, programs from further afield were also examined. This was both a recognition of the dual imperatives of competition for students on both a local and international level that all universities now experience, and also to understand the previous work in structuring such programs.

The area around Macquarie University, i.e., Sydney and nearby parts of New South Wales, is well served with institutions offering tertiary study. Sydney itself hosts five other Universities (University of Sydney, New South Wales University, University of Technology Sydney (UTS), University of Western Sydney (UWS) and Australian Catholic University), subsidiary campuses of other universities and a number of private colleges that offer tertiary qualifications. There are also universities in each of the nearby cities of Newcastle and Wollongong. This provides significant competition for students. All of these institutions offerings were examined for relevant programs. Programs in videogames were found at two universities in Sydney (UTS and UWS), at the University of Wollongong and at two private providers in Sydney (QANTM and JMC Academy). Other Australian offerings, such as those from the Royal Melbourne Institute of Technology (RMIT), were also examined. The international offerings were considered more selectively (exhaustive search being beyond our resources). The programs given detailed examination included those from the University of California, Santa Cruz (UCSC), Sheffield Hallam University and University of the West of Scotland (these UK programs being two of the very few accredited by a creative media industry body).

This examination revealed that videogames bachelor programs exist in two broad categories. The first is where the program is essentially a more focussed version of a broader program, such as a Bachelor of Computer Science or a Bachelor of Information Technology. The students study the core programming and technical units that feature in the general degree. To the core of the base program are added a number of specialist games units and these units then form a minority of the overall program. Examples of this style of program include those offered by the University of Wollongong and the University of Western Sydney.

The second category features a much greater number of specialist units than the first, but at the expense of a

number of what might be considered core units in a more generalist programming degree. For example the program may feature basic programming units but less (or even no) intermediate or advanced programming units, such as explicit coverage of Software Engineering or Data Structures. Instead the program will feature unit (including programming units) explicitly tailored to videogames. Examples of the institution offering such programs include the University of the West of Scotland and the private providers in Sydney.

That is not to say that the categories are exactly uniform, in that the number of specialist units, and the balance between games specific units and broader information technology/programming units may vary. For example, the major in Entertainment Computing in the Bachelor of Information and Communications Technology offered by the University of Western Sydney required students to take three specialist games units out of the 24 required for their degree. In the Multimedia and Game Development major in the bachelor of Computer Science offered by Wollongong University there are five required specialist units. Likewise, the more focussed degrees vary in their balance of videogame versus more general programming or information technology (IT) units. That at Sheffield Hallam University having an equal number of general programming/IT units as specialist videogames units in its core, while the in the core of the Bachelor of Information Technology (Games and Graphics Programming) offered by RMIT the specialist video games units are slightly in the majority. At the private colleges, such as QANTM, the specialist units are clearly the most numerous.

In the majority of these programs the units, whether general programming/IT units or specialist videogames units, are almost wholly technical units. This is not surprising as the degrees are intended to produce graduates with the necessary technical and design skills to produce videogames. These products are, it must be remembered, sophisticated technological artefacts. However, a small number of programs offer units with a digital media perspective, rather than a technical programming one. The program at RMIT offers them as electives, that at UCSC requires students to choose two from a specified list. What is striking about such units is that are general media units, lacking a clear focus on videogames. Given the rise in the academic study of videogames across a range of disciplines, particular in digital media, this is surprising. Students studying videogames should benefit from a critical analysis and media theory perspective.

### **3. Rationale and Philosophy**

It is common practice for tertiary programs to set graduate outcomes that students completing the programs are expected to display. Before being even able to set these high-level aims it is useful to define the basic objective that a program is meant to achieve. In creating the programs at Macquarie University we also had to recognise a number of constraints, including resource limitations. We could only introduce a small number of new units across the two departments involved. The joint nature of the undertaking between the two departments needed to be reflected in the final programs, recognising what each department brought to the project. Early on in the development process we set two clear goals for the programs:

- 1) That a successful videogame designer or developer, while requiring technical competence, needs more than that. They need a wider appreciation of videogames, such as their role in current society, their nature as cultural artefacts and the ability to critically appraise designs.
- 2) That graduates should receive sound technical skills which are not limited to videogames. Students' careers may, by choice or necessity, take them beyond the videogame industry. The programs are intended to provide a wide choice of career options. Also, to be a good specialist still requires sound basic knowledge.

It was also decided at an early stage to offer two programs, one with a high proportion of programming study and one without. The former is the Bachelor of Information Technology – Games Design and Development. The latter is the major in Interactivity and Games within the Bachelor of Arts.

It was clear from considering the existing programs that a number of alternatives existed for structuring the programming focussed degree. However, with the existence of programs in Sydney that had a high proportion of specialist games units, and the limitations on introducing new units, it was considered unrealistic to attempt to introduce a highly specialised program. This meant considering the alternative approach of basing an offering around an existing degree in programming/IT. This fit well with the second aim above, which, when applied in this context, means that if a student is to be a successful videogame programmer than they need to be a successful programmer. The core learning in the software development program needed to be retained. This approach has the added advantage of giving students a qualification that prepares them for a career in the wider software industry, not just the games industry, again in line with our basic objectives. The main software development program at Macquarie University is the Bachelor of Information Technology, majoring in Software Technology. This program has, as well as a solid core of software development units, considerable space for elective choices. Into these we were able to slot, with some minor changes to the basic degree, the specialist

games units, as will be discussed in section 4.

The overwhelming majority of videogame programs that were examined, even the small number focussing on design, included substantial programming study (either via specialised videogame units and/or more general programming ones). Yet many career paths in the industry do not require extensive programming skills. These include games journalism, animation, story writing and even areas of design, such as level design. This is matched by enquiries from prospective students who are interested in videogames, but are reluctant to undertake extensive programming study. Videogames are only one example of interactive media, an area which Macquarie already offers a number of units that do not require a programming background. This enabled us to offer a program rich in study in videogames, interactive media and web design. It still delivers technical skills, in areas such as design, interaction and the web instead of traditional software programming, and shares most of the objectives of the more technically oriented program.

As noted above these considerations resulted in a decision to offer two programs, but ones which would share a significant degree of commonality. One would be a technically focussed program, centring on core programming/IT units and specialist videogame units. The other would be focussed on videogames and interactive media generally, with limited traditional programming content.

The minimalist approach in terms of specialist videogame content in the degree including substantial programming content is not in conflict with an attempt to educate students in the essential of videogame design. As noted by Oxman (2004), "Competence in design praxis appears not to be measured by the quantity of knowledge gained, but by knowing where to find it, which specific kind of knowledge to apply in a particular situation, and how to use it when needed." It was considered feasible to include the basics of videogame design within the programs we envisaged. It is important, as argued by Gestwicki and Sun (2008) to distinguish between game design, which is the process of developing a game idea (Salen & Zimmerman, 2003), and game programming, which is the process of implementing game software (Gestwicki & Sun 2007). We wished to include elements of both into the program that included core programming material, while the other program would include other technical areas, such as animation. We were also influenced by approaches in the engineering sphere, such as (Dym, Agogine, Eris, Frey & Liefer, 2005) where teaching combined both the act of design is combined and the practice of the skills needed to produce the finished technological product. An approach which combined study of technical and design skills would, it is intended, produce graduates who, even if initially employed at the programming level within the industry, would have a better appreciation of the requirements of design than those who concentrated purely on the technical aspects.

However, including design and technical studies in a videogame degree is not exactly innovative. Nor does it take full advantage of the possibilities offered by the joint development of the new programs. It has been argued by Dixon (1987) and Dym (1994) that design is a cognitive activity, in fact one that can be studied by cognitive science and is aided by appropriate tools and techniques. In the words of Dym (1994), study in design should "allow students to express and exercise their creativity". Design is not a rigorously structured process. There is no formula which can be routinely applied to arrive at successful design. This is why so many design programs include significant practical work, to enable students to practice their design skills. It appears to us, however, that this does not cover everything that a designer needs to consider. A designer, whatever their field, needs to do more than be able to understand the technical requirements of their product. Videogames are an increasingly important part of modern western society. It follows that a videogame designer would be best served by at least some understanding of the role and place of videogames within society. Other programs have gone part way towards this, by including study of some media units, but there has been little attempt within these programs to directly study videogames from a media perspective. We decided that the Macquarie programs should include such study. This combination of technical, design and critical study of videogames, the last based in media theory, is intended to produce graduates with a fully rounded appreciation of videogames, their design and technological basis.

The media theory units within these programs offer students rigorous theoretical frameworks through which to understand videogaming specifically and digital media more broadly. These units explore issues such as gender representation, the politics of gaming, video game criticism and journalism, and audience demographics, taste and values. The units are designed to give students a high-level understanding of the cultural context in which videogames are produced, and to help them develop the analytic abilities to create sophisticated videogames and recognise and critique problematic and simplistic assumptions about the form and its audience. We believe it is important for students not to just understand games at a technical level but to also at a political and cultural one. With the expanding audience for videogaming, successful designers will need the skill sets taught in these units to reach and appeal to a broader, more complex and diverse audience. Such programs should be capable of

producing graduates who have a well-rounded education in videogames. The intent is to enable them to undertake videogame design with the ability to consider the products of their design efforts from a variety of perspectives. Design is a multi-faceted activity, involving, amongst other things, creativity, planning and the application of appropriate skills; a rigorous and theoretical informed understanding of the medium is required to generate original ideas and to excel in this competitive industry. Our programs with the strong theoretical underpinnings offer our student a unique opportunity that other similar programs do not.

Macquarie University has a broad set of graduate capabilities for all graduates, in the areas of scholarship, engagement, sustainability and ethical practice. In addition to those a set of specific graduate outcomes was developed for these programs. These include, as would be expected, a knowledge of videogames, videogame design and the relevant technical skills as incorporated into each program. It also includes critical study of videogames to give the students a perspective on the context in which their designs will exist and be used.

Based on the issues discussed above the following specific graduate outcomes were formulated for the programs. The significant difference between the two is the precise technical skills learnt, which will become apparent when the two program structures are discussed below.

Graduates of these programs should:

- 1) Possess and be able to apply competent technical skills in videogame creation.
- 2) Be able to independently generate creative and complete videogame designs and components.
- 3) Be able to apply the knowledge gained to critically appraise videogames.
- 4) Understand the role of videogames in current society and apply that understanding in creating videogames.
- 5) Possess core skills in and an appreciation of the characteristics and importance of analysis, synthesis and design in videogames.
- 6) Be able to effectively communicate and argue for their designs.

#### **4. Degree Structures**

Both the Bachelor of Information Technology – Games Design and Development and the Bachelor of Arts are three year programs at Macquarie University. The standard size for an undergraduate unit at Macquarie is three credit points, with four such units per semester forming a normal full-time load. The program for the Bachelor of Information Technology – Games Design and Development is relatively strictly defined, allowing only five elective units beyond the prescribed units given in Table 1. This follows from the necessity of including both the core software engineering component from the general Bachelor of Information Technology and the games units themselves. The major in Interactivity and Games consists of ten units, as listed in Table 2. Within the normal restrictions on a Bachelor of Arts program students are free to choose the other units in their program of study.

##### *4.1 Bachelor of Information Technology – Games Design and Development*

The units in this program can be grouped into three distinct categories, of roughly equal size, as shown in table 1. These three groups are the units directly related to video game studies, the fundamental units in programming and software engineering and the various supporting and directed elective study units. Unlike some programs which concentrate almost solely on videogames units this program retains a solid core of programming/software engineering units. Videogames, whatever their aesthetic, visual and experiential qualities, are pieces of software. They are implemented in computer code. This requires the work of skilled programmers. This is not to say that videogames are indistinguishable from other forms of software. In many cases their requirements, in areas such as performance and interface design, are unusual, if not unique. But they remain based in code. And it therefore requires a sound knowledge of coding software to be able to create the software that forms a game. This cannot be learnt in one or two units. Therefore students are required to undertake our full first and second year programming/software engineering program. The only core unit from the mainstream BIT missing from this program is a second year unit in databases. This was not viewed as necessary for producing graduates with widely applicable programming skills.

The games units reflect the high level aims of the program. As well as core technical units, such as *Games Design*, *Computer Graphics*, and *Modelling and Animation* there are also units which take other perspectives on videogames. These are: *Critical Game Studies*, *Introduction to Digital Media Production* and *Introduction to Videogames*. The latter unit is jointly delivered by the two departments involved in these programs. Half of the unit concentrates on design, the other on critical media theory, the rationale for which was discussed in section 3.

The final group of units consists of supporting study for the programming stream (such as the units in discrete

mathematics) and some elective choices. These electives are limited to area which will be relevant to the students work in videogames, such as computer networks, artificial intelligence, web technology and screenwriting.

Table 1. Prescribed units for the bachelor of information technology – games design and development

|                                      | Semester 1  | Semester 2                                    | Semester 3   | Semester 4  | Semester 5  | Semester 6  |
|--------------------------------------|---|---|--|---|---|---|
| Games Studies                        | MAS110<br>Introduction to Digital Media Production            | COMP111/MAS111<br>Introduction to Video Games | COMP260<br>to Games Design                                       |   | COMP330<br>Computer Graphics<br>MAS319<br>Modelling and Animation | MAS329<br>Critical Games studies<br>COMP352<br>Games Design Project |
| Programming/<br>Software Engineering | COMP115<br>Introduction to Computer Science                   | COMP125<br>Fundamentals of Computer Science   | COMP225<br>Algorithms and Data Structures                        | COMP229<br>Object-Oriented Programming Practices<br>COMP255<br>Software Engineering |   |   |
| Supporting Studies                   | ISYS114<br>Introduction to Systems Design and Data Management | DMTH137 Discrete Mathematics 1                | DMTH237<br>Discrete Mathematics II<br>200 COMP or Media elective | 200 COMP or Media elective  | 300 COMP elective   | 300 COMP or Media elective  |

Table 2. Prescribed units for the interactivity and games major

|                  | Semester 1  | Semester 2                                    | Semester 3   | Semester 4   | Semester 5                        | Semester 6  |
|------------------|---|---|--|--|-----------------------------------|---|
| Prescribed Units | MAS110<br>Introduction to Digital Media Production<br>COMP115<br>Introduction to Computer Science | COMP111/MAS111<br>Introduction to Video Games | COMP260<br>Games Design<br>MAS240<br>Cybercultures | MAS202<br>Screenwriting or<br>MAS241<br>Interactive Web Design | MAS319<br>Modelling and Animation | MAS329<br>Critical Games studies<br>COMP352<br>Games Design Project<br>300 Media Elective |

#### 4.2 Major in Interactivity and Games

By its nature a major within a flexible degree, such as Macquarie University's Bachelor of Arts, cannot include the depth of study of a specialised degree such as that described in the previous section. Macquarie's approach to undergraduate majors requires that they be limited in size to allow the students to tailor their programs through choice of elective units. Within that structure we have attempted to provide a program that retains almost as much of the study on videogames as is offered by the Bachelor of Information Technology – Games Design and Development without the need for significant programming skills. In fact the only games studies unit listed in table 1 missing from the major is Computer Graphics. Note that some limited programming study remains in the major in the form of *Introduction to Computer Science*, our first year first semester programming unit. This provides sufficient foundation for the students to undertake the other units, such as Games Design. To this core of videogames studies is added 200-level media units in interactivity and web design (Cybercultures and Interactive Web Design) and a 300-level elective from a range of relevant media units (such as screenwriting and further web studies). This provides students with considerable technical skills (in area such as game design, web

design and animation) which do not need significant programming ability. These media studies units, when combined with the practical ones provide the wider appreciation of videogames, and ability to apply that knowledge to analysis and design, that is a core aim of both programs. Apart from roles in animation, story design and game design, students would also be able to apply their studies in areas such as games journalism.

### 5. Pedagogy and Units

The direct experience that any students have of their education is in the individual units, more precisely in the classrooms and other learning environments of those units. Whether students are particularly interested in the structure of their program is not a topic being discussed here. And regardless of the answer to that question the immediate concern of students is what they have to do to complete the units in which they are currently enrolled. Videogames encourage creativity, both in their playing and in their production. Solutions are not straight forward, even in something as deceptively simple as the task of playing a level of Angry Birds. Students come into these programs with a knowledge of videogames and a sense of ownership unusual in undergraduate study. Many of them have a detailed and up to date knowledge of the industry and its products. They are used to playing games, which is itself a practical exercise. Study in this area requires a hands-on approach and this needs to be reflected in the curriculum. Students will readily detect if examples are not accurate or up to date. Staff in these units must have sufficient background knowledge to be able to converse with students on these terms. In addition, guest lecturers from the industry, both the production and journalism sides, provide useful additional material.

Design is not a ‘tame’ discipline. In the terminology of Rittel and Webber (1973) it is ‘wicked’. By this they mean that problems and their solutions are inseparable. The attempt to solve a problem must proceed in iterative steps, with there being no clear finishing point, no absolutes of right or wrong in judging the solution. Videogame design shares this characteristic with programming, engineering, architecture and other design based disciplines. Students attempting to learn the process of design need to repeatedly apply their skills of creation and implementation. This does not correspond to the mental model of learning of many students. In the words of Papert (1980) many students ‘have a model of learning in which you have either “got it” or “got it wrong”’. He goes on to contrast this, in the context of computer programming, with the situation where a working solution is almost never found at the first attempt. His solution is to encourage a hands-on approach to learning in such disciplines where students can continually practice their skills, receive feedback and refine their solutions. This approach has been adopted in the game design units of the programs described here (half of Introduction to Video Games, Games Design, Games Design Project and in Animation and Modelling). That a focus on students and student work is advantageous in teaching design in a qualitative study of design teaching (Trigwell, 2002).

Many educational experts recognise the importance of student activity and placing the learner at the centre of the learning and teaching activity, e.g., (Lebow, 1993), (Jonassen & Reeves, 1996) and (Sims, 1999). In the words of Shuell (1986) “what the student does is actually more important in determining what is learned than what the teacher does”. The assessment in the games design units is centred on project activity. In all these units students create a game. More than that, they develop the idea of the game themselves, they are not told what game to implement. This combines a requirement for both creativity and technical skill. Students are given guidelines as to the scope of their project, but they must decide upon its setting, theme, game mechanics, etc. As well as this, in Introduction to Video Games and Games Design, students are given smaller, more structured, design and implementation tasks to both learn the supporting software and hone their skills. A similar approach is taken in Animation and Modelling. The workshops where these tasks are carried out are structured so that the students receive continuous feedback on their work from both the staff and their peers. This allows them to develop their skills in creativity, planning, analysis and implementation. Students are encouraged to view and comment on each other’s work. Part of the marks in Introduction to Video Games are dependent on the reaction of other students to the games they create. Feedback on the projects themselves is not the typical model of assessment based solely around a finished product. Students are required to discuss their project with teaching staff at a number of points through the unit. As well as providing extensive feedback, this also encourages students to practice their communication skills, by requiring that they describe it to the teaching staff.

The project work in *Introduction to Video Games*, *Games Design* and *Animation and Modelling* is carried out by the individual student. In *Games Design Project* students work in groups of four to six members, enabling them to both create a more substantial piece of work and apply the communication skills they have honed in earlier units to the process of group production. The assessment of the projects is based both on the level of technical skill achieved and on the quality of the game design.

The learning environment for the workshops are held is not a traditional computer lab with desks arranged in rows. Rather the student workstations are arranged in clusters, making it easier for them to collaborate and view

each other's work. This allows them to give and receive advice, encouraging both communication and mentoring skills. It also breaks the typical mould of a teacher standing at the front of the class providing instruction. With tables facing in all directions there is no natural 'front'.

While traditional lectures do form a part of these units, it is not the central part, with only one lecture hour per week in *Introduction to Video Games* and less than that in *Games Design Project*. While there are more lectures in *Games Design*, they are complemented by a group design project, where the class as a whole creates a design proposal for a game (as opposed to an implemented game). In this the students discuss and contribute to the design with the lecturer acting as a moderator and note taker. This gives the students some experience of a larger scale project than they can produce individually and prepares them for the group work in *Games Design Project*.

## 6. Conclusions

Videogame education at traditional universities is still in its infancy. As part of the development of the programs offered by Macquarie University we identified two basic categories of program; the first highly focussed and specialised, the other built around more general programs and adding a number of specialised units. Highly focussed programs, with many specialist units, have an obvious advertising advantage. Students wanting to study videogames will be attracted, as they provide more dedicated study in the direct area of their interest. However, the question of whether such programs provide the necessary basic skills to students has not yet been answered, regardless of their exact area of study, be it programming or some other technical area of relevance to videogames. It is also uncertain whether these programs will provide sufficient career options for graduates throughout the course of their working lives, an obviously related question. Offering these programs requires significant investment on the part of the offering institution. On the other hand the programs built around existing offerings (such as mainstream programming degrees) require less investment, but also offer less specialist study. They do, however, provide skills that have potentially wider applicability. This tension, between the specialist and the generalist approaches to a higher education qualification, is by no means confined to study in videogames, but is particularly apparent here, especially with the existence of highly focussed private provider courses.

At Macquarie University, for both philosophical and practical reasons, the program offered that focusses on programming and videogames, takes the courses of providing a solid foundation in programming software engineering. This was a conscious decision, as shown in the two basic principles for our programs enunciated above. Even within such programs, as noted above, there is no uniformity. How much specialist study is enough? The Bachelor of Information Technology – Games Design and Development has a relatively high number of specialist videogames units for this type of program. Yet it does not cover all possible areas, for example the internals of game engines, as opposed to their use in design and implementation, receives little attention.

The major in Interactivity and Games, while taking a fundamentally similar philosophical approach, offers study in this area without a substantial programming component. This is markedly different to most other programs found in the area, and is unique in Australia in offering such study with a substantial technical component in other areas relevant to videogames such as game design and animation.

Underlying the structure of both these programs is an innovative approach to studying videogame design. That is, that it should be linked to study in the critical appreciation of video games. Designs are made to be used, and a designer who appreciates how their product will be used should produce a better design. This includes both its place in modern society and culture as well, in the case of videogames more direct understanding of player habits and interactions. Understanding design involves being able to analyse and critique the designs of oneself and other and this is also included in the programs described here, as noted above.

Design can only be learnt through practice and the environment provided to students is one where they can both exercise their creativity and practice the various design and implementation skills. The structure provided encourages incremental learning. The use of projects where the students set their own goals by designing the entire game both encourages ownership and gives them an authentic context in which to hone their skills.

Initial reaction to these programs has been good, with over fifty students enrolling in the Bachelor of Information Technology – Games Design and Development program in its first year of offering. Students do not have explicitly nominate their major within the Bachelor of Arts on enrolment, so exact numbers for the major in Interactivity and Games are not known, but interest in it also appears to be high. Only time will tell whether this level of interest is maintained. In the future further empirical studies of the numbers of graduates and their reactions to the programs will be able to be undertaken, but this will have to wait until students have been able to complete the programs. Specialist programs in any area have to continually prove themselves capable of attracting sufficient students. Future development will include continued refinement of the workshop based



delivery of design teaching and review of whether the balance of general and specialist knowledge appears to be meeting the program aims.

## References

- Bakers, L. (2011). *Factbox: A look at the \$65 billion video games industry*. Retrieved from <http://uk.reuters.com/article/2011/06/06/us-videogames-factbox-idUKTRE75552I20110606>
- Brand, J. (2012). *Digital Australia 12, Interactive Games & Entertainment Association*. Retrieved from <http://www.igea.net/wp-content/uploads/2011/10/DA12FinalLinkVideo.pdf>
- Dixon, J. R. (1987). On Research Methodology Towards a Scientific Theory of Design. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, 1(3). Retrieved from <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=4191032>
- Dym, C. L. (1994). Teaching design to freshman: style and content. *Journal of Engineering Education*, 83(4), 303-310.
- Dym, C., Agogino, A., Eris, O., Frey, D., & Leifer, L. (2005). Engineering Design Thinking, Teaching, and Learning. *Mechanical Engineering*. Paper 22. Retrieved from [http://digitalcommons.olin.edu/mech\\_eng\\_pub/22](http://digitalcommons.olin.edu/mech_eng_pub/22)
- Gestwicki, P., & Sun, F. (2007). Game software and the design process. In Proceedings of the Design Science Research in Information Systems and Technology Conference (DESRIST'07). pp. 362–378.
- Gestwicki, P., & Sun, F. (2008). Teaching Design Patterns Through Computer Game Development. *J. Educ. Resour. Comput.*, 8(1), 22. <http://dx.doi.org/10.1145/1348713.1348715>
- Graetz, J. (1981, August). The origin of Spacewar! *Creative Computing*. Retrieved from <http://gillesboulet.ca/textes/spacewar.pdf>
- Jonassen, D., & Reeves, T. (1996). Learning with technology: Using computers as cognitive tools. In D. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology*. New York, Macmillan.
- Lebow, D. (1993). Constructivist values for instructional systems design: Five principles toward a new mindset. *Educational Technology Research and Development*, 41(3), 4-16. <http://dx.doi.org/10.1007/BF02297354>
- Oxman, R. (2004, January). Think-maps: teaching design thinking in design education. *Design Studies*, 25(1), 63-91. [http://dx.doi.org/10.1016/S0142-694X\(03\)00033-4](http://dx.doi.org/10.1016/S0142-694X(03)00033-4)
- Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. New York: Basic Books.
- Rideout, V., Foehr, U., & Roberts, D. (2010). *Generation M2: Media in the Lives of 8- to 18-Year-Olds*, Kaiser Family Foundation. Retrieved from <http://www.kff.org/entmedia/upload/8010.pdf>
- Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(Elsevier Science), 155-173. Retrieved from [http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General\\_Theory\\_of\\_Planning.pdf](http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General_Theory_of_Planning.pdf)
- Salen, K., & Zimmerman, E. (2003). *Rules of Play: Game Design Fundamentals*. MIT Press.
- Shuell, T. (1986). Cognitive conceptions of learning. *Review of Educational Research*, 56, 411-436.
- Sims, R. (1999). Interactivity and narrative: Strategies for effective learning. In B. Collis, & R. Oliver (Eds.), *Proceedings of EdMedia*. Charlottesville, VA, Association for the Advancement of Computing in Education.
- Trigwell, K. (2002, July 1). Approaches to Teaching Design Subjects: a quantitative analysis. *Art, Design & Communication in Higher Education*, 1(2), 69-80. <http://dx.doi.org/10.1386/adch.1.2.69>

## Notes

Note 1. Note that COMP111/MAS111 is a single unit, half of which is taught by the Department of Computing and half by the Department of Media, Music, Communication and Cultural Studies.

Note 2. We are here referring to the half of the unit taught by the Department of Computing.