

Immersive media practices in the classroom: models of the teaching research nexus in an Australian context.

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Abstract (253 words)

In recent years, a new wave of virtual reality (VR) and immersive media forms have gained popularity with both viewers and creators around the globe. This article presents the argument that the emerging nature of this current wave of practices makes this a site of particular importance for research by both academics and students. We explore the nature of the teaching-research nexus around immersive media practices by reporting on six case studies from three Australian Universities. Academic experience is varied and complex, with a variety of Inquiry-based learning approaches in place at undergraduate and postgraduate level, spanning the areas of writing, production, post-production and spectatorship. A study of these aspects allows students to seek knowledge and new understandings of media forms, an experience that we believe is vital for the development of higher-order skills. By exploring this area, we pose the question: *How can immersive media researchers use Inquiry-based learning to conceptually engage students with emerging formats through coursework design?* Furthermore, we seek to examine how Inquiry-based learning in the context of immersive media connects to the more widely used Problem-Based Learning models that have traditionally been employed in media practice courses.

It is hoped that this article provides a starting point for further discussion on the ways in which undergraduate and postgraduate students might benefit from being involved in or exposed to research activity in this area. These benefits might include a discovery process and the creation of new knowledge in relation to cinematic virtual reality, 360-degree video or other immersive media.

Keywords: Immersive media; Inquiry-based learning; VR; media practice; screen production

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(6824 words plus references)

In recent years, a new wave of virtual reality (VR) and immersive media forms has gained popularity with both viewers and creators around the globe. The idea of computer-based VR is not new and has surfaced several times since the 1960s; however, the release of accessible omnidirectional video cameras that integrate with standard video production workflows, as well as good quality consumer grade head mounted displays (HMDs) in the last four years has led to increased interest in the medium. Immersive media has also surfaced in the screen production classroom, with both critical and practical approaches to various forms now being taught as part of undergraduate and/or postgraduate media practice programs at some Australian institutions. The affordances and aesthetic implications of cinematic VR and 360-degree video have not yet been fully explored but this has been a site of significant and ongoing academic research by the authors of this article (see Bender 2019; Dooley 2017, 2018, 2019; Ross & Munt 2018; Schleser 2018). It has also been an area of significant creative practice as research (see Bender & Broderick, 2019; Bender & D’Silva, 2016a, 2016b; Dooley 2020; Ferris 2018; Schleser 2017; 2018). Other surfacing research suggests a ‘new paradigm of mobile cinematics’ (Hesselberth and Poulaki 2017, 172) and that the creative industries not only approach VR as an emerging technology, but as a new industry sector.

This article examines models of the teaching and research nexus in the area of immersive media practices at three Australian Universities, so as to highlight useful linkages and relationships in this area. These models that we present are innovative and diverse, reflecting Wareham and Trowler’s observation that ‘careful analysis of the ways in which the “nexus” as described in [...] case studies and in the literature, shows that in fact that there are multiple sorts of linkages and relationships being referred to...’ (Wareham & Trowler, 2). Writing on the teaching-research nexus, Robertson observes that ‘the notion of a symbiotic relationship between research and teaching constituting the very core of higher education has informed the ethos of most western universities for the past century or more’ (2007, 542). Furthermore, he suggests that ‘recent qualitative research studies indicate that academics continue to hold strong beliefs regarding a symbiotic relationship between research and teaching’ (542). The nature of this symbiotic relationship is, however, impacted by a range of factors such as teaching load, funding sources, university initiatives and government policies. With these issues in mind Robertson notes that ‘the emphasis in university research is moving away from free inquiry to problem solving; from curiosity- driven projects to specific programs funded by external agencies for specific purposes’ (542). He refers to the work of a number of academics (Barnett 2003; Clark 1995; Edwards & Usher 2000; Gibbons et al.1994) to suggest the drifting apart of teaching and research (Robertson, 542).

By interrogating the curriculum of six units taught across three universities, we argue for the vital importance of a teaching-research nexus in the emerging area of immersive media practice. In doing so, we explore methods of Inquiry-based learning, which Spronken-Smith & Walker note ‘has been promoted as a student-centered pedagogy which can both enhance student learning outcomes, particularly the development of higher order skills, as well as strengthen the teaching–research nexus’ (2010, 723). These authors look to Justice et al. (2007) who assert that ‘inquiry-based learning refers to both a process of seeking knowledge and new understanding, as well as a method of teaching’ (Spronken-Smith & Walker 2010, 723). For this reason, they view inquiry-based learning ‘as similar to research, and as a way to integrate research and teaching where both students and teachers are “compatriots in the search for knowledge”’ (Justice et al. quoted in Spronken-Smith & Walker, 724). By exploring this area, we pose the question: *How can immersive media researchers use Inquiry-based learning to conceptually engage students with emerging formats through coursework design?* Furthermore, we seek to examine how Inquiry-based learning in the context of immersive media connects to the more widely used Problem-Based Learning models that have traditionally been employed in media practice courses.

Different categories of Inquiry-based learning have been explored by Staver and Bay (1987), with an emphasis on approaches to problem solving. Spronken-Smith & Walker broaden these definitions to the establish the following three categories:

- structured inquiry – where teachers provide an issue or problem and an outline for addressing it;
- guided inquiry – where teachers provide questions to stimulate inquiry but students are self-directed in terms of exploring these questions;
- open inquiry – where students formulate the questions themselves as well as going through the full inquiry cycle’

(Spronken-Smith & Walker 2010, 727).

These categories provide a useful tool for the analysis of our varied approaches to the teaching of immersive media practices the case studies and discussion below.

Further to this, we look to Griffith’s models of the research- teaching nexus as another framework through which to analyze our approaches (2004). Although produced in the context of the built environment disciplines, these models provide an apt means to examine the teaching of media practice, in the absence of an established framework in this area. Griffith proposes four approaches that involve varied levels of inquiry and autonomy for students. The first asserts that teaching can be research-led ‘in the sense that the curriculum is structured around subject content, and the content selected is directly based on the specialist research interests of teaching staff’ (Griffiths 2004, 722). This resembles a traditional model of ‘information transmission’ with an emphasis on ‘understanding research findings rather than research processes’ (722). The second model calls for teaching that is ‘research-oriented’, this relating to a curriculum that ‘places emphasis as much on understanding the processes by which knowledge is produced in the field as on learning the codified knowledge that has been achieved’ (722). This approach focuses on the teaching of inquiry skills and the acquisition of a ‘research ethos’ (722). The third model suggests that teaching can be ‘research-based’, with the curriculum ‘largely designed

around inquiry-based activities, rather than on the acquisition of subject content' (722). In this model, Griffiths sees a minimized division between the roles of students and teacher, with deliberate exploitation of 'the scope for two-way interactions between research and teaching' (722). The final model calls for teaching that is 'research-informed', this meaning that 'it draws consciously on systematic inquiry into the teaching and learning process itself' (722).

The six case studies that follow (three undergraduate and three postgraduate) interrogate Inquiry-based approaches to the teaching-research nexus with reference to these models. While reporting on immersive media focused teaching practices at various universities, we will outline the nature of various authors' research and describe how this impacts upon curriculum design and classroom practices, so as to foster a beneficial learning experience for students.

Undergraduate Case studies

Immersive Media as a module in a first year Screen Arts course- Curtin University

Students at Curtin University investigate a series of cinematic virtual reality (CVR) projects over a period of two weeks in the undergraduate Screen Arts unit, *Introduction to Screen Creativity*. In the first week, they are introduced to current CVR practice and aesthetics via a seminar that incorporates a broad history of VR and a discussion of concepts such as presence, embodiment and proximity in relation to this medium. This lecture is followed up with classroom activities that involve CVR project viewing and discussion. Students use a selection of head mounted displays (a limited number of Oculus Go headsets and a larger supply of google cardboard style viewers) to watch a range of CVR experiences that are streamed from the with.in website (2019). This useful VR distribution site features a range of cutting edge CVR new releases as well as notable older works such as *Clouds Over Sidra* (2015) and *Notes on Blindness* (2016). Following this screening, students are placed into small groups to discuss the nature of the viewing experience that they have just undertaken, guided by questions asking them to compare the experience to that of traditional 2D film viewing. Students also consider the narrative form and aesthetics of the CVR films that they have experienced.

The following week students complete a written assignment that asks them to further consider one CVR experience. Students reflect upon this in relation to the concepts introduced in the lecture- presence, embodiment and proximity- and present their impressions of the specificity of the CVR medium. Given the emerging nature of CVR in the 360-video format, these written responses contribute to a relatively new and important discourse on CVR aesthetics and spectatorship.

This unit of study was designed by the Unit Coordinator, Dr Kath Dooley, and links with her ongoing research into firstly, the emerging screen grammar of CVR (Dooley 2017) and secondly, the notion of proximity in CVR (Dooley 2019). Although the unit is delivered by a number of tutors, Dooley is present in the classroom for the sessions that involve CVR viewing, so as to guide and contribute to discussion. As such, the design and teaching of this module aligns to some degree with both the first and the third of Griffith's models of the teaching-research nexus (2004). In relation to the first, it can be observed that the teaching is research-led in the sense that the content selected is directly based on Dooley's specialist research area. While the seminar

component resembles a traditional ‘information transmission’ model (Griffiths 2004, 722), the classroom activities that follow encourage inquiry based learning. In this setting students are encouraged to interrogate their individual viewing experiences alongside their peers and instructors. In particular, Dooley is able to use her own experience as a viewer and researcher of the emerging CVR medium to guide student learning activities. While other modules in the Curtin unit that interrogate traditional media formats and aesthetics draw upon significant academic work and established film theory, this module on the CVR form allows students to explore an area that is not yet fully understood, working alongside Dooley. In this sense ‘the division of roles between teacher and student is minimized [and] the scope for two-way interactions between research and teaching is deliberately exploited’ (Griffiths 2004, 722).

The written response that the students generate could be considered as a form of ‘structured inquiry’, in that Dooley has provided a question and an outline of how to address it (Spronken-Smith & Walker 2010, 727). By encouraging students to consider a number of key concepts in relation to the viewing of a CVR experience, space is created for students to interrogate their individual experience of spectatorship, hopefully leading to new understandings of not just the CVR form, but the characteristics of traditional media also. By giving time to the CVR form, Dooley’s intention is to create a learning experience that values student experience and highlights the dynamic nature of the screen industries.

Experimental Screen Production - Swinburne University of Technology



Figure 1: Student projects in Experimental Screen Production at Swinburne University of Technology.

At Swinburne University of Technology students in the Film and TV and Screen Production program take the *Experimental Screen Production* unit in their first two years of their study program. The unit was designed and is taught by Dr Max Schleser. He recently produced two experimental cinematic VR projects, *Neocortex* (2017) and *[Mynd] Journey* (2018), that screened at SF3 in the Sydney Opera House, VR Fringe in Melbourne and Riga Digital Forum. His investigation into technical workflows, creative concepts, aesthetics and cameras has translated into the studio class. His prior research into CVR as dreamscape and towards spatial experiences was presented at the annual Australia Screen Production Education & Research Association (ASPERA) Conference at Bond University in 2017 (Schleser 2017). Schleser also runs workshops with tailor made frameworks for industry professionals and community groups

(Schleser 2017, Schleser 2019 and 2018). As an Adobe Education leader, he also makes resources available for colleagues via the Adobe Education Exchange (Schleser 2019).

The unit's first assignment, an experimental smartphone film, is an exercise for students to develop an understanding of montage, non-linear and experimental approaches to filmmaking. Students explore *Film as Film* (Le Grice 1979) to make connections between avant-garde cinema, experimental documentary and contemporary experimental smartphone filmmaking. Students engage with experimental methods and refine their aesthetic choices into a coherent smartphone film. They are encouraged to submit their film to one of the now many smartphone film festivals internationally (such as the *International Mobile Innovation Screening & Festival*) and learn about writing a log-line, synopsis and director's statement.

After successful experimentation, students will consider a shift from traditional storytelling towards 'experiences' as a framework for their experimental projects. This provides a good foundation for their second assignment in which students have a choice between a CVR (360-degree video or interactive 360 video), multiscreen installation or live AV (VJ) project. Conceptually these approaches move beyond the cinema screen and inform students' exploration of emerging media (VR headsets, omnidirectional video cameras) and software (such as Avenue Arena, Premiere Pro for editing and WondaVR for interactive 360 videos)¹.

By means of applying practice-led research, Schleser's experimental CVR projects investigate the emerging filmmaking form and formats of 360-degree video, CVR and its implications for the development of visual storytelling. *Neocortex* explores spatial narratives, imaginative spaces and the architecture of the image as key considerations and creative strategies for 360-degree filmmaking and CVR. *My[nd] Journey*, as a non-linear experience, is a journey into a meditative state of mind.

Students explore these projects as inspiration and engage with the experimental frameworks that drove these projects. In reference to Griffith's (2004) models of the research-teaching nexus, his third approach is most closely linked to the design of *Experimental Screen Production*. The unit also emphasises the understanding of creative processes and filmmaking approaches in a cinematic VR context. Here Schleser's research experiences provide students with some inspiration and a possible road map to technical and creative challenges. The unit's experimental approach is underpinned by a documentation of this process so that students can reflect on their progress and are introduced to a sound 'research ethos'.

As part of his research, Schleser has curated the MINA 'International Mobile Innovation' Screening for the last nine years. At the 8th edition (Schleser 2018, 2019) mobile CVR was included in the screening program. As one of the first initiatives internationally to address this form, the screening included experimental mobile CVR works in order to provide a record for these developments.

¹ An overview of the students' work is presented on the Adobe Spark page <https://spark.adobe.com/page/KYhoWFkp6zhJZ/>.



Figure 2: #MINA2018 VR showcase, Smart Storytelling Symposium, Swinburne University of Technology, Melbourne, November 2018, www.mina.pro.

Immersive media production and post-production within the context of a visual effects practice unit – Curtin University

One alternative core unit in the Screen Arts stream at Curtin University was modified in 2019 to focus on 360-degree cinema within the context of visual effects (VFX) post-production. Unit Coordinator Dr Stuart Bender has traditionally concentrated the curriculum on the integration of digital VFX compositing within live-action filmmaking, with the promoted emphasis of enhancing production values and utilising photorealistic modes of VFX (Prince 2012). Many major group-based productions have operated within the photorealistic domain even as the creative subject matter spanned typical themes such as zombie apocalypse, doppelgänger horror stories, and occasionally spy thrillers. 2019's CVR emphasis aimed to work within the same parameters, yet extend the VFX application into the 360-degree spherical video format. Bender's approach here represents an excellent opportunity to engage students in an emerging area of academic research – this time, the aesthetics of CVR.

The first task in renovating the digital effects curriculum was to map the VFX techniques from previous iterations of the unit onto CVR. While the techniques taught in previous years may be considered a luxury for flat-screen filmmaking (for instance, composited explosions, muzzle-flashes, smoke and fire elements), it is extremely difficult to make CVR with high production values without some sort of basic VFX capability. For example, removing the tripod from the nadir of the 360-degree frame can be classed as a visual effect. But moreover, while that can be accomplished quite easily, more sophisticated knowledge of VFX can enable the production to use rotoscoping, masking and advanced clean-up techniques to remove lights and microphones from the shot, as well as remove the director.

Much of the curriculum ideas around these techniques are inspired by the production constraints discovered by Bender in the production of two CVR films in 2016 (Bender & D'Silva 2016a; 2016b). For instance, many CVR projects that do not rely upon a knowledgeable VFX team tend to have the director leave the room so they are not visible in the 360-degree frame. Playback of

the 360-degree recording is still quite a difficult process, which means that the director may have no clear idea of how the scene actually played out until after the footage is stitched and they are at the edit bench. VFX compositing enables the director to stay in the room – and be painted out later in post-production – to observe the action and choose whether or not to do another take. Most of the students in the unit opted to use this technique when making their CVR project, and informally commented that initially they had been apprehensive about how to direct actors in 360-degree space until they had learned how to do these VFX techniques.

In general, the unit aligns primarily with the first type of research-teaching nexus identified in Griffiths' (2004) model: the teaching is *research-led* in that Bender, as the curriculum designer, is structuring the content around some of his research interests and expertise. This is a type of *creative* research-led teaching that is informed not only by the educator's scholarly awareness of content but via the educator's own creative practice. In relation to the use of CVR and VFX, this on-going research project has resulted in practical and theoretical knowledge in CVR production around controlling audience attention with visual cues and editing (Bender 2019), embedding and compositing flat-imagery into the 360-degree spherical view (Bender & Broderick 2019).

The unit is also loosely connected to the third type of research-teaching nexus identified in Griffiths' (2004) model: the teaching is *research-oriented* in that the student projects are identifying experimental areas of VR production and staging as well as areas in which student productions are likely to benefit from and require VFX. For example, at this stage the published scholarship in screen tends to propose purely speculative accounts of how practitioners may make different aesthetic choices in CVR (see Mateer 2016). Therefore, one of the advantages of having students trial various techniques in the inquiry-based creative projects of this unit is that it provides a range of test material utilising a variety of aesthetic choices such as different camera heights, object/subject distances and motion, and a range of editing styles.

Postgraduate Case Studies

'Screen Ideas' - University of Technology Sydney

In 2019 UTS transformed their postgraduate degree, adapting learning outcomes for students to encounter a radically different 'screenscape' from that for which the course was initially designed. In an Arts Hub interview Dr Alex Munt stated, 'it's our aim to future-proof this new cohort and inspire them to be responsive, adaptive, and innovative' (Carroll 2018). Within the new Masters of Media Practices and Industry (MPI) course structure Munt was handed the responsibility to deliver a new style of screenwriting subject to sit within a production context to reflect a contemporary model of screen development that enfold a broader sense of 'writing' – for, on and with screens – in the digital era. The curriculum for *Screen Ideas* builds upon screenwriting research from Steven Maras (2009) and Kathryn Millard (2014). The subject advocates the practice of 'scripting' in a digital era as multimodal writing with images and sounds and cites Millard's 'Manifesto for Sustainable Screenwriting' (2014) – to inspire students to privilege ideas and their potential impact, then work with the tools at hand to drive these to production. Munt's own research trajectory in screenwriting for micro-budget cinema, and more recently, screenwriting for immersive media contributed to a strong research-teaching nexus.

The pedagogical foundation for *Screen Ideas*, as its name implies, was inspired by the concept of ‘the screen idea’ articulated and developed by Ian W. Macdonald a founding member of the international Screenwriting Research Network. His articulation of ‘the screen idea’ is elegant and flexible. It privileges the journey of the screen idea through screenwriting and development, into production and post-production towards the ‘final’ iteration - as the ‘screen work’ itself. For Macdonald, ‘...It is the focus of the practice of screenwriting, whether mainstream or not. It is what you, as the writer, think you’re writing... as the screenwork develops, each draft script becomes one more fixed version of the screen idea. The final film – the screenwork – is another such version’ (2014, 5).

For UTS’ *Screen Ideas*, a key challenge was to enliven this conceptual framework for new spatialised media. It was evident to Munt that the best screen ideas (whether for ‘new’ immersive media or heritage media) interact with both time – and space. Across the spectrum of visual media - from painting, photography to the moving image – space is a representation. In his ‘A History of Pictures: From the Cave to the Computer Screen’, David Hockney, with Martin Gayford, privilege the traditions of ‘picture-making’ beyond medium specificity (2014). This notion was adopted in a recent article in the *Journal of Screenwriting* by Munt, with Dr Miriam Ross, where they argued that the dominant perspectival mode of vision that underpins classical cinema is a restrictive regime of vision for new 360-degree immersive cinematic media (2018, 193). This article contributes to a new conception of screenwriting for Cinematic Virtual Reality adding to work by Mateer (2017) and Dooley (2017).

This research proved core to *Screen Ideas* in engaging students to reflect on what it means to write for 360-degree immersive media – a new medium where the ‘rules’ are not yet set either in screenwriting, or production. In their final assessment in the subject students have the opportunity to work with new CVR prototype-screenplay formats. With a production-based approach, students employ prosumer Virtual Reality cameras to ‘write’ and develop their screen ideas – for production in later subjects within the degree. Students submit both page-based ‘manuscript’ versions of their screen idea, complemented with 360-video produced and edited, to be experienced on YouTube as spatial video, or in a Head Mounted Display (HMD) for VR.

In contrast to screenwriting practices, traditionally hosted within literary or creative writing departments, in a media arts and production context screen ideas are provided a ‘motor’ using production technology to visualise and iterate strong ideas to include both scriptwriting (as manuscript) and writing with images including photography, moving image and immersive 360-degree video. This syncs with the wider UTS Model of Learning which prioritises practice-orientated education and reflects the interests of the Media Arts academics at UTS who see themselves as ‘makers’ as much as they do as ‘writers’ for new screen media².

‘Immersive Media’ - University of Technology Sydney

Immersive Media is a production elective in the Masters of MPI, designed and taught by Dr Gregory Ferris. Practice-based, it resides within a block of production electives and examines forms of immersion and associated technologies, historical, contemporary and emerging, whilst

² The UTS model of learning can be accessed at <https://www.uts.edu.au/research-and-teaching/learning-and-teaching/uts-model-learning/what-students-learn>

developing works across media that include stereoscopy, 360 Video, and Virtual Reality. The subject explores hybrid and alternative forms of post-production whilst being cautiously responsive to emerging immersive technologies, advancing student's knowledge through a 'scaffolding' structure. Referencing aspects of media archeology, pre-virtual and pre-cinematic immersion, it reflects a research theory professional teaching nexus — mirroring research and practice outlined in Ferris' doctoral studies, *Every time I leave the room: image, time and metadata in off-screen space* (2012), as well as the associated immersive research projects, *Eavesdrop* (2004) and *Conversations* (2004-06), undertaken through the iCinema Centre at the University of New South Wales.

Seminars are split between the theoretical, past and present exemplars of immersion as well as hands-on production. Students begin by exploring the notion of *empathie* (feeling into) as it relates to the German Romantic movement, as an ascendant to contemporary notions around empathy and immersion. Friedrich's *Wanderer above the Sea of Fog* (1818) and Géricault *Raft of the Medusa* (1818-19) are presented as examples, the former as experience into nature, the latter as the empathetic experience of suffering. Alternative mediums of the period are also examined, such as Trompe l'oeil and more importantly painted panoramas, which dovetails into the exploration of the moving panorama fad of the mid-nineteenth century and their representation of *feeling into*, for example into place, the experience of others, or the fictionalised. An exploration of the history and techniques of stereo-photography prepare students for the first practice-based assignment involving stereoscopic stills and moving image production, using stereoscopic apps and bespoke 3D video camera rigs.



Figure 3: Stereoscopic photograph of a room, by MPI student Chuyu Luo (2019).

Familiarising students with stereoscopy and immersion helps to transition students into the next subject block, which examines 3D 360 Video. Modern concepts of empathy, from the Cherokee Indians 'walking in someone else's shoes' to the thematic use of such tropes in literature, thence films use of the 'body swap' as a narrative device are investigated alongside the cinematic representation of the immersive experience in movies such as *Brainstorm* (1983). Students examine cinema's relationship to and use of immersion and spectacle, from the first projected moving images to Cinemascope and Cinerama and the theatrics of William Castle, to the olfactory (Smell-O-Vision), and the use of sound technologies.

This conceptualisation of cinematic immersion prepares students for 360 video production, including post-production, compositing, and sound. Students examine contemporary 360 video examples alongside other immersive systems. Students subsequently work in groups to produce a stereoscopic 360 video to a given brief.



Figure 4: Winterborn Tattoo Studio, 360 Video Documentary, by UTS MPI students Bridget Anne Garcia, Yingxin Liang, Zisheng Zhang, Anyan Sun & Mengting Wang (Equirectangular still from video, 2019).

Finally, students explore augmented, mixed, and virtual realities and associated conventions, theories and practices, preparing them with the skills necessary for their final assignment, room-scale exploratory environments using game engines, using HMDs and controllers for basic interaction. Students explore the history of augmented and virtual reality, interaction and immersion, including the work of VR pioneer Char Davies. They also explore a number of contemporary VR experiences across a range of genres, notably the interactive documentary series *Spheres* (2018), the Australian science fiction drama *Awake* (2018), and the Australian Indigenous animated documentary *A Thin Black Line* (2017). These experiences also introduce students to sense technologies as they relate to virtual reality - touch, smell, and taste, through proprioception technologies such as haptics (touch, vibration), the olfactic (smell), and thermoreceptive (simulated climatic change).



Figure 5: Vive Room Scale assessment, by UTS MPI student Zejian Wang (screenshot of experience, 2019).

Students then work in computer labs to add basic interactivity and other assets such as a virtual reality camera with controllers and collision detection for triggering actions. Finally, they beta-test their works, either through a dedicated VR lab, or directly in general computer labs, using a portable VR setup, before in-class presentation and assessment.

A user-centred design approach to conceptualising and developing experiential media - University of Technology Sydney

Postgraduate students have the opportunity to develop a concept for an original expanded media project as part of the subject, *Experiential Media* in the Masters of MPI. The subject was conceptualised by Dr Megan Heyward, curriculum was jointly developed by Dr Bettina Frankham and Heyward and the first subject running was convened by Frankham. The subject focuses on understanding audience experience and designing media experiences for emerging technologies such as XR, VR and AR as well as transmedia forms. The curriculum is structured to guide students through the shift from creating an autonomous work of linear, author-centred media to working with experiential models of media production that focus on how best to connect with an audience. As noted by Sandra Gaudenzi, this shift creates a tension for producers of traditional media and there are still issues around how to maintain the creative spark of an authorial intention within a user centred design framework (Gaudenzi 2019). The subject is one of four subjects available as an industry choice within the MPI program.

Over four modules within the subject, students are introduced to concepts of audience/user centred experience design, guided through frameworks for evaluating media experiences, conduct their own user experience analyses, apply development methodologies that are specific to developing interactive digital narratives, test out different project prototyping and visualisation methods and determine the best method for communicating the detail of their own experiential media concept to their peers, potential funders and collaborators. Along the way students experience a range of immersive media experiences, starting with a viewing in a 360-degree cylindrical screening facility (the UTS Data Arena); exploring online VR content from platforms such as With.In, YouTube and SBS VR; experiencing locative media projects (such as *It must*

have been dark by then by Duncan Speakman of the Ambient Literature project (2018)), augmented reality works (such as *TendAR* by Tender Claws (2018)), mobile storytelling apps (such as *Karen* by Blast Theory (2015)), and social platform storytelling (for example *Lizzie Bennet Diaries* (Green & Su, 2012)). A very broad definition of immersive media is applied within the subject that builds on work in transmedia storytelling by Henry Jenkins (2006) and Robert Pratten (2015), experience design by Marc Hassenzahl (2010), worldbuilding by Trent Hergenrader (2019), methods for structuring narrative VR developed by Heyward (2019) and work by Caines and Frankham on artist experimentation with emerging forms of media that immerse the audience member through sound, image, narrative and temporal means (2019). Using a scaffolded approach to the subject structure, students move from what Rachel Spronken-Smith and Rebecca Walker describe as ‘structured inquiry’ (2010, 727) in an assessment task where they analyse existing projects according to a provided framework, to guided inquiry where students are provided with broad prompts intended to promote their project ideation through to open inquiry where students conceptualise and research prototyping methods as appropriate to their individual project concept.

The subject has been ‘research-informed’ in that the subject convener’s methods for exploring, trialing and understanding new production processes informs the way students are prepared for assessment tasks (Griffiths 2004, 722). As a practice-based researcher, Frankham is familiar with a certain degree of uncertainty and discovery in approaching an innovation in form or medium. This experimental process of pushing at the boundaries of existing, accepted practice is encouraged through in-class discussion of projects for analysis and in one-on-one consultations with students about their project ideas.

In the context of Frankham’s own creative work, the research methodology incorporates analysis of existing works, examining industry resources, experiments in making to test boundaries in practice, applying critical thinking and reflection to outcomes and iteration. Frankham has applied this methodology to two immersive projects, a 360-degree video *Magic Hour and the Fading Light* (in progress) and an interactive VR essay *In a Minor Key* (in progress). While not unique to immersive media research, this methodology of creative practice research forms the underlying structure of *Experiential Media*, suggesting one way to approach conceptual development in emerging media forms.

Where many of the resources around experience design and user centred design have a commercial, product or service focus, the convener’s creative practice research has been crucial in reframing the available materials in order to better orient the emphasis to the media arts context of the course, balancing a critical aesthetic practice that is appropriate to a Masters level course against a strict interpretation of user centred design that may be found in industry focused texts.

The self-devised project proposal/concept document that students produce for their final assignment has a high level of propensity to develop inquiry skills in order to solve problems that are specific to the student projects. The research experience of staff is then strongly integrated into the learning process through providing informed suggestions and feedback as well as modelling an experimental discovery process to investigate the affordances and potentials of emerging immersive media formats.

Discussion

The six case studies above present a range of curricula that critically explore immersive media writing, production, postproduction and viewing practices. While for undergraduate students the introduction to immersive and emerging media is in the foreground, postgraduate programs provide more specific focused inquiry on multimodal writing, user-centred design and/or VFX. One can note that the course designers and conveners, as researchers, approach the emerging field of CVR relative to their individual research interests and backgrounds, thus aligning with several models of Griffith's teaching/research nexus (2004, 722). As indicated in this article a number of theoretical frameworks such as presence, embodiment and proximity, avant-garde cinema and experimental documentary, spatialised media, empathy and immersion (influenced by the German Romantic movement), stereo photography and audience/user centred experience design have provided relevant contexts for analysis.

Returning to the question of how immersive media researchers can use Inquiry-based learning to conceptually engage students with emerging formats through coursework design, we suggest that the answer lies in the formation of open ended learning experiences that emphasise the unstable and developing nature of immersive media formats and experiences. In all six of the case studies above, one can note the inclusion of classroom activities and assessments that call for knowledge construction and independent thought to address the unknowns that exist in relation to project conceptualisation, production and user experience. These inquiry-based teaching methods 'emphasize students' knowledge construction, call for active learning, and provide strategies for independent thinking' (Benson & Bruce 2001 ,154). Kuhn et al define inquiry learning as 'an educational activity in which students individually or collectively investigate a set of phenomena—virtual or real—and draw conclusions about it' (2000, 496-7). While these researchers suggest that students direct their own investigatory activity, they note that 'they may be prompted to formulate questions, plan their activity, and draw and justify conclusions about what they have learned' (2000, 496-7). These activities, which align with the three methods of inquiry (structure, guided and open) outlined by Spronken-Smith & Walker (2010), are utilised by the six unit designers as a means to interrogate a range of immersive formats.

For example, Dooley and Bender at Curtin University, and Ferris at UTS adopt structured inquiry approaches to encourage students to examine the specificity of immersive media formats. By posing open-ended questions about individual student CVR viewing experiences in a classroom setting, Dooley forces reflection on the aesthetic and narrative elements that give rise to a viewer emotion and bodily responses. She draws upon 'questions stems', which are defined by King (1994) as 'queries such as "What are the implications of... ? Explain why... Explain how..."', to guide student learning (quoted in Lampert 2006, 47). Lampert notes that these questions 'facilitate higher order thinking by requiring students to reflect upon and reconcile various perspectives' (2006, 47). Similarly, Bender and Ferris take structured inquiry approaches that allow students to work through a number of variables in the production and post production of immersive media works. Their unit curricula allow students to identify the cause and effects of elements such as camera height, movement and the addition of interactive devices. These inquiry activities allow students to move beyond the description or classification of immersive media models, to identify 'which variable or variables are responsible for an outcome or how a change

in the level of one variable causes a change in one or more other variables in the system' (Kuhn et al 2000, 497).

On a similar note, Frankham and Munt at UTS and Scheleser at Swinburne University use guided inquiry methods to stimulate students' self-directed learning, this being assessed through project work centered on scripts, other conceptual materials and/or a complete immersive media production. Students' work on these projects involves a process where the rules governing relations between concept, production and user experience are discovered first hand through exploration and experimentation. The discussion and adoption of CVR prototype-screenplay formats and emerging media technologies demands that students look beyond traditional media approaches so as to address concepts such as immersion, presence and embodiment. Thus, students' understanding of immersive media affordances is understood through creative practice.

As Frankham notes above, the final assessment for the UTS *Experiential Media* unit is an example of open inquiry, with the students' self-devised project proposal/concept document allowing them to go through a full inquiry cycle. Further to improving students' problem-solving skills, we would suggest that such an activity encourages them to reflect on the dynamic nature of immersive media aesthetics and technologies, and to recognize the need for ongoing research. This is in keeping with Kuhn et al's observation that inquiry-based learning involves student acquisition of 'a set of intellectual values—values that deem activities of this sort to be worthwhile in general and personally useful' (2000, 496).

In all six case studies instructor research and expertise is used to guide students so as to encourage the generation of new knowledge and understanding of immersive media formats. In regards to inquiry learning, Lampert rightly notes that 'without teacher intervention students may revert to seeking just one "right answer" to a problem rather than working to reconcile various and opposing viewpoints and perspectives' (2006, 47). We suggest that this is where the teaching-research nexus becomes key to students' conceptual understanding of immersive media, in that staff, as researchers actively investigating the affordances and potentials of emerging immersive media formats, can model a process of experimentation and discovery. As a result, students are encouraged to think critically about a number of perspectives and solutions in regards to aesthetic and narrative approaches.

Inquiry-based learning shares some affinities with the Project-based and Problem-based learning models that have traditionally been employed in media practice courses. Lattas notes that Inquiry-based learning 'is similar to Problem Based Learning [...] in that it organises students into small groups and encourages them to consider themselves, from the start, as active researchers' (12). Students might be given a project brief and are encouraged to complete their own research so as to respond to it appropriately. For both types of learning, the instructor becomes a facilitator, who guides the student on their path. However, the emerging nature of immersive media formats aligns with experimental rather than professional practice, the latter of which is most commonly the focus of Problem-based learning. For example, students may produce short films, television productions or corporate video works that model industry norms. Similarly, project-based learning models involve activities that are 'designed to answer a question or solve a problem and generally reflect the types of learning and work people do in the everyday world outside the classroom' (Hanney, 49). Somewhat differently, immersive media, as

a developing area, does not yet sit within a normative system in regards to production or viewing, and therefore no such professional context for its instruction exists. By exploring creative responses to new technologies, students and instructors can co-create knowledge through experimentation and critical reflection, working without the parameters associated with traditional media products. This experience of ‘discovering’ an emerging format privileges the pursuit of knowledge for its own sake, and stresses the dynamic nature of the medium.

Conclusion

This article provides insight into immersive media practice undertaken at researcher and student level across six units of study and at three institutions in Australia. By exploring the teaching/research nexus in these contexts, we hope to inspire the expansion of Inquiry-based learning models, and to contribute to the development of these pedagogical practices in media production classrooms globally.

The emerging nature of the current wave of immersive media practices makes this a site of particular importance considering future media trends and careers. CVR is now a key format in the Australian mediascape in Broadcasting (i.e. SBS VR), at Film Festivals (such as the Melbourne International Film Festival), at Moving-Image Arts institutions such as the Australian Centre for Moving Image (ACMI), which features regular CVR showcases, and a number of VR companies providing services for the Creative Industries and beyond. While there are some great VR experiences that can provide inspiration, such as *Awavena* (2018), we have not yet seen the proliferation of VR producers with more than 20 feature credits as this domain is still emerging.

The intellectual capacity to venture into unknown knowledge domains is a transferable skill that will be required by future agile content creators working in VR/AR/XR environments with emerging media. While approaches are being shaped and this article will contribute to a specific understanding of immersive media languages, students realize the opportunities to be harnessed by venturing into these new domains. Working with emerging technologies and screen grammars, filmmakers and creative arts researchers (i.e. students) can find a niche that can transform into a career pathway and a distinctive approach to working. In this fast-moving field, Inquiry-based learning in the studio or classroom positions students and educators at the center of these greater developments.

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Figures

Figure 1: Student projects in Experimental Screen Production at Swinburne University of Technology.

Figure 2: #MINA2018 VR showcase, Smart Storytelling Symposium, Swinburne University of Technology, Melbourne, November 2018, www.mina.pro .

Figure 3: Stereoscopic photograph of a room, by MPI student Chuyu Luo (2019).

Figure 4: Winterborn Tattoo Studio, 360 Video Documentary, by UTS MPI students Bridget Anne Garcia, Yingxin Liang, Zisheng Zhang, Anyan Sun & Mengting Wang (Equirectangular still from video, 2019).

Figure 5: Vive Room Scale assessment, by UTS MPI student Zejian Wang (screenshot of experience, 2019).