THE UNIVERSITY OF ARIZONA

New Academic Program Workflow Form

General

Proposed Name: Game Design and Development

Transaction Nbr: 00000000000034

Plan Type: Major

Academic Career: Undergraduate

Degree Offered: Bachelor of Science

Do you want to offer a minor? Y

Anticipated 1st Admission Term: Fall 2020

Details

Department(s):

SBSC

DEPTMNT ID	DEPARTMENT NAME	HOST
0481	School of Information	Y

Campus(es):

MAIN

LOCATION	DESCRIPTION
TUCSON	Tucson

Admission application terms for this plan: Spring: Y Summer: Y Fall: Y

Plan admission types:

Freshman: Y Transfer: Y Readmit: Y Graduate: N

Non Degree Certificate (UCRT only): N

Other (For Community Campus specifics): N

Plan Taxonomy: 50.0411, Game and Interactive Media Design.

Program Length Type: Program Length Value: 0.00

Report as NSC Program:

SULA Special Program:

Print Option:

Diploma: Y Bachelor of Science in Game Design and Development

Transcript: Y Bachelor of Science in Game Design and Development

Conditions for Admission/Declaration for this Major:

Current students must be in good standing academically (2.0 GPA or above) in order to declare the major. Students do not have to complete any coursework before joining the major, and should declare the major by meeting with an academic advisor.

Requirements for Accreditation:

N/A

Program Comparisons

University Appropriateness

The iSchool is the only iSchool in the Southwest U.S. and in Arizona - as an interdisciplinary site for exploring 4th IR, cutting edge, and new media experiences, the iSchool is uniquely situated to serve the student population in this capacity. As a College, SBS means to explore human experiences, the iSchool focuses on issues where technologies and people intersect, so these programs are consistent with our University and College goals. These proposals are also consistent with other top iSchool activity (e.g., Illinois iSchool announces the hire of Dr. Pintar, who does research on: Social Informatics, interactive AI and suggestibility, developing tools to foster programming literacy through collaborative game design, interactive digital narrative, playful pedagogies, social narrative approaches to trauma and memory studies).

Arizona University System

NBR	PROGRAM	DEGREE	#STDNTS	LOCATION	ACCRDT
1	Digital Culture-Media Process	BS	67	Arizona State University	N

Peer Comparison

Please see attachment.

Faculty & Resources

Faculty

Current Faculty:

INSTR ID	NAME	DEPT	RANK	DEGREE	FCLTY/%
16308664	David Sherman	0481	Lecturer	Master of Fine Arts	.60
01183700	Drew Castalia	0481	Adj. Instor.	Master of Arts	.50
22075562	Lal Bozgeyikli	0481	Assit. Prof	Doctor of Philosophy	.40
22075762	Evren Bozgeyikli	0481	Assit. Prof	Doctor of Philosophy	.40
22054491	Catherine Brooks	0481	Assoc. Prof	Doctor of Philosophy	.20

Additional Faculty:

N/A

Current Student & Faculty FTE

DEPARTMENT	UGRD HEAD COUNT	GRAD HEAD COUNT	FACULTY FTE
0481	482	230	27.82

Projected Student & Faculty FTE

	UGRD HEAD COUNT			GRAD HEAD COUNT			FACULTY FTE		
DEPT	YR 1	YR 2	YR 3	YR 1	YR 2	YR 3	YR 1	YR 2	YR 3
0481	534	586	638	247	264	281	27.82	27.82	27.82

Library

Acquisitions Needed:

Online references through UArizona Main Library

Physical Facilities & Equipment

Existing Physical Facilities:

Existing resources will be used.
-Oculus Go head-mounted displays (x12)
-Virtual reality and game development compatible computer workstations (x25)
-Virtual reality and game development software installed on the computers, such as Unity Game Engine,
Adobe Suite and Oculus Libraries.
-Equipment of the Extended Reality and Games Lab that are used in some of the classes to broaden the
students knowledge on advanced systems, such as Magic Leap spatial augmented reality head-mounted

display, HTC VIVE Pro Eyes virtual reality head-mounted display, FOVE virtual reality head-mounted
display.

Additional Facilities Required & Anticipated:

Additional sections of OSCR lab offerings, along with the possibility of more:
-Oculus Go head-mounted displays
-Virtual reality and game development compatible computer workstations
-Virtual reality and game development software installed on the computers, such as Unity Game Engine,
Adobe Suite and Oculus Libraries.
-Equipment of the Extended Reality and Games Lab that are used in some of the classes to broaden the
students knowledge on advanced systems, such as Magic Leap spatial augmented reality head-mounted
display, HTC VIVE Pro Eyes virtual reality head-mounted display, FOVE virtual reality head-mounted
display.

Other Support

Other Support Currently Available:

existing resources will be used

Other Support Needed over the Next Three Years:

existing resources will be used

Comments During Approval Process

THE UNIVERSITY OF ARIZONA

NEW ACADEMIC PROGRAM-UNDERGRADUATE MAJOR
ADDITIONAL INFORMATION FORM

I. MAJOR DESCRIPTION -provide a marketing/promotional description for the proposed program. Include the purpose, nature, and highlights of the curriculum, faculty expertise, emphases (sub-plans; if any), etc. The description will be displayed on the advisement report(s), Degree Search, and should match departmental and college websites, handouts, promotional materials, etc.

The **Bachelor of Science in Game Design and Development** will provide undergraduate students with the design and development skills necessary to create virtual interactive environments that span across devices and platforms. This game program would include games for entertainment but also serious games and virtual reality simulations for training, education, healthcare and other purposes. The degree will provide students with the real-world skills and experience needed for successful game design and development; and will signal to employers that students have dedicated the time and energy necessary to build fluency with the underlying concepts and tools. The degree will cover all aspects of game design and development. This would include conceptualization, market analysis, technical design, and usability studies. The degree program will serve a diverse student population, training learners in artistic, technical and business aspects of games. The degree will require students to complete a set of core courses, yet also allow students to choose among a large set of electives in order to focus on their preferred areas of study (e.g., intensive programming, creative computing, and entrepreneurial aspects of game development). Students will apply the key theories and best practices they learned to practical game projects and refine their skills. Students will have multiple opportunities to produce finished games, both individually and team-based. The degree is intended for students who aspire to hold careers in the digital games industry.

II. NEED FOR THE MAJOR/JUSTIFICATION-describe how the major fulfills the needs of the city, state, region, and nation. Provide market analysis data or other tangible evidence of the need for and interest in the proposed major (and emphases, if applicable). This might include results from surveys of current students, alumni, and/or employers or reference to student enrollments in similar programs in the state or region. Include an assessment of the employment opportunities for graduates of the program for the next three years. Curricular Affairs can provide a job posting/demand report by skills obtained/outcomes/CIP code of the proposed major. Please contact Martin Marquez to request the report for your proposal.

The video game industry has been steadily growing in recent years. As the technology advances and new mediums, such as virtual and mixed reality arise, application areas of video games expand beyond entertainment, spanning areas from training and education to healthcare. A recent report (Video Games in the 21st Century) states the following facts: The total direct employment by the U.S. game industry now exceeds 65,000 employees, growing at an annual rate of 2.9%. The total employment in the U.S. that depends on the game software industry now exceeds 220,000. Statistics reported the value of the video game market in the U.S. in 2017 as $18.4Bn. Video games constitute a major industry not only in the U.S., but also in the world. In a recent report (by the games and esports analytics company NewZoo), global games market is estimated to grow to $143.5Bn in 2020. Hence, creating degrees and education opportunities in video game design and development and ensuring national advancement in this field is important for keeping up with other nations as well.

The U.S. Department of Labor, Bureau of Labor Statistics reported 'Software development, applications' job that includes video game design and development among the top ten fastest-growing occupations, with a 24% annual growth (much faster than the average for all occupations). In 2016, the number of jobs for software developers was 1,256,200 with a median annual wage of $101,790. California is reported as the state with the highest employment level (141,870). There are several employment opportunities in a wide-array of job roles, such as game designer, game programmer, game analyst, network specialist, user interface (UI) developer, art director, lead game artist, modeler, animator, quality assurance specialist, audio programmer, user experience researcher, cloud architect, level designer, content creator, user experience analyst, UI designer, producer and artificial intelligence programmer. Moreover, there are several opportunities for entrepreneurially-minded students in independent careers that offer significant income opportunities (e.g., streaming gameplay on Twitch, which has more than 15M unique daily visitors; participating in e-sports, where players can make up to $2M by playing games competitively; publishing independent games such as Minecraft, which can lead to big success and significant revenues). The proposed degree will provide education and hands-on experience in different areas of emphasis, with a variety of courses to ensure that students develop a competitive skill-set necessary for success in today's increasingly complex marketplace, and they can follow the most suitable career path for them after graduation.
Additional evidence of interest in the proposed major can be seen in enrollment of iSchool game courses such as Game Design, Game Development and Virtual Reality. A few student responses in the TCEs to the question "What did you especially like about this course?" were as follows: "Getting hands-on experience with VR development." "Learning how to code in Unity and work with VR is very fun and rewarding." "I really enjoyed the subject matter of the course. Working on VR applications is very fun and entertaining while still providing challenges." "I liked learning about some obscure aspects to Virtual reality and what goes into make a game from scripting to scenes to debugging." "Really interesting technology and

use of Unity." "The course is really fun and a cool topic to learn about and work with" "building our own 3d environments was challenging and rewarding" "The content is so interesting and activities have been consistently challenging, engaging, and fun." "The interactive use of technology is really interesting." "It was cool learning about VR and its applications. It was also great to be using the Oculus Go headsets." "Getting to use and learn about VR development was a unique opportunity." "Learning about Unity." "How VR works and how to implement your own games on it." "This was one of the best courses I have taken. I am newer to computer science, and it has made me excited to move forward. I know I will keep building on what I learned in this course, and I want to keep playing with designing in Unity and incorporate it into my future research." The interest in these courses was not only from the students of the iSchool, students from several other departments have been taking the game-related courses we offer. A recent enrollment roster (Fall 2018) for the ISTA 251 Introduction to Game Design course shows that students from a wide range of majors took the course, including General Studies, Communication, Computer Science, Business, Astronomy, and Film and Television (see Appendix B for the related data). The proposed program will address a growing student population, who wants to get education on digital games and work in the professional gaming industry afterwards. Enrollment numbers in the B.S. in Information Science & Technology offered by the iSchool has been consistently increasing over the past five years (see Appendix C for the relevant data). This increasing trend is another indication of potential interest in the offered B.S. program in Game Design and Development.

In the State of Arizona, there are four game-related programs according to the data from the National Center for Education Statistics: (1) Embry-Riddle Aeronautical University-Prescott, which hasn't awarded any degrees yet, as the program was opened in 2017; (2) The Art Institute of Phoenix, which awarded 18 Bachelor's Degrees in 2017; (3) Yavapai College, awarded 3 certificates in 2017; (4) Pima Community College, which awarded 10 Associate Degrees in 2017. The community colleges in Arizona can be feeders to the proposed program. As a more established game program in the area, the University of Southern California's game program awarded 50 degrees in 2017.

All of the mentioned data and student interest indicate a demand for the proposed program.

III. MAJOR REQUIREMENTS– complete the table below by listing the major requirements, including required number of units, required core, electives, and any special requirements, including emphases* (sub-plans), thesis, internships, etc. Note: information in this section must be consistent throughout the proposal documents (comparison charts, four year plan, curricular/assessment map, etc.). Delete the EXAMPLE column before submitting/uploading. Complete the table in Appendix A if requesting a corresponding minor.

Total units required to complete the degree	120
Upper-division units required to complete the degree	30 in the major, 42 upper div. for UA
Foundation courses	
Second language	2nd Semester Proficiency
Math	Moderate Strand
General education requirements	Tier I Two 150s Two 160s Two 170s Tier II One Tier II Arts One Tier II Humanities One Tier II Individuals and Societies
Pre-major? (Yes/No). If yes, provide requirements. Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	No
List any special requirements to declare or gain admission to this major (completion of specific coursework, minimum GPA, interview, application, etc.)	None
Major requirements	
Minimum # of units required in the major (units counting towards major units and major GPA)	**46**

Minimum # of upper-division units required in the major (upper division units counting towards major GPA)	30
Minimum # of residency units to be completed in the major	18
Required supporting coursework (courses that do not count towards major units and major GPA, but are required for the major). Courses listed must include prefix, number, units, and title. Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	-ISTA 116 Statistical Foundations for the Information Age (3)
Major requirements. List all major requirements including core and electives. If applicable, list the emphasis requirements for each proposed emphasis*. Courses listed count towards major units and major GPA. Courses listed must include prefix, number, units, and title. Mark new coursework (New). Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	Core Courses/Required Major Coursework (28 units) GAME 1XX Programming for Game Dev. (3) GAME 2XX Game Development I (3) ISTA 130 Computational Thinking and Doing (4) ISTA 161 Ethics in a Digital World (3) ISTA 251 Introduction to Game Design (3) ISTA 416 Introduction to Human Computer Interaction (3) ISTA 425 Algorithms for Games (3) ISTA 451 Game Development (3) *will be renamed Game Dev. II ISTA 498 Senior Capstone (3) **Elective Coursework in the Major** **(18 upper division units)** The School of Information faculty have generated suggested course combinations to assist students with their career goals, though students can choose any combination of major elective courses, in consultation with their advisor. **INTENSIVE GAME PROGRAMMING** ● (New) GAME 3XX Game Physics (3) ● ISTA 331 Principles and Practice of Data Science (3) ● ISTA 350 Prog. for Informatics Applications (4)

	• ISTA 424 Virtual Reality (3) **GAME FUTURES** • (New) GAME 3XX Monetizing Indep. Gaming (3) • ESOC 316 Digital Commerce (3) • ESOC 318 Disruptive Technologies (3) • LIS 484 Introduction to Copyright (3) **ARTIFICIAL INTELLIGENCE AND GAMES** • ISTA 450 Artificial Intelligence (3) • (New) GAME 4XX Artificial Intelligence in Games (3) • ISTA 421 Introduction to Machine Learning (3) • ISTA 457 Neural Networks (3) **ART OF GAMES** • ISTA 301 Computing and the Arts (3) • ISTA 302 Technology of Sound (3) • ISTA 303 Introduction to Creative Coding (3) • ESOC 300 Digital Storytelling and Culture (3) • ESOC 340 Information, Multimedia Design & the Moving Image (3)
Internship, practicum, applied course requirements (Yes/No). If yes, provide description.	**No**
Senior thesis or senior project required (Yes/No). If yes, provide description.	**Yes** • ISTA 498 Senior Capstone (3)
Additional requirements (provide description)	None
Minor (specify if optional or required)	Optional
Any double-dipping restrictions (Yes/No)? If yes, provide description.	Majors with the new BA in Game Behavior cannot minor with this BS.

*Emphases are officially recognized sub-specializations within the discipline. ABOR Policy 2-221 c. Academic Degree Programs Subspecializations requires all undergraduate emphases within a major to share at least 40% curricular commonality across emphases (known as “major core”). Total units required for each emphasis must be equal. Proposed emphases having similar curriculum with

other plans (within department, college, or university) may require completion of an additional comparison chart. Complete the table found in Appendix B to indicate if emphases should be printed on student transcripts and diplomas.

IV. CURRENT COURSES–using the table below, list all existing courses included in the proposed major. You can find information to complete the table using the UA course catalog or UAnalytics (Catalog and Schedule Dashboard> "Printable Course Descriptions by Department" On Demand Report; right side of screen). If the courses listed belong to a department that is not a signed party to this implementation request, upload the department head's permission to include the courses in the proposed program and information regarding accessibility to and frequency of offerings for the course(s). Upload letters of support/emails from department heads to the "Letter(s) of Support" field on the UAccess workflow form. Add rows to the table, as needed.

Course prefix and number (include cross-listings)	Units	Title	Course Description	Pre-requisites	Modes of delivery (online, in-person, hybrid)	Typically Offered (F, W, Sp, Su)	Dept signed party to proposal? (Yes/No)
ISTA 116	3	Statistical Foundations for the Information Age	Understanding uncertainty and variation in modern data: data summarization and description, rules of counting and basic probability, data visualization, graphical data summaries, working with large data sets, prediction of stochastic outputs from quantitative inputs. Operations with statistical computer packages such as R.	None	In-Person	F., SP.	In iSchool
ESOC 300	3	Digital Storytelling and Culture	This course will lay a foundation for understanding how stories shape communities, identities, memories, and perspectives on our lives. In addition, this course will provide opportunities for the theoretical analysis of self-representation, composite narratives on behalf of others, cultural heritage, and memories as they are preserved and performed within stories and through narrative. Influences on digital storytelling such as the sociocultural context, the institutional contexts of production the audience, and the needs or goals of the digital storyteller will be examined. Students will be required to call on their own intellectual, emotional, and imaginative processes, as well as to develop their own skills in digital storytelling,	None	In-Person Online	F, Sp, Su	In iSchool

			interviewing, oral history collection, and the use of relevant digital storytelling tools.				
ESOC 316	3	Digital Commerce	This course will look at how commerce in information content (websites, books, databases, music, movies, software, etc.) functions. We will discuss things like switching costs, net neutrality, the long tail, differential pricing, and complementary goods. We will address the following sorts of questions: - Why do so many information producers give away content (such as "apps" for mobile phones) for free? How do companies (such as Google and Facebook) stay in business when no one has to pay to use their services? - What are contemporary practices with regard to purchasing access to information content? For instance, why do we tend to buy books, but only rent movies? Also, how do new modes of content provision (such as Pandora and Spotify) change the way that creators get paid for their work? - Why are there restrictions on how information content can be used? For instance, why can you play the DVD that you bought on your trip to Europe on the DVD player that you bought at home in the United States? But why should anybody other than an economist care about the answers to these sorts of questions? The world now runs on the production, dissemination, and consumption of information. All of us constantly access all sorts of information, through all sorts of devices, from all sorts of providers. We read and interact with websites, we query databases, and we communicate with each other via social media. These sorts of activities permeate both our personal and professional lives. In order to successfully navigate this digital world, information consumers, information producers, and information policy makers need to understand what sorts of information goods are likely to be	None	In-person Online	F, Sp, Su	In iSchool

			available and how much they are likely to cost. We cannot learn enough about digital commerce simply by studying the various information technologies that are now available to create and disseminate information content. What matters most is how people choose to spend their time using these technologies, and what sorts of content can provide earning potential for its creators. What also matters are the unique properties of information content that make it very different from other sorts of goods. For instance, while only one person at a time can drive a particular car or eat a particular hamburger, millions of people can simultaneously read the same book, listen to the same song, and use the same software. These are issues that are part and parcel to living, working, purchasing, and being entertained in an eSociety; these are the issues addressed in this course.				
ESOC 318	3	Disruptive Technologies	This course introduces key concepts and skills needed for those working with information and communication technologies (ICT). Students will be exposed to hardware and software technologies, and they will explore a wide variety of topics including processing and memory systems, diagnostics and repair strategies, operating systems in both desktop and mobile devices. As part of this course, students will consider current technological disruptions, those issues emerging as technologies and social needs collide. Students we also learn about design issues and user needs tied to mobile or computer applications and web-based tools, sites, games, data platforms, or learning environments.	None	In-person Online	F, Sp, Su	In iSchool
ESOC 340	3	Information, Multimedia Design & the Moving Image	We are living in a time when nearly everyone has the means to make movies, music and photos using just their own personal tools like smartphones, iPads, and similar mobile gadgets. This course will develop and refine skills and understanding of multimedia in contemporary culture. Offering a	None	In-person	F, Sp, Su	In iSchool

			survey of innovative works in film and information arts, this course will allow students a hands-on opportunity to respond to concepts covered in class using self-produced media. This course will address how information functions in time-based forms of multimedia and video in this era of interactive information and displays. Drawing on historical precedents in the media and computational arts, this course focuses on both linear and non-linear approaches of using image, sound and text to create critical and creative works that function in a the context of social media and our contemporary digital society. How and why do certain images, music or films affect us so profoundly? We will address this question through a study of the components of media literacy that include: Production, Language, Representation, and Audience. These concepts will be examined through a cross-section of writers including: Marshall McLuhan, John Berger and Susan Sontag.				
ISTA 130	4	Computational Thinking and Doing	An introduction to computational techniques and using a modern programming language to solve current problems drawn from science, technology, and the arts. Topics include control structures, elementary data structures, and effective program design and implementation techniques. Weekly laboratory.	College algebra recommended.	In-person	F, Sp, Su	In iSchool
ISTA 161	3	Ethics in a Digital World	This course explores the social, legal, and cultural fallout from the exponential explosion in communication, storage, and increasing uses of data and data production. In this class, we emphasize the opposing potentials of information technologies to make knowledge widely available and to distort and restrict our perceptions. In a world of rapid technological change, topics include (but are not limited to): eavesdropping and secret communications, privacy; Internet censorship and filtering, cyberwarfare, computer ethics and ethical	None	In-person	F, Sp, Su	In iSchool

			behavior, copyright protection and peer-to-peer networks, broadcast and telecommunications regulation, including net neutrality, data leakage, and the power and control of search engines.				
ISTA 251	3	Introduction to Game Design	This course provides an introduction to game design and teaches students the fundamental concepts for creating games. Students will survey many different games, exploring the issues game designers face when designing games in different genres. Students will participate in a series of game design challenges and will be responsible for designing and prototyping simple games using a game building tool. Students will present their solutions to these challenges in front of the class for general discussion and constructive criticism.	None	In-Person	F, Sp, Su	In iSchool
ISTA 301	3	Computing and the Arts	This course examines the ways in which computing and information science support and facilitate the production and creation of art in current society. A particular focus of the course will be to discuss how artists have used advances in technology and computing capacity to explore new ways of making art, and to investigate the relationships between technical innovation and the artistic process.	None	In-Person	F, Sp	In iSchool
ISTA 302	3	Technology of Sound	This course will provide the student with the information and experience necessary for the creation and manipulation of digital audio. Students will have the opportunity to experience the music-making process with the technology tools and techniques that are common in both home and professional studios. The class will make use of a variety of software packages designed for contemporary music production, explaining the universal techniques and concepts that run through all major software programs. Topics will include musical analysis, MIDI control, synthesis techniques, audio editing, and audio mixing. Lab assignments will emphasize hands-on experience working with musical hardware and software to provide the necessary skills to create music based	None	In-Person	F, Sp	In iSchool

			on today's musical styles. The course provides the foundation for further study, creative applications, and personal expression.				
ISTA 303	3	Introduction to Creative Coding	While the 20th Century saw the rise of the knowledge worker and the information worker, the 21st Century has ushered in the era of the creative professional. Our society is being rapidly transformed by new technologies that are revolutionizing many spheres of life, from entrepreneurship to artistic production. This course provides an introduction to software and hardware packages that are spurring innovation and creativity. Students will explore rapid prototyping, object design, and physical computing using Computer-Aided Design Software, 3D printing technology, and Arduino circuit boards. The Processing programming language will be introduced in this course and used to create generative artworks in both visual and audio idioms. An overview of creative evolutionary computation will survey applications of genetic algorithms and artificial intelligence for creating art.	CSC 127A or CSC 110 or ISTA 130 or ECE 175 or equivalent or consent of instructor.	In-person	F, Sp	In iSchool
ISTA 331	3	Principles and Practice of Data Science	ISTA 331 explores the ideas and techniques that businesspersons and scientists alike use to exploit data in order to create knowledge and make money. Topics and projects may include recommender systems (which powered Amazon's rise to global retail dominance), spam filters (the first machine learning application that affected our daily lives), topic extraction from documents, and an introduction to neural networks.	ISTA 116 and ISTA 131	In-person	F (even years)	In iSchool
ISTA 350	4	Prog. for Informatics Applications	This course will provide an introduction to informatics application programming using the python programming language and applying statistical concepts from a first semester statistics course. A key goal of this course is to prepare students for upper division ISTA courses by expanding on the skills gained in ISTA 116 and 130 but will be broadly applicable to any informatics discipline. Throughout the semester students will be	ISTA 131 and ISTA 116; or consent of instructor	In-person	Sp	In iSchool

			faced with information application problems drawn from several different disciplines in order to expand their breadth of experience while simultaneously increasing their depth of knowledge of scientific and informatics programming methods. Students will practice problem decomposition and abstraction, gaining experience in identifying commonly occurring information processing issues and in applying well-known solutions. In addition, students will design their own algorithmic solutions to problems and will learn how to effectively compare different solutions, evaluating efficiency in order to choose the best solution for a given problem. Periodic code reviews will be held in order to expose students to a range of different solution methods, which will aid them in discovering weaknesses in their own work and will improve their ability to communicate with others on technical topics. The course will include an introduction to the python scientific computing libraries and other statistical packages. Additional course topics will include the use of version control systems, software profiling, general software engineering practices and basic shell scripting.				
ISTA 416	3	Introduction to Human Comp. Interaction	The field of Human-Computer Interaction (HCI) encompasses the design, implementation, and evaluation of interactive computing systems. This course will provide a survey of HCI theory and practice. The course will address the presentation of information and the design of interaction from a human-centered perspective, looking at relevant perceptive, cognitive, and social factors influencing in the design process. It will motivate practical design guidelines for information presentation through Gestalt theory and studies of consistency, memory, and interpretation. Technological concerns will be examined that include interaction styles, devices, constraints, affordances, and metaphors. Theories, principles and design guidelines will be surveyed for both classical and emerging interaction	ISTA 130 or CSC 110 or ECE 175 or consent of the instructor.	In person	F, Sp	In iSchool

			paradigms, with case studies from practical application scenarios. As a central theme, the course will promote the processes of usability engineering, introducing the concepts of participatory design, requirements analysis, rapid prototyping, iterative development, and user evaluation. Both quantitative and qualitative evaluation strategies will be discussed. This course is co-convened: Upper-level undergraduates and graduate students are encouraged to enroll. Graduate students will be expected to complete more substantial projects and will be given more in-depth reading assignments.				
ISTA 421	3	Introduction to Machine Learning	Machine learning describes algorithms which can modify their internal parameters (i.e., "learn") to recognize patterns and make decisions based on examples or through interaction with the environment. This course will introduce the fundamentals of machine learning, will describe how to implement several practical methods for pattern recognition, feature selection, clustering, and decision making for reward maximization, and will provide a foundation for the development of new machine learning algorithms.	ISTA 311, MATH 129, and MATH 313, or equivalent, or consent of instructor. ISTA 116 or comparable is recommended.	In person	F	In iSchool
ISTA 424	3	Virtual Reality	Virtual reality is an emerging novel area of technology that has been becoming more and more widely used. It enables a more immersive user experience as the head mounted displays surround 360-degree view. It encompasses many disciplines such as computer science, human computer interaction, game design and development, information science and psychology. This course merges a theoretical, practical and project based approach to give students the necessary knowledge required to design and develop their own virtual reality projects using Unity, which is one of the most widely used 3D game engines worldwide.	ISTA 130, CSC 110 or ECE 175 with a grade of “C” or higher	In person	F, Sp	In iSchool
ISTA 425	3	Algorithms for Games	Algorithms is a crucial component of game development. This course will provide students with an in-depth introduction to algorithm concepts for game development. The course will cover basic	ISTA 350 or CSC 335 or consent of instructor	In person	F, Sp	In iSchool

			algorithm and data structures concepts, basic math concepts related to game algorithms, physics and artificial intelligence based game algorithms that are supplemented with modern examples. Unity Game Engine along with C# programming language will be used throughout the class.				
ISTA 450	3	Artificial Intelligence	The methods and tools of Artificial Intelligence used to provide systems with the ability to autonomously problem solve and reason with uncertain information. Topics include: problem solving (search spaces, uninformed and informed search, games, constraint satisfaction), principles of knowledge representation and reasoning (propositional and first-order logic, logical inference, planning), and representing and reasoning with uncertainty (Bayesian networks, probabilistic inference, decision theory).	ISTA 350 or CSC 345 or equivalent, or consent of instructor	In person	Sp	In iSchool
ISTA 451	3	Game Development	This course provides an introduction to video game development. We will explore game design (not just computer games, but all games) and continue with an examination of game prototyping. Once we have working prototypes, we will continue with the development of a complete 2D computer game. The remaining course topics include: designing the game engine, rendering the graphics to the screen, and artificial intelligence. Students will be given periodic homework that reinforces what was learned in class. Homework will include developing a game prototype, game design documentation, some programming tasks. Students will work in small teams to develop a working game as a term project. Grades will be primarily based on the term project with some small amount of weight to homework. The examples provided in class will be programmed in Java and available for execution on any operating system. Programming homework assignments will be done in either Java or the language chosen by the instructor. The term project can be written in any programming language with instructor permission.	ISTA 130 or CSC 110 or CSC 127A or ECE 175, or consent of instructor.	In person	F, Sp	In iSchool

ISTA 457	3	Neural Networks	Neural networks are a branch of machine learning that combines a large number of simple computational units to allow computers to learn from and generalize over complex patterns in data. Students in this course will learn how to train and optimize feed forward, convolutional, and recurrent neural networks for tasks such as text classification, image recognition, and game playing.	ISTA 350 or CSC 345 or NSCS 344, or equivalent, or consent of instructor	In-person	F, Sp	In iSchool
ISTA 498	3	Senior Capstone	A culminating experience for majors involving a substantive project that demonstrates a synthesis of learning accumulated in the major, including broadly comprehensive knowledge of the discipline and its methodologies. Senior standing required.	Consent of instructor.	In-person	F, Sp, Su	In iSchool
LIS 484	3	Introduction to Copyright	Introduces the basics of copyright law and fair use, also discusses the theoretical foundations and history of copyright and the public domain. These issues are placed within a broader multicultural and international context. By the end of the course students will: (a) know the basics of copyright law and fair use as they apply to libraries and related information services, and (b) understand the importance of balancing the rights of intellectual property owners with the societal need for a robust public domain.	None	In Person, online	F, Su	In iSchool

V. NEW COURSES NEEDED – using the table below, list any new courses that must be created for the proposed program. If the specific course number is undetermined, please provide level (ie CHEM 4**). Add rows as needed. Is a new prefix needed? If so, provide the subject description so Curricular Affairs can generate proposed prefix options.

All new courses are still being developed

Course prefix and number (include cross-listings)	Units	Title	Course Description	Pre-requisites	Modes of delivery (online, in-person, hybrid)	Status*	Anticipated first term offered	Typically Offered (F, W, Sp, Su)	Dept signed party to proposal? (Yes/No)	Faculty members available to teach the courses
GAME 1**	3	Programing for Game Development				D				
GAME 2**	3	Game Development I				D				
GAME 3**	3	Game Physics				D				
GAME 3**	3	Monetizing Independent Gaming				D				
GAME 4**	3	Artificial Intelligence in Games				D				

*In development (D); submitted for approval (S); approved (A)

Subject description for new prefix (if requested). Include your requested/preferred prefix, if any:

GAME
Courses with the game prefix will focus on individual experiences with games and gaming, the design and development of games, virtual reality simulations for training and other purposes, as well as societal impacts of gamification across contexts and sectors.

VI. FACULTY INFORMATION- complete the table below. If UA Vitae link is not provided/available, attach a short CV (2-3 pages) to the end of the proposal or upload to the workflow form (in the "Letter(s) of Support" field). UA Vitae profiles can be found in the UA directory/phonebook. Add rows as needed. Delete the EXAMPLE rows before submitting/uploading. **NOTE: full proposals are distributed campus-wide, posted on committee agendas and should be considered "publicly visible". Contact Pam Coonan and Martin Marquez if you have concerns about CV information being "publicly visible".**

Faculty Member	Involvement	UA Vitae link or "CV attached"
Lila Bozgeyikli	Currently teaching ISTA/INFO 424/524: Virtual Reality	https://ischool.arizona.edu/sites/ischool.arizona.edu/files/Lila-Bozgeyikli-CV.pdf
Ren Bozgeyikli	Currently teaching ISTA/INFO 425/525: Algorithms for Games	https://ischool.arizona.edu/sites/ischool.arizona.edu/files/Ren-Bozgeyikli-CV.pdf
Drew Castalia	Currently teaching ISTA 251: Intro to Game Design and ISTA/INFO 451/551: Game Development	http://www.hwstn.com/Resume.pdf
Catherine Brooks	Director of the School of Information. Plans to teach a future course centered around Game Culture	https://ischool.arizona.edu/sites/ischool.arizona.edu/files/CV_Brooks_06172019.pdf
David Sherman	Currently teaching ESOC 340: Info MM Design & Moving Images, ISTA 301: Computing and the Arts, and ISTA 302: Technology of Sound	https://ischool.arizona.edu/people/david-sherman
Other iSchool faculty as needed		

VII. FOUR-YEAR PLAN – provide a sample four-year degree plan that includes all requirements to graduate with this major and takes into consideration course offerings and sequencing. Refer to Degree Search for examples. Use generic title/placeholder for requirements with more than one course option (e.g. Upper Division Major Elective, Minor Course, Second Language, GE Tier 1, GE Tier 2). Add rows as needed.

Semester 1		**Semester 2**		**Semester 3**		**Semester 4**	
Course prefix and number	**Units**	**Course prefix and number**	**Units**	**Course prefix and number**	**Units**	**Course prefix and number**	**Units**
ISTA 130 Computational Thinking and Doing	4	GAME 1XX Programming for Game Development	3	ISTA 251 Introduction to Game Design	3	GAME 2XX Game Development I	3
		ISTA 116	3	ISTA 161 Ethics in a Digital World	3	Elective	3
English 101	3	English 102	3	Language 101	4	Tier II Arts	3
Indiv. & Soc 150	3	Indiv. & Soc 150	3	Natural Science 170	3	Language 102	4
Traditions & Culture 160	3	Traditions & Culture 160	3	Elective	3	Natural Science 170	3
Total	13	**Total**	15	**Total**	16	**Total**	16

Semester 5		**Semester 6**		**Semester 7**		**Semester 8**	
Course prefix and number	**Units**	**Course prefix and number**	**Units**	**Course prefix and number**	**Units**	**Course prefix and number**	**Units**
ISTA 451 Game Development (will be modified later and moved to 3XX)	3	ISTA 416 Introduction to Human Computer Interaction	3	ISTA 498 Senior Capstone	3	ESOC 480 Digital Engagement	3
Elective	3	Upper Division Major Elective	3	ISTA 425 Algorithms for Games	3	Upper Division Major Elective	3
Tier II: Individuals and Society	3	Tier II Humanities	3	Upper Division Minor	3	Upper Division Major Minor	3
Minor	3	Upper Division Major Elective	3	Upper Division Minor	3	Elective	3
Minor	3	Elective	3	Elective	3	Elective	3
Total	15	**Total**	15	**Total**	15	**Total**	15

VIII. STUDENT LEARNING OUTCOMES AND CURRICULUM MAP—describe what students should know, understand, and/or be able to do at the conclusion of this major. Work with Office of Instruction and Assessment to create a curricular map using Taskstream. Include your curricular map in this section (refer to Appendix C for sample Curriculum Map generated using Taskstream).

University of Arizona AMS
DEMO AREA

BS Game Design and Development

Courses and Activities Mapped to BS Game Design and Development

	Outcome								
	Outcome F1.1 Students will demonstrate understanding of the use of information and communication technologies and the implications of such use, for example: scientific and social uses of information, and social, cultural, and economic implications of digital life and culture.	Outcome F1.2 Students will demonstrate facility using basic research methods, for example: research design; statistics and analysis; organization, identification, and location of data and information including open- and closed-access sources; and/or presentation of findings in oral, written and multi-media form, including proper use of and citation of sources.	Outcome F1.3 Students will acquire the skills, knowledge and self-understanding to communicate with and effectively work and interact across cultures and with diverse people and groups.	Outcome F1.4 Students will demonstrate knowledge of career and further education options and opportunities open to them relative to their plan of study and will set goals and make plans beyond their expected graduation.	Outcome EV3.1 Students will be able to recognize and analyze ethical and policy concerns raised by new technologies and will be able to apply ethical thinking to real world cases and craft effective solutions.	Outcome EV3.2 Students will be able to identify and apply professional ethics and standards relevant to their career to aspirations.	Outcome: Game One Students will demonstrate knowledge of user's needs and rights, such as identifying target user groups for games, PR tools and platforms, analytics and metric tools, play testing and evaluation, monetization models, information protection, game related permissions on different platforms, ethical competence, professional ethics, quality steering, assurance, monitoring and social media utilization.	Outcome: Game Two Students will demonstrate the ability to design a game for various purposes, such as education, health and well-being, training and entertainment, by incorporating best-practices related to gamification in all stages, including challenges and fun factor, balancing, level design, scoring and progression, user interface, interaction mechanics, narration, functionality, usability and playability.	Outcome: Game Three Students will exhibit understanding of and skills related to varied approaches, tools, systems, platforms, devices, processes and their effective utilization for game development that are well-established and currently used in the games industry.

Courses and Learning Activities									
GAME 1XX Class assignments Programming for Game Development (3)	I			I	I	I	I	I	I
GAME 2XX Class assignments Game Development I (4)	I			I	I	I	I/P	I/P	I/P
ESOC 302 Class assignments Quantitative Methods for the Digital Marketplace (3)		P/A	I	I	I	I			
ISTA 130 Class assignments Computational Thinking and Doing (4)	P	P/A	P	P	P	P		P	
ISTA 161 Class assignments Ethics in a Digital World (3)	P/A		P/A		P/A	P/A			
ISTA 251 Class assignments Introduction to Game Design (3)	P		P	P	I/P	I/P	I/P	I/P	I/P
ISTA 416 Class assignments Introduction to Human Computer Interaction (3)	P	P		P	P/A	P/A	P/A	P/A	P/A
ISTA 425 Class assignments Algorithms for Games (3)	P	P			P	P	P	P	P
ISTA 451 Class assignments Game Development (will modify to GAME 3XX Dev. II later)(4)	P/A	P/A			P/A	P/A	P/A	P/A	P/A
Program Outcome Assessment Activities									
Student Survey Student Survey (Indirect)	A	A	A	A	A	A	A	A	A
ISTA 498 Capstone-Direct	A	A	A	A	A	A	A	A	A

Legend : I Introduced | P Practiced | A Assessed | I/P Introduced/Practices

IX. ASSESSMENT PLAN FOR STUDENT LEARNING- using the table below, provide a schedule for program assessment of intended student learning outcomes 1) while students are in the program and 2) after completion of the major. Add rows as needed. Delete EXAMPLE row.

Learning Outcomes	Sources(s) of Evidence	Assessment Measures	Data Collection Points
Students will demonstrate understanding of the use of information and communication technologies and the implications of such use, for example: scientific and social uses of information and social, cultural and economic implications of the digital life and culture.	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course
Students will demonstrate facility using basic research methods, for example: research design, statistic and analysis; organization, identification, and location of data and information including open-and closed access sources; and/or presentation of findings in oral, written and multi-media form, including proper use of and citation of sources.	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course
Students will acquire the skills, knowledge and self-understanding to communicate with and effectively work and interact across cultures and with diverse people and groups.	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course
Students will demonstrate knowledge of career and further education options and opportunities open to them relative to their plan of study and will set goals and make	Course-embedded assessments	Exams, papers, and other forms of student work Summative critical self-	During each course, end of each course

plans beyond their expected graduation.	Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	reflections	
Students will be able to recognize and analyze ethical and policy concerns raised by new technologies and will be able to apply ethical thinking to real world cases and craft effective solutions.	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course
Students will be able to identify and apply professional ethics and standards relevant to their career aspirations.	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course
Students will demonstrate knowledge of users' needs and rights, such as identifying target user groups for games, PR tools and platforms, analytics and metric tools, play testing and evaluation, monetization, models, information, protection, game related permissions on different ethical competence, professional ethics, quality steering, assurance, monitoring and social media utilization.	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course
Students will demonstrate the ability to design a game for various purposes, such as education, health and well-being, training and entertainment by incorporating best-practices related to gamification in all stages including challenges and fun factor, balancing, level design, scoring and progression, user interface, interaction mechanics,	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course

narration, functionality, usability and playability.			
Students will exhibit understanding of and skills related to varied approaches, tools, systems, platforms, devices, processes and their effective utilization for game development that are well established and currently used in the games industry.	Course-embedded assessments Pre-post student reflection essays; exit surveys; student focus group; alumni surveys	Exams, papers, and other forms of student work Summative critical self-reflections	During each course, end of each course

X. PROGRAM ASSESSMENT PLAN- using the table below, provide a schedule for program evaluation 1) while students are in the program and 2) after completion of the major. Add rows as needed. Delete EXAMPLE rows.

Assessment Measure	Source(s) of Evidence	Data Collection Point(s)
Job placement statistics	Student/alumni surveys	At graduation and as part of alumni survey
Academic program review	Reviewers' responses	Every 7 years
Student interest	Enrollment numbers	Every year
The School's academic success	National ranking	Every year

XI. ANTICIPATED STUDENT ENROLLMENT-complete the table below. What concrete evidence/data was used to arrive at the numbers?

5-YEAR PROJECTED ANNUAL ENROLLMENT					
	1st Year	2nd Year	3rd Year	4th Year	5th Year
Number of Students	20	40	60	80	100

Data/evidence used to determine projected enrollment numbers:
We've looked at the enrollment data in colleges that offer similar degrees in Arizona and in the nearby region, and used an average of these numbers in our estimations. We've used the increasing trend in enrollment in our existing undergraduate degrees, while

projecting the enrollment numbers. The estimated enrollment numbers include both the new students and the existing students who would want to switch to the new program.

XII. ANTICIPATED DEGREES AWARDED- complete the table below, beginning with the first year in which degrees will be awarded. How did you arrive at these numbers? Take into consideration departmental retention rates. Use National Center for Education Statistics College Navigator to find program completion information of peer institutions offering the same or a similar program.

PROJECTED DEGREES AWARDED ANNUALLY					
	1st Year	2nd Year	3rd Year	4th Year	5th Year
Number of Degrees	3	21	42	50	55

Data/evidence used to determine number of anticipated degrees awarded annually:

We've looked at the program completion information data in colleges that offer similar degrees both in Arizona and in the nearby region. We also took into account the degree completion percentage in our existing programs and used a combination of these inputs in our estimations. For the third year, we are only expecting three degrees awarded, consisting of the students who changed majors and switched to the new program. For the fourth year, we are expecting degrees awarded to a high percentage of the students who enrolled the program in its first year, with an addition of the major changing students. The fifth year's estimated degree awarding includes the students who enrolled in the program in its second year and the major-changing students. We are expecting a high retention rate in the program, due to the high demand in the game-related courses we currently offer.

XIII. PROGRAM DEVELOPMENT TIMELINE- describe plans and timelines for 1) marketing the major and 2) student recruitment activities.

This program will be marketed alongside our other degree programs. As a School we invest in event sponsorships so that we can hand out flyers and other marketing materials, we attend conferences, and advertise in print outlets and on the radio

across Arizona. We plan to directly recruit students in and from locations like:
- GE courses where a wide variety of students are in attendance (e.g., ESOC 150b).
- non-GE courses that draw students from across that campus to the iSchool (e.g., ISTA 251 game design).
- Undergraduate on-campus fairs and recruiting events.
- UA events like the UA hackathon, or community events like TenWest.

XIV. DIVERSITY AND INCLUSION-describe how you will recruit diverse students and faculty to this program. In addition, describe retention efforts in place or being developed in order to retain students.

The iSchool's strong commitment to diversity will be maintained across the proposed new major. Student diversity in recruitment will be ensured through outreach activities targeting high schools serving underrepresented populations. During the recruitment process, the Curriculum and Instruction Committee will aim to maintain an increased diversity among the accepted students, while ensuring qualification quality of the students. Program information will be placed on the website, so that the prospective students easily see it. The University of Arizona's diversity initiatives on the campus will be made visible on the website as well, with links that direct prospective students to these resources, so that they become aware of an existing support network for diversity and inclusion. iSchool social media posts aiming to increase awareness about the proposed program will encourage diversity. High-school students will be invited to on-campus demo events, such as the School's iShowcase where enrolled students demonstrate their finished course projects, such as video games and applications. Voluntary outreach activities, such as game development workshops for AP Campus Visits, have been held at the iSchool. These activities will be continued, as they help in increasing diversity and inclusion, in addition to outreach. We believe the current diverse student population of the iSchool will also encourage diverse student populations to apply. The race breakdown in the previous semester was as follows: 53% white, 19% Hispanic, 8% international, 7% Asian, 5% two or more races 5%, American Indian 1%, less than 1% unknown, less than 1% Pacific Islander. We give great importance to make our diverse student population visible in all possible outlets, such as website pictures, social media posts and outreach activities. The iSchool's Knowledge River program, which aims to increase and maintain diversity will be another important factor in supporting underrepresented students who are interested in studying the intersection of library sciences and games (e.g., using virtual reality in libraries). Lastly, the University of Arizona's existing mechanisms for supporting and increasing diversity in prospective students (e.g., campus tours, summer camps, workshops, Early Academic Outreach Program etc.) and in enrolled students (e.g., financial aid, academic assistance, community support, leadership skills development programs etc.) will help in increasing multiculturalism and diversity within the proposed program. With all of these mentioned efforts, equitable access to the program will be ensured for a diverse and qualified pool of candidates, such as ethnic minorities and

first generation and low-income students. Moreover, for the enrolled students, a nondiscriminatory and inclusive environment will always be maintained to provide support for students and increase their sense of belonging.
To ensure an inclusive climate, diversity will also be emphasized in hiring of new faculty. Existing faculty will be encouraged to use inclusive materials in their courses (e.g., photographs) and encourage their students to use inclusive materials in their coursework as well (e.g., game characters).

XV. ABOR REQUIREMENT: Proposed New Program Information

Name of Proposed Academic Program: Bachelor of Science in Game Design and Development
Academic Department: School of Information
Geographic Site: In-person classes will be taught at UA MAIN campus with the opportunity for online courses
Instructional Modality: Fully in-person, fully online , and potentially hybrid courses
Total Credit Hours: 120
Proposed Inception Term: Fall 2020
Brief Program Description: The Bachelor of Science in Game Design and Development will provide undergraduate students with the design and development skills necessary to create virtual interactive environments that span across devices and platforms. This game program would include games for entertainment but also serious games and virtual reality simulations for training, education, healthcare and other purposes. The degree will provide students with the real-world skills and experience needed for successful game design and development; and will signal to employers that students have dedicated the time and energy necessary to build

fluency with the underlying concepts and tools. The degree will cover all aspects of game design and development. This would include conceptualization, market analysis, art design, technical design, implementation and marketing. The degree program will serve a diverse student population, training learners in artistic, technical and business aspects of games. The degree will require students to complete a set of core courses, yet also allow students to choose among a large set of electives in order to focus on their preferred areas of study (e.g., intensive programming, creative computing, and entrepreneurial aspects of game development). Students will apply the key theories and best practices they learned to practical game projects and refine their skills. Students will have multiple opportunities to produce finished games, both individually and team-based. The degree is intended for students who aspire to hold careers in the digital games industry or work independently on gaming. Students will have opportunities to participate in games research being conducted by UA faculty and game industry partners

Learning Outcomes and Assessment Plan:

Students will demonstrate understanding of the use of information and communication technologies and the implications of such use, for example: scientific and social uses of information and social, cultural and economic implications of the digital life and culture.

Students will demonstrate facility using basic research methods, for example: research design, statistic and analysis; organization, identification, and location of data and information including open-and closed access sources; and/or presentation of findings in oral, written and multi-media form, including proper use of and citation of sources.

Students will acquire the skills, knowledge and self-understanding to communicate with and effectively work and interact across cultures and with diverse people and groups.

Students will demonstrate knowledge of career and further education options and opportunities open to them relative to their plan of study and will set goals and make plans beyond their expected graduation.

Students will be able to recognize and analyses ethical and policy concerns raised by new technologies and will be able to apply ethical thinking to real world cases and craft effective solutions.

Students will be able to identify and apply professional ethics and standards relevant to their career to aspirations.

Students will demonstrate knowledge of users' needs and rights, such as identifying target user groups for games, PR tools and platforms, analytics and metric tools, play testing and evaluation, monetization, models, information, protection, game related permissions on different ethical competence, professional ethics, quality steering, assurance, monitoring and social media utilization

Students will demonstrate the ability to design a game for various purposes, such as education, health and well-being, training and entertainment by incorporating best-practices related to gamification in all stages including challenges and fun factor, balancing, level design, scoring and progression, user interface, interaction mechanics, narration, functionality, usability and playability.

Students will exhibit understanding of and skills related to varied approaches, tools, systems, platforms, devices, processes and their effective utilization for game development that are well established and currently used in the games industry.

Projected Enrollment for the First Three Years:

5-YEAR PROJECTED ANNUAL ENROLLMENT					
	1st Year	2nd Year	3rd Year	4th Year	5th Year
Number of Students	20	40	60	80	100

Evidence of Market Demand:

The video game industry has been steadily growing in recent years. As the technology advances and new mediums, such as virtual and mixed reality arise, application areas of video games expand beyond entertainment, spanning areas from training and education to healthcare. A recent report (Video Games in the 21st Century) states the following facts: The

total direct employment by the U.S. game industry now exceeds 65,000 employees, growing at an annual rate of 2.9%. The total employment in the U.S. that depends on the game software industry now exceeds 220,000. Statistics reported the value of the video game market in the U.S. in 2017 as $18.4Bn. Video games constitute a major industry not only in the U.S., but also in the world. In a recent report (by the games and eSports analytics company NewZoo), global games market is estimated to grow to $143.5Bn in 2020. Hence, creating degrees and education opportunities relating to gaming, gamification, implications of emerging eSports, and societal impact of these trends is paramount for students to have strong educational choices on higher education.

For graduates, there are several employment opportunities in a wide-array of job roles, such as game designer, game programmer, game analyst, network specialist, user interface(UI) developer, art director, lead game artist, modeler, animator, quality assurance specialist, audio programmer, user experience researcher, cloud architect, level designer, content creator, user experience analyst, UI designer, producer and artificial intelligence programmer. Moreover, there are several opportunities for entrepreneurially-minded students in independent careers that offer significant income opportunities (e.g., streaming gameplay on Twitch, which has more than 15M unique daily visitors; participating in eSports, where players can make up to $2M by playing games competitively; publishing independent games such as Minecraft, which can lead to big success and significant revenues). This degree will provide students a broad understanding of individual and societal impacts of these trends.

One of the tools that the interest for the proposed major was gauged was the interest in the currently offered game courses at the iSchool – our current courses relating to games are consistently full. In the State of Arizona, there are four game-related programs according to the data from the National Center for Education Statistics: (1) Embry-Riddle Aeronautical University-Prescott, which hasn't awarded any degrees yet, as the program was opened in 2017; (2) The Art Institute of Phoenix, which awarded 18 Bachelor's Degrees in 2017; (3) Yavapai College, awarded 3 certificates in 2017; (4) Pima Community College, which awarded 10 Associate Degrees in 2017. The community colleges in Arizona can be feeders to the proposed program. As a more established game program in the area, the University of Southern California's game program awarded 50 degrees in 2017.

Similar Programs Offered at Arizona Public Universities:
Digital Culture (Art and Design Sciences), BA

Arizona State University
New Resources Required? (i.e. faculty and administrative positions; infrastructure, etc.): This degree is structured to use existing faculty and administration members.
Program Fee/Differentiated Tuition Required? YES ☐ NO ☐ Estimated Amount: Program Fee Justification:
Specialized Accreditation? YES ☐ NO ☐ Accreditor:

Appendix A. Minor Requirements. Complete if requesting a corresponding minor.

Total units required to complete minor	18
Upper-division units required	9
Total transfer units that may apply to minor	9
List any special requirements to declare/admission to this minor (completion of specific coursework, minimum GPA, interview, application, etc.)	none

Minor requirements (list all required coursework including core and electives). Courses listed must include course prefix, number, units, and title. Mark new coursework (New). Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	GAME 1XX Programming for Game Dev. (3) GAME 2XX Game Development I (3) ISTA 251 Introduction to Game Design (3) 9 additional upper division units of GAME coursework. Chosen from: GAME 3XX Game Physics GAME 3XX Gamification in Society GAME 3XX Monetizing Independent Gaming GAME 4XX Artificial Intelligence in Games
Internship, practicum, applied course requirements (yes/no). If yes, provide description.	no
Additional requirements (provide description)	no
Any double-dipping restrictions? (Yes/No. If yes, provide description)	Yes, Students majoring in the new games BA will not be able to minor in this degree.

Appendix A. Enrollment Trends for the gaming-related courses

Term	Campus	Session	Subject	Cat #	Section	Course	Total Enroll	Max Enroll	% Enroll	Instructor
Spring 2017	MAIN	Regular Academic Session	ISTA	251	001	Introduction to Game Design	39	40	97.5%	Giannone,Angelia R
Fall 2017	MAIN	Regular Academic Session	ISTA	251	001	Introduction to Game Design	24	26	92.3%	Castalia,Drew
Spring 2018	MAIN	Regular Academic Session	ISTA	251	001	Introduction to Game Design	29	30	96.7%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	251	002	Introduction to Game Design	29	30	96.7%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	451	001	Game Development	24	30	80.0%	Bozgeyikli,Evren
	MAIN	Regular Academic Session	ISTA	251	002	Introduction to Game Design	27	30	90.0%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	424	001	Virtual Reality	19	25	76.0%	Bozgeyikli,Lal
	MAIN	Regular Academic Session	ISTA	424	002	Virtual Reality	23	25	92.0%	Bozgeyikli,Lal
	MAIN	Regular Academic Session	ISTA	451	001	Game Development	23	20	115.0%	Castalia,Drew
Spring 2019	MAIN	Regular Academic Session	ISTA	251	001	Introduction to Game Design	29	30	96.7%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	251	002	Introduction to Game Design	22	30	73.3%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	424	002	Virtual Reality	23	20	115.0%	Bozgeyikli,Lal
	MAIN	Regular Academic Session	ISTA	451	002	Game Development	27	30	90.0%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	251	002	Introduction to Game Design	22	30	73.3%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	451	001	Game Development	27	35	77.1%	Castalia,Drew
	MAIN	Regular Academic Session	ISTA	451	002	Game Development	23	25	92.0%	Castalia,Drew

Appendix B: Results from survey of iSchool students showing existing interest in a Gaming BA and BS.

	Column Labels Neither Agree nor Disagree (3)	Somewhat Agree (2)	Somewhat Disagree (4)	Strongly Agree (1)	Strongly Disagree (5)	Grand Total
Count of If there had been a BS in Game Design and Development Major/Minor when I entered UA, I would have considered earning the degree.	6	19	3	74	9	111
	5%	17%	3%	67%	8%	

	Column Labels Definitely Not (5)	Definitely Yes (1)	Might or Might Not (3)	Probably Not (4)	Probably Yes (2)	Grand Total
Count of If either of these degrees had been available when I entered UA, I would have considered a double major or dual degree in the BA or BS	7	50	13	6	34	110
	6%	45%	12%	5%	31%	

Appendix C. Major Enrollment Trends for the Degrees Offered by the School of Information

Major Enrollment Trends

						Headcount				
						Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018
Academic Career	College	Academic Program	Academic Plan	Academic Sub Plan	Degree	Active in Plan	Active in Plan	Active in Plan	Active in Plan	Active in Plan
Undergraduate	College of Social & Behav Sci	College of Science	Information Science & Arts	Not Available	Bachelor of Arts	62				
			Information Science & Tech	Not Available	Bachelor of Science	111	3			
		College of Soc & Behav Sci	Information Science & Arts	Not Available	Bachelor of Arts		56	53	50	43
			Information Science & Tech	Not Available	Bachelor of Science		118	139	196	225
			Information Science & eSociety	Not Available	Bachelor of Arts		54	91	176	226
			eSociety	Not Available	Bachelor of Arts	48	41	12	1	
Grand Total						**221**	**272**	**295**	**423**	**494**

Academic Plan is equal to **Information Science & Arts** , **Information Science & Arts 2** , **Information Science & Tech** , **Information Science & Tech 2** , **Information Science & eSociety** , **eSociety**

and Academic Plan Type is equal to **Major** , **Major (Secondary)**

and Term is equal to **Fall 2014** , **Fall 2015** , **Fall 2016** , **Fall 2017** , **Fall 2018**

and Enrolled in Term Flag is equal to **Y**

and Term Specific Primary Major Plan Flag is equal to **Y**

and Term Specific Plan Active Flag is equal to **Y**

Appendix D: Signed Memo about the new GAME subject

THE UNIVERSITY OF ARIZONA
COLLEGE OF SOCIAL & BEHAVIORAL SCIENCES
School of Information

Harvill Building
1103 E. Second Street
Tucson, Arizona 85721
Phone: 520.621.3565
https://ischool.arizona.edu/

August 26, 2019

To: Pam Coonan, Executive Director, Academic & Curricular Affairs

From: Catherine Brooks, Director, School of Information (iSchool)
Amy C. Kimme Hea, Associate Dean for Academic Affairs and Student Success
College of Social and Behavioral Sciences

Dear Pam:

To begin, we would like to provide students a new prefix (GAME) for the following courses under development:
GAME 1XX Programming for Game Dev. (3)
GAME 2XX Games, Behavior, and Individuals (3)
GAME 2XX Game Development I (4)
GAME 3XX Game Physics (3)
GAME 3XX Gamification in Society (3)
GAME 3XX Monetizing Independent Gaming (3)
GAME 4XX Artificial Intelligence in Games (3)

Courses with the game prefix will focus on individual experiences with games and gaming, the design and development of games, virtual reality simulations for training and other purposes, as well as societal impacts of gamification across contexts and sectors. We expect additional game courses will be developed over time.

For students, the GAME prefix will make the classes easy to find and distinct from School of Information's other courses. This prefix will help students locate the classes much like FOOD prefix has done for the BA and BS degrees shared with CALS. Thank you for your consideration of this new path for future learners at the University of Arizona.

THE UNIVERSITY OF ARIZONA

BUDGET PROJECTION FORM

Name of Proposed Program or Unit:

	Projected		
Budget Contact Person:	**1st Year** 2020 - 2021	**2nd Year** 2021- 2022	**3rd Year** 2022- 2023
METRICS			
Net increase in annual college enrollment UG	20	40	60
Net increase in college SCH UG	870	1,680	2,520
Net increase in annual college enrollment Grad	-	-	-
Net increase in college SCH Grad	-	-	-
Number of enrollments being charged a Program Fee	-	-	-
New Sponsored Activity (MTDC)	-		
Number of Faculty FTE	-	-	-
FUNDING SOURCES			
Continuing Sources			
UG RCM Revenue (net of cost allocation)			
Grad RCM Revenue (net of cost allocation)			
Program Fee RCM Revenue (net of cost allocation)			
F and A Revenues (net of cost allocations)			
UA Online Revenues			
Distance Learning Revenues			
Reallocation from existing College funds (attach description)			
Other Items (attach description)			
Total Continuing	**$ -**	**$ -**	**$ -**
One-time Sources			
College fund balances	500	250	250
Institutional Strategic Investment			
Gift Funding			
Other Items (attach description)			
Total One-time	**$ 500**	**$ 250**	**$ 250**
TOTAL SOURCES	**$ 500**	**$ 250**	**$ 250**
EXPENDITURE ITEMS			
Continuing Expenditures			
Faculty			
Other Personnel			
Employee Related Expense			
Graduate Assistantships			
Other Graduate Aid			
Operations (materials, supplies, phones, etc.)			
Additional Space Cost			
Other Items (attach description)			
Total Continuing	**$ -**	**$ -**	**$ -**
One-time Expenditures			
Construction or Renovation			
Start-up Equipment			
Replace Equipment			
Library Resources			
Other Items (attach description)	500	250	250
Total One-time	**$ 500**	**$ 250**	**$ 250**
TOTAL EXPENDITURES	**$ 500**	**$ 250**	**$ 250**
Net Projected Fiscal Effect	**$ -**	**$ -**	**$ -**

Undergraduate Major Peer Comparison Chart - select two peers for completing the comparison chart from (in order of priority) ABOR-approved institutions, AAU members, and/or other relevant institutions recognized in the field. The comparison chart will be used to identify typically required coursework, themes, and experiences for majors within the discipline. The comparison programs are not required to have the same degree type and/or major name as the proposed UA program. Information for the proposed UA program must be consistent throughout the proposal documents. Delete EXAMPLE columns once ready to submit/upload.

Program name, emphasis (sub-plan) name (if applicable), degree, and institution	**Proposed UA Program:** Game Design and Development, BS	**Peer 1:** Digital Culture (Media Processing), BS, Arizona State University	**Peer 2:**
Current # of enrolled students			
Major Description. Includes the purpose, nature, and highlights of the curriculum, faculty expertise, emphases (sub-plans; if any), etc.	The Bachelor of Science in Game Design and Development will provide undergraduate students with the design and development skills necessary to create virtual interactive environments that span across devices and platforms. This game program would include games for entertainment but also serious games and virtual reality simulations for training, education, healthcare and other purposes. The degree will provide students with the real-world skills and experience needed for successful game design and	The BS program in digital culture with a concentration in media processing is for students wishing to specialize in media processing aspects of new media. This program seeks to understand the transformative role of digital technology in cultural practice, society and day-to-day life, emphasizing the strongest emerging trends in cultural media: systems and processes that integrate digital technology with the everyday physical human experience. Students in the Bachelor of Science program complement the knowledge acquired through digital culture coursework with a more advanced understanding of the programming, data structures, signals processing and system architecture aspects of new media.	

	development; and will signal to employers that students have dedicated the time and energy necessary to build fluency with the underlying concepts and tools. The degree will cover all aspects of game design and development. This would include conceptualization, market analysis, art design, technical design, implementation and marketing. The degree program will serve a diverse student population, training learners in artistic, technical and business aspects of games. The degree will require students to complete a set of core courses, yet also allow students to choose among a large set of electives in order to focus on their preferred areas of study (e.g., intensive programming, creative computing, and entrepreneurial aspects of game development). Students will apply the key theories and best practices they learned to practical game projects and refine their skills. Students will have multiple opportunities to produce finished games,		

	both individually and team-based. The degree is intended for students who aspire to hold careers in the digital games industry or work independently on gaming. There will be ongoing opportunities to participate in research into games being conducted by faculty across campus and by industrial partners.		
Target careers		Animator, Audio-Visual Technician, Computer Programmer, Computer Scientist, IT Project Manager, Performance Artist, Production Assistant, Software Developer, Software Engineer, Video Game Designer	
Total units required to complete the degree	120	120	
Upper-division units required to complete the degree	51	45	
Foundation courses			
Second language	2nd Semester Proficiency	None required	
Math	Moderate Strand	MAT 210: Brief Calculus, 3 units	
Pre-major? (Yes/No). If yes, provide requirements. Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	No	No	
List any special requirements to declare or gain admission to this	None	All Digital Culture majors must have a minimum 3.00 Digital Culture GPA at the end of Term 2 to continue in the program. If a student's Digital Culture GPA is below a	

major (completion of specific coursework, minimum GPA, interview, application, etc.)		3.00, the student will be placed on a probationary status for one term. If the student is not successful in raising their Digital Culture GPA to a 3.00 after the probationary term, the student will not be able to continue in the Digital Culture program.	
Major requirements			
Minimum # of units required in the major (units counting towards major units and major GPA)	51		
Minimum # of upper-division units required in the major (upper division units counting towards major GPA)	31	45	
Minimum # of residency units to be completed in the major	18	56	
Required supporting coursework (courses that do not count towards major units and major GPA, but are required for the major). Courses listed must include prefix, number, units, and title. Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for	Required courses: Math 113, or Math 116, and ISTA 116	Term 1: ENG 101 or ENG 102 First-Year Composition OR ENG 105 Advanced First-Year Composition OR ENG 107 or 108 First-Year Composition, 3 units MAT 210 Brief Calculus, 3 units Term 2: ENG 101 or ENG 102: First-Year Composition OR ENG 105 Advanced First-Year Composition OR ENG 107 or 108 First-Year Composition, 3 units Social-Behavioral Sciences AND Cultural Diversity in the U.S., 3 units Term 3: Humanities, Arts and Design AND Global Awareness, 3 units	

courses not owned by your department.		Natural Science-Quantitative (PHY 101 Recommended), 4 units Social-Behavioral Sciences, 3 units Term 4: MAT 243 Discrete Mathematical Structures, 3 units Humanities, Arts and Design AND Historical Awareness, 3 units Elective, 3 units Term 5: Upper Division Digital Culture Studies, 6 units Upper Division Media Processing Elective, 3 units Natural Science-Quantitative OR Natural Science-General, 4 units Term 6: Complete 2 courses: Upper Division Digital Cultures Studies, 6 units Complete 2 courses: Upper Division Media Processing Elective, 6 units Upper Division Literacy and Critical Inquiry, 3 units Term 7: Upper Division Digital Culture Studies, 3 units Upper Division Media Engineering, 3 units Upper Division Media Processing Elective, 3 units Upper Division Humanities, Arts and Design OR Upper Division Social-Behavioral Sciences, 3 units Term 8: Upper Division Digital Culture Studies, 3 units Upper Division Media Processing Elective, 3 units Elective, 3 units	

Major requirements. List all major requirements including core and electives. If applicable, list the emphasis requirements for each proposed emphasis. Courses listed count towards major units and major GPA. Courses listed must include prefix, number, units, and title. Mark new coursework (New). Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	Core Courses/Required Major Coursework (33 units) GAME 1XX Programming for Game Dev. (3) GAME 2XX Game Development I (4) ● ESOC 302 Quantitative Methods for the Digital Marketplace (3) ● ESOC 314 Theories of New Media (3) ● ISTA 130 Computational Thinking and Doing (4) ● ISTA 161 Ethics in a Digital World (3) ● ISTA 251 Introduction to Game Design (3) ● ISTA 416 Introduction to Human Computer Interaction (3) ● ISTA 425 Algorithms for Games (3) ● ISTA 451 Game Development (4) Individual/Capstone Required Coursework (6 upper division units) Internship, Directed Research, Individual or Independent Study (3) along with the ISTA 498 Capstone req.(3).	Term 1: AME 111 Introduction to Digital Culture, 3 units AME 101 ASU Digital Culture Experience, 3 units *Complete 2 courses:* AME 112 Computational Thinking for Digital Culture OR AME 130 Prototyping Dreams OR AME 210 Media Editing OR AME 230 Programming for the Media Arts, 6 units Term 2: AME 112 Computational Thinking for Digital Culture OR AME 130 Prototyping Dreams OR AME 210 Media Editing OR AME 230 Programming for the Media Arts, 3 units CSE 110 Principles of Programming, 3 units Term 3: CPI 111 Game Development I, 3 units CSE 205 Object-Oriented Programming and Data Structures, 3 units Digital Culture Studies, 3 units Term 4: Digital Culture Studies, 3 units CPI 211 Game Development II OR CSE 240 Introduction to Programming Languages, 3 units Term 5: Upper Division Digital Culture Studies, 6 units CPI 360 Decision Making and Problem Solving OR CSE 310 Data Structures and Algorithms OR CPI Game Engine Development, 3 units Term 6: Complete 2 courses: Upper Division Digital Cultures Studies, 6 units Complete 2 courses: Upper Division Media Processing Elective, 6 units Upper Division Literacy and Critical Inquiry, 3 units	

	Elective Coursework in the Major (12 upper division units units) *These courses are organized in to 'tracks' depending on students' interests, students are encouraged but not required to complete their elective coursework in a particular specialty area. PROGRAMMING-INTENSIVE TRACK (12 units) ● (New) GAME 3XX Game Physics (3) ● ISTA 311 Foundations of Info. and Inference (3) ● ISTA 331 Principles and Practice of Data Science (3) ● ISTA 350 Prog. for Informatics Applications (3) ● ISTA 424 Virtual Reality (3) GAME ENTREPRENEUR TRACK (12 units) ● (New) GAME 3XX Monetizing Indep. Gaming (3) ● ESOC 316 Digital Commerce (3) ● ESOC 318 Disruptive Technologies (3) ● LIS 484 Introduction to Copyright (3)	Term 7: AME 485 Digital Culture Capstone I, 3 units Upper Division Digital Culture Studies, 3 units Upper Division Media Engineering, 3 units Term 8: AME 486 Digital Culture Capstone II OR AME 484 Internship, 3 units Upper Division Digital Culture Studies, 3 units	

	ARTIFICIAL INTELLIGENCE TRACK (12 Units) ● ISTA 450 Artificial Intelligence (3) ● (New) GAME 4XX Artificial Intelligence in Games (3) ● ISTA 421 Introduction to Machine Learning (3) ● ISTA 457 Neural Networks (3) ART OF GAMES TRACK (12 Units) ● ISTA 301 Computing and the Arts (3) ● ISTA 302 Technology of Sound (3) ● ISTA 303 Introduction to Creative Coding (3) ● ISTA 403 Advanced Creative Coding (3) ● ESOC 300 Digital Storytelling and Culture (3) ● ESOC 340 Information, Multimedia Design & the Moving Image (3)		
Internship, practicum, applied course requirements (Yes/No). If yes, provide description.	Individual/Capstone Required Coursework (6 upper division units) INFO 493 Internship, INFO 492 Directed Research, INFO 499 Individual or Independent Study (3) along with ISTA 498 Senior Capstone (3)	Optional: Structured practical experience following a contract or plan, supervised by faculty and practitioners.	

Senior thesis or senior project required (Yes/No). If yes, provide description.	No	Capstone: Senior capstone projects in digital culture are interdisciplinary team projects that offer experience in diverse collaborations for solving complex problems, a proficiency widely demanded by employers. Students integrate, extend and apply information, principles, theories and/or methods learned in previous courses while supervised by the instructor.	
Additional requirements (provide description)	None	Optional Global Experience Opportunity: Additionally, The School of Arts, Media and Engineering also offers a summer study abroad to the Netherlands. Interested parties (regardless of major) should explore the program Design and Society in the Netherlands: Visualizing the Invisible on the study abroad website: http://links.asu.edu/VisualizingtheInvisible.	
Minor (specify if optional or required)	Optional	No requirements listed.	

*Note: comparison of additional relevant programs may be requested.

Undergraduate Major Peer Comparison Chart-delete EXAMPLE columns once ready to submit/upload. Find UA peers here: https://www.azregents.edu/arizonas-public-universities/peer-institutions

Program name, sub-plan name (if applicable), degree, and institution	**Proposed UA Program:**	**Peer 1:** Computer Game Science, Bachelor of Science, Univ. of California, Irvine	**Peer 2:** Game Design and Development, Bachelor of Science, Rochester Institute of Technology
Current # of enrolled students	[redacted]	??	??
Major Description - provide a description for the proposed program. Include the purpose, nature, and program highlights. Description must be consistent throughout the proposal documents and match departmental and college websites, handouts, and promotional materials.	The **Bachelor of Science in Game Design and Development** will provide undergraduate students with the design and development skills necessary to create virtual interactive environments that span across devices and platforms. This game program would include games for entertainment but also serious games and virtual reality simulations for training, education, healthcare and other purposes. The degree will provide students with the real-world skills and experience needed for successful game design and development; and will signal to employers that students have dedicated the time and energy necessary to build fluency with the underlying concepts and tools. The degree will cover all aspects of game design and development. This would include conceptualization, market analysis, art design, technical design, implementation and marketing. The degree program will serve a diverse student population, training learners in artistic, technical and business aspects of games. The degree will require students to complete a set of core courses,	From: https://www.ics.uci.edu/ugrad/degrees/degree_cgs.php The B.S. in computer game science is designed around a set of core courses that introduce the fundamentals of computer science (programming, data structures, graphics and artificial intelligence), math (statistics, linear algebra and logic), and games (games and society, game design, game engines and multiplayer games). From there, nearly thirty electives offer students the chance to specialize, focusing anywhere from typical game topics such as modeling, world building and mobile games to more peripheral topics such as software design and social impacts. Throughout the major, students gain hands-on experience in creating a variety of digital games, for entertainment purposes, but also for education, training and engendering social change. Working in teams, you will employ a variety of different programming languages, game platforms and hardware. This culminates in the two-quarter capstone course, in which you will be part of a team that designs and implements a new game from scratch	From: https://www.rit.edu/programs/game-design-and-development-bs With an emphasis on game programming, the major exposes students to a breadth of development and design processes. Students complete a core of required course work and then pursue advanced studies that can be customized to individual interests and career goals. Students can further specialize their major by taking electives in areas such as game design, production, engines and systems, graphics programming and animation, mobile, web, audio, and more. This depth of course work also enables students to build a robust portfolio of games and other interactive projects. Cooperative education is full-time, paid work experience that provides students with an opportunity to learn on the job in real-world industry setting—a definite edge when applying for jobs after graduation. Students are required to complete two blocks of co-op, which may start after their second year of study. Although students usually complete co-ops during the summer term, they may also be completed during the academic year.

	yet also allow students to choose among a large set of electives in order to focus on their preferred areas of study (e.g., intensive programming, creative computing, and entrepreneurial aspects of game development). Students will apply the key theories and best practices they learned to practical game projects and refine their skills. Students will have multiple opportunities to produce finished games, both individually and team-based. The degree is intended for students who aspire to hold careers in the digital games industry or work independently on gaming. There will be ongoing opportunities to participate in research into games being conducted by faculty across campus and by industrial partners.	under the supervision of game designers from the local industry. Overall, the major strongly emphasizes the technical aspects of creating games, as well as working in teams to design and implement them. You will be prepared to adapt to what are the always-changing circumstances of the profession — whether it is a new game platform, newly emerging game mechanics, or new ways of earning revenue.	
Target careers	There are several employment opportunities in a wide-array of job roles, such as game designer, game programmer, game analyst, network specialist, user interface developer, art director, lead game artist, modeler, animator, quality assurance specialist, audio programmer, user experience researcher, cloud architect, level designer, content creator, user experience analyst, UI designer, producer and artificial intelligence programmer.	Because of the strong technical underpinnings of the degree program, demand for our computer game science majors is strong. The majority find employment in the industry, whether at a major publisher, smaller studio or as self-employed freelancers. Many squarely focus on entertainment, others succeed in bringing their skills to the design and development of serious games in a variety of domains, including healthcare and education. Of course, graduate school in game design, interactive media, computer science, informatics or related field is a career path that a portion of our students also choose to take after they complete the major.	The game design and development major allo/ws students to explore the entertainment technology landscape and related areas, while still pursuing a broad-based university education. The degree is intended specifically for students who aspire to hold careers within the professional games industry or a related field, such as simulation, edutainment, or visualization. This degree also provides students with a core computing education that prepares them for graduate study or employment in a number of computing fields.
Total units required to complete degree	120	180	124

Upper-division units required to complete degree	51	64 http://catalogue.uci.edu /donaldbrenschoolofinformationandcomputersciences /#undergraduatetext	62
Foundation courses			
English composition		Two lower-division plus one upper-division course (12 units total)	RIT required all students to complete three Writing Intensive (WI) courses. The courses come from the degree program (IGME 236), the First Year Writing Program (UWRT 150 or ENGL 150 or ISTE 110), and one General Education Writing Intensive (GE-WI) course or one Program Writing Intensive (PR-WI) course.
Second language	2nd Semester Proficiency	One course (4 units)	-
Math	Moderate Strand	MATH 2A Single-Variable Calculus MATH 2B Single-Variable Calculus And I&C SCI 6N Computational Linear Algebra or MATH 3A Introduction to Linear Algebra	GAMEDES-BS students are required to complete a minimum three-course math sequence. The score on the Math Placement Exam (MPE) determines the first course in the math sequence, though typically it will be MATH 131. Students can opt to take MATH 171, MATH 181A, or MATH 181 in the fall of their second year. Placement in MATH 171, MATH 181A, or MATH 181 is determined by the MPE score.
General education requirements	Tier I Two 150s Two 160s Two 170s Tier II One Tier II Arts One Tier II Humanities One Tier II Individuals and Societies	http://catalogue.uci.edu/informationforadmittedstudents/ requirementsforabachelorsdegree/ The general education requirement is a *graduation* requirement and, with the exception of the lower-division writing requirement, need *not* be satisfied during only the lower-division years. To satisfy the general education requirement, courses are required in each of the following categories: **I. Writing** (two lower-division plus one upper-division course) **II. Science and Technology** (three courses) **III. Social and Behavioral Sciences** (three courses) **IV. Arts and Humanities** (three courses) **V. Quantitative, Symbolic, and Computational Reasoning, with subcategories Va and Vb** (three courses that may also satisfy another GE category)	https://www.rit.edu/gccis/igm/sites/rit.edu.gccis.igm/files/images/gdd-handbook-ay2018-2019.pdf The 124 credits that students need to graduate are as follows: • 41 credits of GDD Core Courses • 12 credits of IGM Advanced Electives • 3 credits of First Year Writing • 15 credits of Arts & Sciences Perspectives • 9 credits of Immersion Experience • 15 credits of General Education Electives • 14-15 credits of Math and Science • 15 credits of Free Electives • 1 Co-op Preparation Workshop, non-credit bearing • 2 different Wellness or Activity courses are also required, but they are non-credit bearing • YearOne, non-credit bearing

		VI. Language Other Than English (one course) **VII.** Multicultural Studies (one course that may also satisfy another GE category) **VIII.** International/Global Issues (one course that may also satisfy another GE category)	• 2 Co-operative Education experiences, non-credit bearing • 3 Writing Intensive courses (First Year Writing (FYW), a program course (IGME-236), and a third course of your choosing)
Pre-major? (Yes/No. If yes, provide requirements.) Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	No	No	No
List any special requirements to declare or gain admission to this major (completion of specific coursework, minimum GPA, interview, application, etc.)	None	None	For all bachelor's degree programs, a strong performance in a college preparatory program is expected. Generally, this includes 4 years of English, 3-4 years of mathematics, 2-3 years of science, and 3 years of social studies and/or history. Specific math and science requirements and other recommendations: 4 years of math including pre-calculus required Requires chemistry or physics and strongly recommends both. Computing electives are recommended SAT (EBRW+M): 1280 -1450 ACT Composite: 29-34
Major requirements			
Minimum # of units required in major (units	51	124	124

counting towards major units and major GPA)			
Minimum # of upper-division units required in the major (upper division units counting towards major GPA)	31	64	32
Minimum # of residency units to be completed in the major	18	??	??
Required supporting coursework (courses that do not count towards major units and major GPA, but are required for the major). Courses listed must include subject code, units, and title. Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	Required courses: Math 113, or Math 116, and ISTA 116	None	All incoming first-year students must take YearOne, designed to prepare them for success at RIT. Students are required to complete two different wellness activities. GDD students must successfully complete two co-ops, which count toward the graduation requirements.

Major requirements (list all required major coursework including major core, major electives, sub-plan core, and sub-plan electives; courses count towards major units and major GPA) Courses listed must include course prefix, number, units, and title. Mark new coursework (New). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	Core Courses/Required Major Coursework (33 units) GAME 1XX Programming for Game Dev. (3) GAME 2XX Game Development I (4) ● ESOC 302 Quantitative Methods for the Digital Marketplace (3) ● ESOC 314 Theories of New Media (3) ● ISTA 130 Computational Thinking and Doing (4) ● ISTA 161 Ethics in a Digital World (3) ● ISTA 251 Introduction to Game Design (3) ● ISTA 416 Introduction to Human Computer Interaction (3) ● ISTA 425 Algorithms for Games (3) ● ISTA 451 Game Development (4) Individual/Capstone Required Coursework (6 upper division units) Internship, Directed Research, Individual or Independent Study (3) along with the ISTA 498 Capstone req.(3). Elective Coursework in the Major (12 upper division units units) *These courses are organized in to 'tracks' depending on students' interests, students are encouraged but not required to complete their elective coursework in a particular specialty area. PROGRAMMING-INTENSIVE TRACK (12 units) ● (New) GAME 3XX Game Physics (3)	Lower-division A. Select one of the following series: I&C SCI 31- 32- 33 Introduction to Programming and Programming with Software Li and Intermediate Programming or I&C SCI 32A- 33 Python Programming and Libraries (Accelerated) and Intermediate Programming B. Complete: I&C SCI 45C Programming in C/C++ as a Second Language I&C SCI 46 Data Structure Implementation an Analysis I&C SCI 51 Introductory Computer Organizati I&C SCI 60 Computer Games and Society I&C SCI 61 Game Systems and Design I&C SCI 62 Game Technologies and Interactive IN4MATX 43 Introduction to Software Engineeri MATH 2A Single-Variable Calculus MATH 2B Single-Variable Calculus I&C SCI 6N Computational Linear Algebra or MATH 3A Introduction to Linear Algebra I&C SCI 6B Boolean Logic and Discrete Structu I&C SCI 6D Discrete Mathematics for Compute Science STATS 67 Introduction to Probability and Sta for Computer Science PHYSICS 3A Basic Physics I FLM&MDA 85A Introduction to Film and Visual Ana or FLM&MDA 85C New Media and Digital Technologi Upper-division A. Computer Game Science Core Requirements	**First Year** IGME-105 Game Development and Algorithmic Problem Solving I 4 IGME-106 Game Development and Algorithmic Problem Solving II 4 IGME-110 Introduction to Interactive Media 3 MATH-131 LAS Perspective 7A (mathematical): Discrete Mathematics 4 IGME-119 2D Animation and Asset Production 3 PHYS-111 LAS Perspective 6 (scientific principles): College Physics I 4 MATH-185 LAS Perspective 7B (mathematical): Mathematics of Graphical Simulation I 3 ACSC-010 Year One 0 First Year Writing 3 LAS Perspective 1 (ethical) 3 LAS Perspective 2 (artistic) 3 Wellness Education* 0 **Second Year** IGME-202 Interactive Media Development 3 IGME-219 3D Animation and Asset Production 3 IGME-236 Interaction, Immersion, and the Media Interface (WI) 3 IGME-220 Game Design and Development I 3 IGME-209 Data Structures and Algorithms for Games and Simulations I 3 IGME-230 Website Design and Implementation 3 IGME-099 Co-op Preparation Workshop 0 IGME-499 Cooperative Education (summer) Co-op LAS Perspective 3 (global) LAS Perspective 4 (social) LAS Perspective 5 (natural science inquiry) Mathematics Course†

	● ISTA 311 Foundations of Info. and Inference (3) ● ISTA 331 Principles and Practice of Data Science (3) ● ISTA 350 Prog. for Informatics Applications (3) ● ISTA 424 Virtual Reality (3) GAME ENTREPRENEUR TRACK (12 units) ● (New) GAME 3XX Monetizing Indep. Gaming (3) ● ESOC 316 Digital Commerce (3) ● ESOC 318 Disruptive Technologies (3) ● LIS 484 Introduction to Copyright (3) ARTIFICIAL INTELLIGENCE TRACK (12 Units) ● ISTA 450 Artificial Intelligence (3) ● (New) GAME 4XX Artificial Intelligence in Games (3) ● ISTA 421 Introduction to Machine Learning (3) ● ISTA 457 Neural Networks (3) ART OF GAMES TRACK (12 Units) ● ISTA 301 Computing and the Arts (3) ● ISTA 302 Technology of Sound (3) ● ISTA 303 Introduction to Creative Coding (3) ● ISTA 403 Advanced Creative Coding (3) ● ESOC 300 Digital Storytelling and Culture (3) ● ESOC 340 Information, Multimedia Design & the Moving Image (3)	COMPSCI 171 Introduction to Artificial Intelligence I&C SCI 161 Game Engine Lab I&C SCI 162 Modeling and World Building I&C SCI 167 Multiplayer Game Systems I&C SCI 168 Multiplayer Game Project I&C SCI 169A- 169B Capstone Game Project I and Capstone Game Project II and select two of the following: COMPSCI 112 Computer Graphics I&C SCI 163 Mobile and Ubiquitous Games I&C SCI 166 Game Design B. Select two of the following: COMPSCI 122A Introduction to Data Management COMPSCI 132 Computer Networks COMPSCI 143A Principles of Operating Systems COMPSCI 152 Computer Systems Architecture IN4MATX 113 Requirements Analysis and Engineering IN4MATX 121 Software Design: Applications IN4MATX 131 Human Computer Interaction C. CGS Elective Courses: Five additional courses: 1. Two courses from A-C. 2. Three courses must be in the same Bren ICS track.	**Third Year** IGME-320 Game Design and Development II 3 IGME-309 Data Structures and Algorithms for Games and Simulations II 3 IGME-330 Rich Media Web Application Development I 3 IGME-499 Cooperative Education (summer) Co-op LAS Immersion 1, 2 6 LAS Electives 6 Advanced Elective 3 Free Electives 6 **Fourth Year** Advanced Electives 9 Free Electives 9 LAS Immersion 3 3 LAS Electives 9 Total Semester Credit Hours 124 **Advanced electives** IGME-340 Multi-platform Media App Development IGME-420 Level Design IGME-421 Tabletop Game Design and Development IGME-430 Rich Media Web Application Development II IGME-440 Online Virtual Worlds and Simulations IGME-450 Casual Game Development IGME-451 Systems Concepts for Games and Media IGME-460 Data Visualization IGME-470 Physical Computing and Alternative Interfaces IGME-480 Current Topics in Interactive Development IGME-529 Foundations of Interactive Narrative IGME-540 Foundations of Game Graphics Programming

			IGME-550 Foundations of Game Engine Design and Development IGME-560 Artificial Intelligence for Game Environments IGME-570 Digital Audio Production IGME-571 Interactive Game Audio IGME-580 IGM Production Studio IGME-581 Innovation and Invention IGME-582 Humanitarian Free and Open Source Software Development IGME-583 Legal/Business Aspects of FOSS IGME-584 Linux Software Development IGME-585 Project in FOSS Development IGME-589 Research Studio IGME-590 Undergraduate Seminar in IGM IGME-599 Independent Study
Internship, practicum, applied course requirements (Yes/No. If yes, provide description)	Individual/Capstone Required Coursework (6 upper division units) INFO 493 Internship, INFO 492 Directed Research, INFO 499 Individual or Independent Study (3) along with ISTA 498 Senior Capstone (3)		The IGM Bachelor of Science degrees in Game Design & Development requires two semesters of full-time work to fulfill your co-op requirements. Co-op is short for co-operative education which has the following benefits: ● Gain real life career experience ● All co-ops are compensated ● The experience gained will assist with full-time position. ● Allow the opportunity for students to define their career paths
Senior thesis or senior project required (Yes/No. If yes, provide description)	No	**I&C SCI 169A&B. Capstone Game Project I&II. 8 Units.** Students work in teams to design and implement a new computer game or virtual world. Emphasis on sound, art, and level design, building a community, cut	No

		scenes, production values, full utilization of hardware and software platform, and current industry trends.	
Additional requirements (provide description)	None		
Minor (specify if optional or required)	Optional	optional	Optional

*Note: comparison of additional relevant programs may be requested.

Comparison Chart—UA Game Proposals

Program name, emphasis (sub-plan) name (if applicable), degree, and institution	BS Game Design and Development (in INFO)	BA Games and Behavior (in INFO)	Game Studies emphasis, BA in Applied Humanities
Current # of enrolled students	0	0	0
Major Description. Includes the purpose, nature, and highlights of the curriculum, faculty expertise, emphases (sub-plans; if any), etc.	The Bachelor of Science in Game Design and Development will provide undergraduate students with the design and development skills necessary to create virtual interactive environments that span across devices and platforms. This game program would include games for entertainment but also serious games and virtual reality simulations for training, education, healthcare and other purposes. The degree will provide students with the real-world skills and experience needed for successful game design and development; and will signal to employers that students have dedicated the time and energy necessary to build fluency with the underlying concepts and tools. The degree will cover all aspects of game design and development. This would include conceptualization, market analysis, art design, technical design, implementation and marketing. The degree program will serve a diverse student population, training learners in artistic, technical and business aspects of games. The degree will require	The Bachelor of Arts in Games and Behavior will provide students with a broad understanding of important design principles and human behavior in serious and recreational games, but also the implications tied to gamification in society. Students will learn the basics of multimedia, storytelling, and sound technologies. This degree will also include courses that focus on the individual (e.g., psychology of simulations and play) and also courses that consider group or societal trends (e.g., inequality in the game and in the development environment; psychology of play in game communities). Issues of artistic game design alongside behavioral and societal trends related to games and gamification across sectors are the focus of this degree (e.g., education, health management, occupational training, social support, recreation). The degree will cover many aspects of game design and related social and societal factors without the need of extensive knowledge of computer programming.	The proposed Game Studies emphasis in the BA in Applied Humanities will concentrate on what is widely known as "Game Studies," that is, the study of games as distinct from the technical context of designing and making them. The emphasis will include the following focus areas: ● Critical approaches to understanding games and the game industry (e.g., techniques for understanding the relationship between a game's technical design and the socio-cultural milieu out of which it arose); ● Studies of the cultures surrounding games (e.g., cosplay, pro-gaming, fan crafts); ● Studies of the industry itself (e.g., corporate trajectories, mergers, and collapses; shifting monetization structures); ● Cultural studies of game content (e.g., analyses of gender, race, and age representation in games); ● Studies of game narratives (e.g., how games tell stories);

	students to complete a set of core courses, yet also allow students to choose among a large set of electives in order to focus on their preferred areas of study (e.g., intensive programming, creative computing, and entrepreneurial aspects of game development). Students will apply the key theories and best practices they learned to practical game projects and refine their skills. Students will have multiple opportunities to produce finished games, both individually and team-based. The degree is intended for students who aspire to hold careers in the digital games industry or work independently on gaming. There will be ongoing opportunities to participate in research into games being conducted by faculty across campus and by industrial partners.		● Studies of design histories (e.g., changing form factors of game cartridges, consoles, and arcade cabinets); ● Game reviewing for online and print venues, as well as for fan and trade audiences (e.g., publishing critical evaluations of games for independent gaming websites); ● Studies of game cultures and practices internationally (e.g., 1980s Russian bootleg game culture); ● Studies of changing play styles, aesthetics, and interfaces (e.g., gaming in the arcade vs. at home). At the recommendation of an external consultant, the emphasis will also include one introductory course in game design, and one introductory course in game development. The purpose of these courses is to integrate rudimentary knowledge of game production practices so that students acquire (1) a deeper understanding of the products and cultures that flow from those labors, and (2) a fuller sense of the day-to-day production side of media sphere should they choose to explore employment there.

Methodology	Programming, logic, linear algebra, discrete mathematics, trigonometry	Design, prototyping, qualitative and quantitative social research methods.	Humanities-based approaches to the game medium, its industry, and the cultures that inform and are informed by them.
Learning Outcomes	Game One: for the BA and BS Students will demonstrate knowledge of user's needs and rights, such as identifying target user groups for games, PR tools and platforms, analytics and metric tools, play testing and evaluation, monetization models, information protection, game related permissions on different platforms, ethical competence, professional ethics, quality steering, assurance, monitoring and social media utilization. Game Two: for the BA and BS Students will demonstrate the ability to design a game for various purposes, such as education, health and well-being, training and entertainment, by incorporating best-practices related to gamification in all stages, including challenges and fun factor, balancing, level design, scoring and progression, user interface, interaction mechanics, narration, functionality, usability and playability.	Game One: for the BA and BS Students will demonstrate knowledge of user's needs and rights, such as identifying target user groups for games, PR tools and platforms, analytics and metric tools, play testing and evaluation, monetization models, information protection, game related permissions on different platforms, ethical competence, professional ethics, quality steering, assurance, monitoring and social media utilization. Game Two: for the BA and BS Students will demonstrate the ability to design a game for various purposes, such as education, health and well-being, training and entertainment, by incorporating best-practices related to gamification in all stages, including challenges and fun factor, balancing, level design, scoring and progression, user interface, interaction mechanics, narration, functionality, usability and playability.	Upon completing the BA in Applied Humanities–Game Studies major, students are expected to have achieved the following primary learning outcomes. Students should be able to: ● Describe the industrial, creative, and cultural processes by which play is transformed into games; ● Analyze games as design objects, playful companions, era defining technologies, and artifacts for contemplation, escape, and education; ● Develop reports, business plans, design documents, and other applied work for critical, commercial, and persuasive purposes related to games, their industries, and their cultures;

	Game Three: for the BS only Students will exhibit understanding of and skills related to varied approaches, tools, systems, platforms, devices, processes and their effective utilization for game development that are well-established and currently used in the games industry.	Game Three: for the BA only Students will exhibit understanding of human behavior in serious and recreational games, the impact of gaming on individuals across contexts, and the implications tied to gamification in society.	
Target careers	Game Developer Graphic Designer Animation Specialist Sound Technologist Software Developers. Computer and Information Research Scientists Computer Programmer Software Developer	Game Designer Social Worker Educator Occupational Therapist eSport Behavior/Planner Computer and Information Research Scientists Game Event Planner Game-based Trainer Instructional Designer Game Coach	● Reviewing (print/online) ● Marketing and promotion ● Public relations ● Legal services ● Financial services ● Quality assurance ● Retail ● Museums/archives ● Producing ● Localization/translation ● Adaptation ● Technical support
Total units required to complete the degree	120	120	120
Upper-division units required to complete the degree	51	24	42
Foundation courses			
English Composition	English 101 and 102	English 101 and 102	UA Foundations Composition
Math	Moderate Strand	Moderate Strand	UA Foundations G-strand math
Second Language	2nd Semester Proficiency	4thSemester Proficiency	4th semester proficiency

General Education			
Tier I GE Requirements (150, 160, 170)	Tier I Two 150s Two 160s Two 170s	Tier I Two 150s Two 160s Two 170s	18 units Tier One (6 each 150, 160, 170)
Tier II GE Requirements (Arts, HUMS, INDV, NATS)	One Tier II Arts One Tier II Humanities One Tier II Individuals and Societies	One Tier II Arts One Tier II Humanities One Tier II Natural Sciences	9 units Tier Two (3 each Individuals & Societies, Natural Science, Arts)
Pre-major? (Yes/No). If yes, provide requirements. Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	No	No	No
List any special requirements to declare or gain admission to this major (completion of specific coursework, minimum GPA, interview, application, etc.)	None	None	None
Major requirements			
Minimum # of units required in the major (units counting towards major units and major GPA)	51	42	42
Minimum # of upper-division units required in the major (upper division	51	42	24

units counting towards major GPA)			
Minimum # of residency units to be completed in the major	18	18	18
Required supporting coursework (courses that do not count towards major units and major GPA, but are required for the major). Courses listed must include prefix, number, units, and title. Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	Required courses: Math 113, or Math 116, and ISTA 116	None	None
Major requirements. List all major requirements including core and electives. If applicable, list the emphasis requirements for each proposed emphasis. Courses listed	**Core Courses/Required Major Coursework (33 units)** 1XX Programming for Game Dev. (3) 2XX Game Development I (4) ESOC 302 Quantitative Methods for the Digital Marketplace (3)	**Core Courses/Required Major Coursework (21 Units)** 2XX Games, Behavior, and 3XX Gamification in Society ISTA 161 Ethics in a Digital ISTA 251 Introduction to Ga ESOC 211 Collaborating in	**MAJOR CORE (21 units)** ● PAH 200: Introduction to Applied Humanities (3) ● PAH 201: Applied Humanities Practice: Techniques and Technologies (3) ● PAH 372: Intercultural Competence: Culture, Identity, Adaptation, and Intercultural Relations (3)

count towards major units and major GPA. Courses listed must include prefix, number, units, and title. Mark new coursework (New). Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	ESOC 314 Theories of New Media (3) ISTA 130 Computational Thinking and Doing (4) ISTA 161 Ethics in a Digital World (3) ISTA 251 Introduction to Game Design (3) ISTA 416 Introduction to Human Computer Interaction (3) ISTA 425 Algorithms for Games (3) STA 451 Game Development (4) **Individual/Capstone Required Coursework (6 upper division units)** Internship, Directed Research, Individual or Independent Study (3) along with the ISTA 498 Capstone req.(3). **Elective Coursework in the Major (12 upper division units)** *These courses are organized in to 'tracks' depending on students' interests, students are encouraged but not required to complete their elective coursework in a particular specialty area. PROGRAMMING-INTENSIVE TRACK (12 units) 3XX Game Physics (3) ISTA 311 Foundations of Info. and Inference (3) ISTA 331 Principles and Practice of Data Sci (3)	ESOC 302 Quantitative Methods for the Digital Marketplace (3) ESOC 480: Digital Engagement **Individual/Capstone Required Coursework (3 upper division units**) Internship, Directed Research, Individual or Independent Study (3). **Elective Coursework in the Major (at least 18 units)** 3XX Monetizing Indep. Gaming (3) ISTA 301 Computing and the Arts (3) ISTA 302 Technology of Sound (3) ISTA 321 Data Mining and Discovery (3) ISTA 416 Introduction to Human Comp. Interaction (3) ESOC 316 Digital Commerce (3) ESOC 318 Disruptive Technologies (3) ESOC 340 Multimedia Design & the Moving Image (3)	● PAH 383/383H: Pre-internship: Building Career Readiness (3) ● PAH 420: Innovation and the Human Condition: Learning How to Improve Life in the Community and Beyond (3) ● PAH 493/493H: Internship (3) ● PAH 498: Senior Capstone (3) **GAME STUDIES EMPHASIS (18 units)** ● PAH 230: Video Games as Artifacts: Appreciating Interactive Multimedia Entertainment (3) ● PAH 231: Global Video Game Cultures and Their Origins (3) **[New]** ● PAH 330: The Video Game Industry: An Introduction to the Business of Making Money with Play (3) ● PAH 331: Video Game Studies: Critical/Cultural Approaches (3) **[New]** ● INFV 405: Introduction to Game Design (3) <u>or</u> ISTA 251: Introduction to Game Design (3) ● INFV 406: Introduction to Game Development (3) <u>or</u> ISTA 451: Game Development (3) **MAJOR ELECTIVES (3 units from among the following)** <u>Africana Studies Program</u> ● AFAS 223: African Philosophical Worlds (3) ● AFAS 463: Doing Business In/With Africa: A Cultural Perspective (3)

	ISTA 350 Prog. for Informatics Applications (3) ISTA 424 Virtual Reality (3) GAME ENTREPRENEUR TRACK (12 units) 3XX Monetizing Indep. Gaming (3) ESOC 316 Digital Commerce (3) ESOC 318 Disruptive Technologies (3) LIS 484 Introduction to Copyright (3) ARTIFICIAL INTELLIGENCE TRACK (12 Units) ISTA 450 Artificial Intelligence (3) 4XX Artificial Intelligence in Games (3) ISTA 421 Introduction to Machine Learning (3) ISTA 457 Neural Networks (3) ART OF GAMES TRACK (12 Units) ISTA 301 Computing and the Arts (3) ISTA 302 Technology of Sound (3) ISTA 303 Introduction to Creative Coding (3) ISTA 403 Advanced Creative Coding (3) ESOC 300 Digital Storytelling and Culture (3) ESOC 340 Information, Multimedia Design & the Moving Image (3)	LIS 484 Introduction to Copyright (3)	<u>College of Humanities</u> ● HUMS 375: Globalization and Transnational Cinema (3) <u>Department of East Asian Studies</u> ● CHN 245: Chinese Popular Culture (3) ● CHN 410B: The Anthropology of Contemporary China (3) ● CHN 444: Chinese Media & Culture (3) ● JPN 245: Japanese Anime and Visual Culture (3) ● JPN 425A: Anthropology of Japan: Images and Realities (3) ● KOR 245: K-pop, Webtoons, Ethnic Food, and More: Understanding Korean Pop Culture (3) ● KOR 251: Introduction to Korea through Films (3) ● EAS 444: East Asian Traditions and the Rise of Commercial Civilization (3) ● EAS 466: Japanese and Chinese Nationalism (3) <u>Department of French & Italian</u> ● FREN 230: French Culture (1789-present) (3) ● FREN/ITAL 231: Fashion and Culture in France and Italy (3) ● FREN 373: US & Francophone Hip-Hop Cultures (3) ● FREN 433: Business French 1(3) ● FREN 434: Business French 2 (3) ● ITAL 230: Introduction to Italian Culture (3) ● ITAL 240: Italian Folklore and Popular Culture (3)

			<u>Department of German Studies</u> ● GER 246: Culture, Science and Technology (3) ● GER 315: German for Professional Purposes (3) ● GER 371: Contemporary German Culture (3) ● GER 416: Minority Views in German Culture (3) ● GER 430: Crossing Borders/Crossing Cultures (3) <u>Department of Public & Applied Humanities</u> ● PAH 220: Collaboration: A Humanities Perspective (3) ● PAH 221: Creating, Imagining, Innovating: Intercultural Approaches to Academic and Career Success (3) ● PAH 240: Some We Love, Some We Hate, Some We Eat: Global Perspectives on Human/Animal Relationships (3) ● PAH 310: Urban Multilingualism: An Introduction to Exploring Diverse Cities (3) ● PAH 320: Working: The Rewards and Costs of Employment (3) ● PAH 350: Health Humanities: Intercultural Perspectives ● PAH 456: Humanities and the Global Creative Economy (3) <u>Department of Religious Studies & Classics</u> ● CLAS 311: Athens Through the Ages (3)

			● RELI 210: Religion in the American Experience (3) ● RELI 230: Religions and Cultures of India (3) ● RELI 335: Rap, Culture and God (3) ● RELI 345: Religion and the Arts in India (3) ● RELI 363: Religion and Sex (3) ● RELI 367: Yoga (3) ● RELI 404: Religion, Gender, and the Body (3) ● RELI 412: Religion and Literature in Latin America (3) <u>Department of Russian & Slavic Studies</u> ● RSSS 315: Werewolves and Vampires: Slavic Folklore in our Culture (3) ● RSSS 325: Eastern Orthodoxy in a Global Age (3) <u>Department of Spanish & Portuguese</u> ● PORT 430: Brazilian Civilization (3) ● PORT 463: Topics in Luso-Brazilian Literature (3) ● SPAN 352: Reading Politics and Culture in the Hispanic World (3) ● SPAN 371A/B: Spanish for Business and Economics (3) ● SPAN 430: Issues in Spanish Culture (3) ● SPAN 431: Issues in Spanish-American Culture (3) ● SPAN 433: Issues in Mexican and Mexican-American Culture (3) ● SPAN 480: Service Learning v <u>Department of Teaching, Learning & Sociocultural Studies</u>

			● TLS 386: Global Citizenship: Reading the World and the Word (3)
Internship, practicum, applied course requirements (Yes/No). If yes, provide description.	**Yes/Individual/Capstone Required Coursework (6 upper division units)** INFO 493 Internship, INFO 492 Directed Research, INFO 499 Individual or Independent Study (3) along with ISTA 498 Senior Capstone (3)	**Yes/Individual/Capstone Required Coursework (3 upper division units**) INFO 493 Internship, INFO 492 Directed Research, INFO 499 Individual or Independent Study (3).	Yes. Complete 3 units of pre-internship (PAH 383) and 3 units of an internship (PAH 493).
Senior thesis or senior project required (Yes/No). If yes, provide description.	No	No	No (no separate senior project but one is embedded in capstone)
Additional requirements (provide description)	None	None	None
Minor (specify if optional or required)	Optional	Required	Required

*Note: comparison of additional relevant programs may be requested.

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March 24, 2020

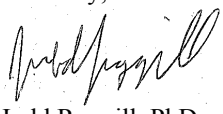
Catherine Brooks, PhD
Director and Associate Professor | School of Information | College of Social & Behavioral Sciences
Affiliate Faculty:
- Graduate Interdisciplinary Program in Social, Cultural & Critical Theory
- Graduate Interdisciplinary Program in Second Language Acquisition & Teaching
cfbrooks@arizona.edu

Dear Dr. Brooks:

Subject: Proposed BA in Games & Behavior; proposed BS in Game Design & Development

On behalf of the Department of Public & Applied Humanities, I write this letter in support of the proposed BA in Games & Behavior and the proposed BS in Game Design & Development. The degrees look very exciting, and will no doubt be well received by students. Please let me know if there are additional ways we can help support the proposals.

Sincerely,



Judd Ruggill, PhD
Professor and Head | Department of Public & Applied Humanities | College of Humanities
Affiliated Faculty:
- Africana Studies Program | College of Humanities
- Department of English | College of Social & Behavioral Sciences
- Graduate Interdisciplinary Program in Social, Cultural & Critical Theory
- Institute for LGBT Studies
- School of Information | College of Social & Behavioral Sciences
- School of Theatre, Film & Television | College of Fine Arts
Co-Director, Learning Games Initiative
jruggill@email.airzona.edu

cc Kimberly Jones, PhD
Vice Dean for Academic Affairs | College of Humanities
Affiliate Faculty:
- Graduate Interdisciplinary Program in Second Language Acquisition & Teaching
kjones@email.arizona.edu

VALIDATE: EMPLOYMENT POTENTIAL

PROJECT CRITERIA

Validate	Programs
Metro Areas (MSAs)	Tucson, AZ
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

HOW MANY JOBS ARE THERE FOR YOUR GRADUATES?

For your project criteria, there were 0 job postings in the last 12 months.

Compared to:

- 111,367 total job postings in your selected location
- 32,031 total job postings requesting a Bachelor's degree in your selected location

The number of jobs is expected to grow over the next 8 years.

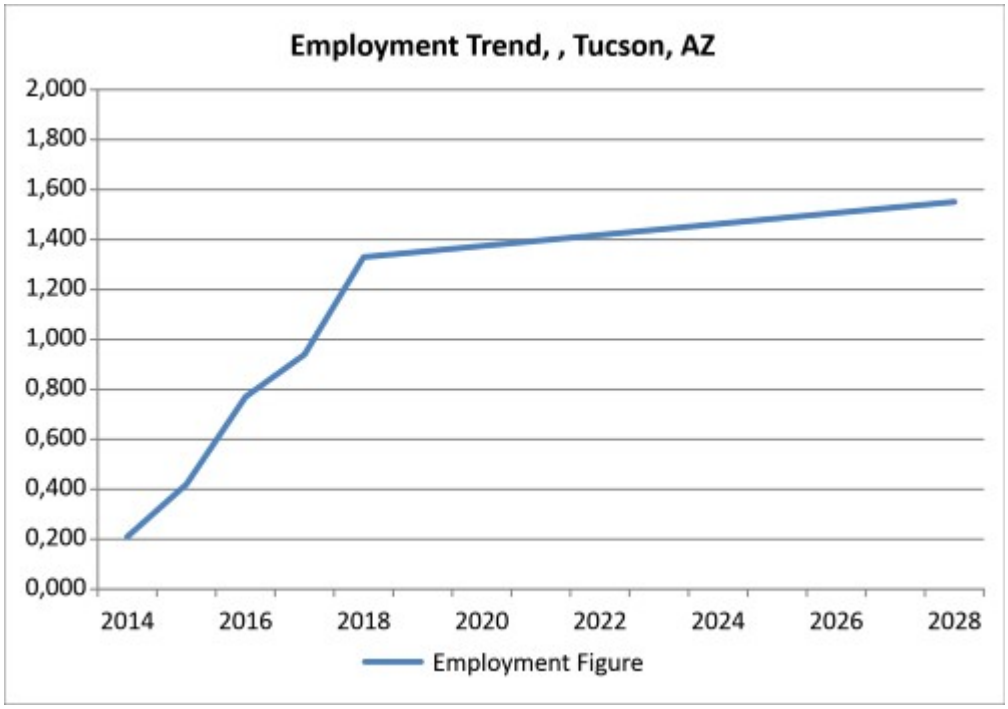
GROWTH BY GEOGRAPHY

Geography	Selected Occupations	Total Labor Market	Relative Growth
Tucson, AZ	16.62 %	17.14 %	Average
Arizona	16.60 %	14.97 %	Average

Nationwide	9.30 %	5.78 %	Average

HOW HAS EMPLOYMENT CHANGED FOR CAREER OUTCOMES OF YOUR PROGRAM?

	2014	2015	2016	2017	2018	2028
Employment (BLS)	210	420	770	940	1,330	1,551



Employment data between years 2019 and 2028 are projected figures.

DETAILS BY OCCUPATION

Occupation Group	Postings	LQ	Employment (2018)	Employment Growth (2017 - 2018)	Projected Employment Growth (2019-2028)
Front-End Application Design	0	0.0	1,330	41.5%	16.6%

HOW VERSATILE IS MY PROGRAM?

Graduates of this program usually transition into any of the 1 different occupation groups:

Occupations Group	Market Size (postings)	Percentage of Career Outcome demand
Front-End Application Design	0	0.0%

WHAT SALARY WILL MY GRADUATES MAKE?

The average salary in Tucson, AZ for graduates of your program is $0

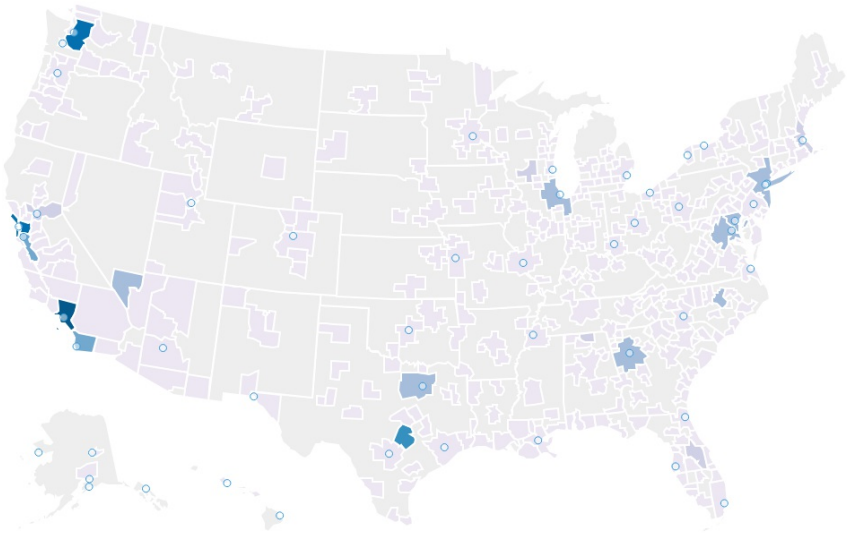
This average salary is Below the average living wage for Tucson, AZ of $32,011

No experience salary information is currently available

Salary numbers are based on Burning Glass models that consider advertised job posting salary, BLS data, and other proprietary and public sources of information.

Occupation Group	25th Percentile	Average	75th Percentile

WHERE IS THE DEMAND FOR MY GRADUATES?



TOP LOCATIONS BY POSTING DEMAND

Location	Postings
Los Angeles-Long Beach-Anaheim, CA	525
San Francisco-Oakland-Hayward, CA	275
Seattle-Tacoma-Bellevue, WA	227
Austin-Round Rock, TX	106
San Jose-Sunnyvale-Santa Clara, CA	68
San Diego-Carlsbad, CA	51
Atlanta-Sandy Springs-Roswell, GA	47
New York-Newark-Jersey City, NY-NJ-PA	39

Las Vegas-Henderson-Paradise, NV	27
Chicago-Naperville-Elgin, IL-IN-WI	24

VALIDATE: COMPETITIVE LANDSCAPE

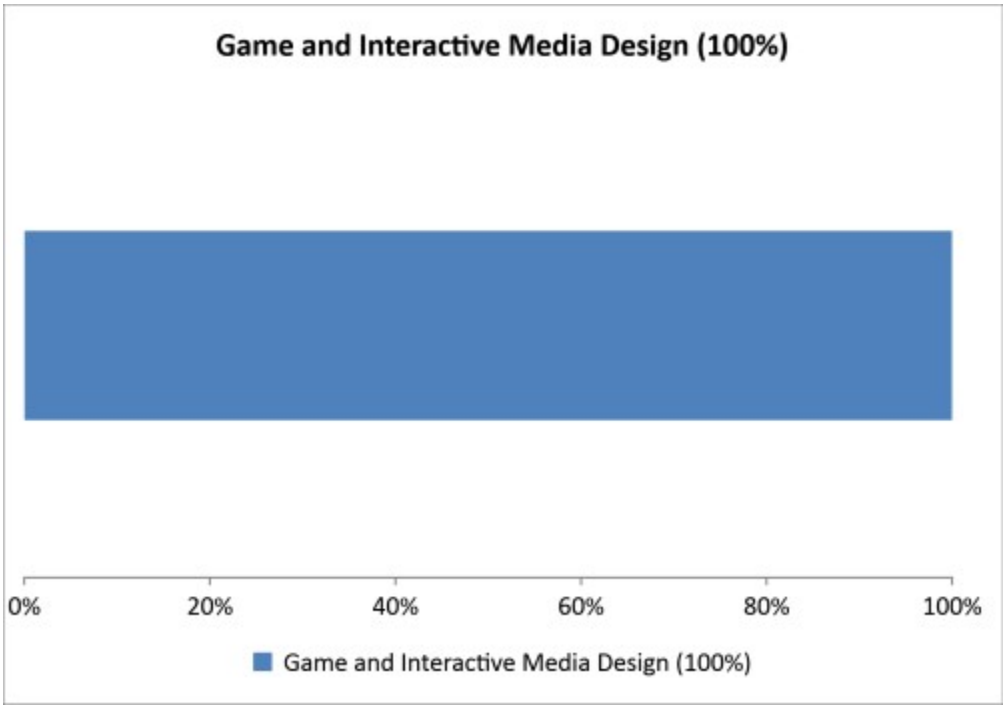
PROJECT CRITERIA

Validate	Programs
Metro Areas (MSAs)	Tucson, AZ
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

OVERVIEW

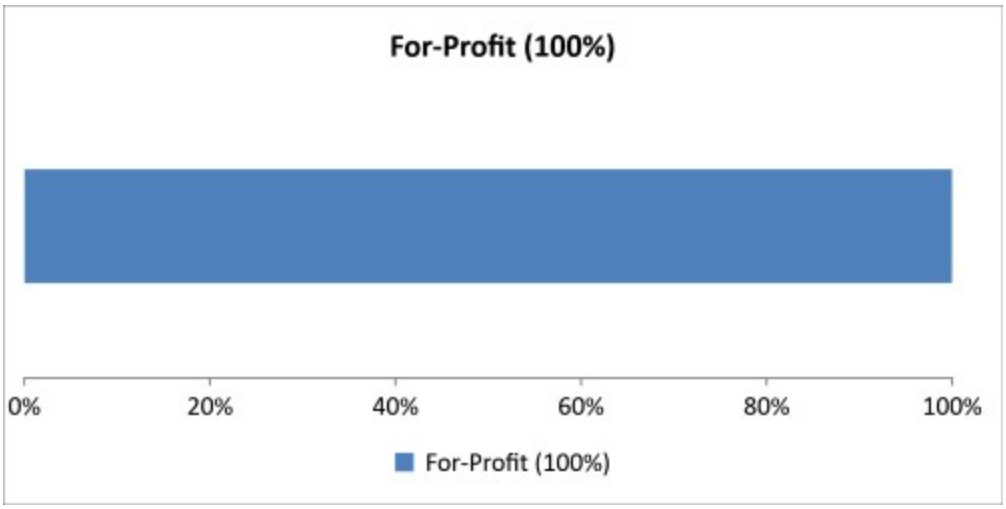
	#	% Change (2013-2017)
Degrees Conferred	3	100%
Number of Institutions	1	100%
Average Conferrals by Institution	3	100.00%
Median Conferrals by Institution	3	100.00%

MARKET SHARE BY PROGRAM



Program	Conferrals (2017)	Market Share (%)
Game and Interactive Media Design	3	100.00%

MARKET SHARE BY INSTITUTION TYPE



Institution Type	Conferrals (2017)	Market Share (%)
For-Profit	3	100.00%

TOP INSTITUTIONS

Institution	School Type	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)
The Art Institute of Tucson	For-Profit	100.00%	100.00%	3	100.00%

TOP PROGRAMS

Program	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)

Game and Interactive Media Design	100.00%	100.00%	3	100.00%

ACTIVE COMPETITORS

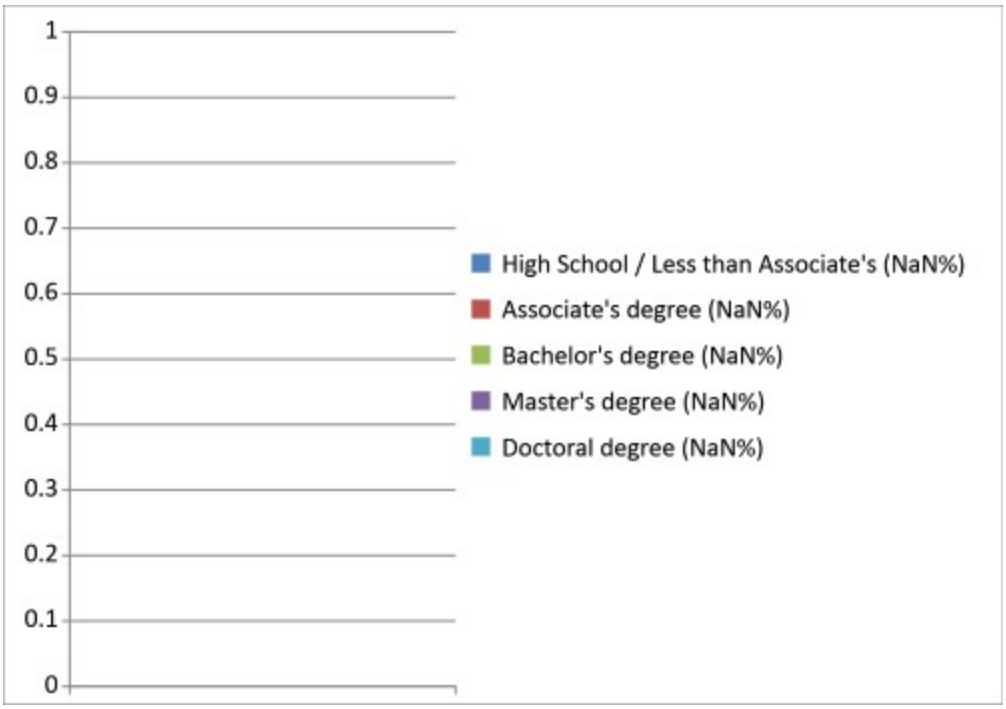
Institution	School Type	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)

VALIDATE: MARKET ALIGNMENT

PROJECT CRITERIA

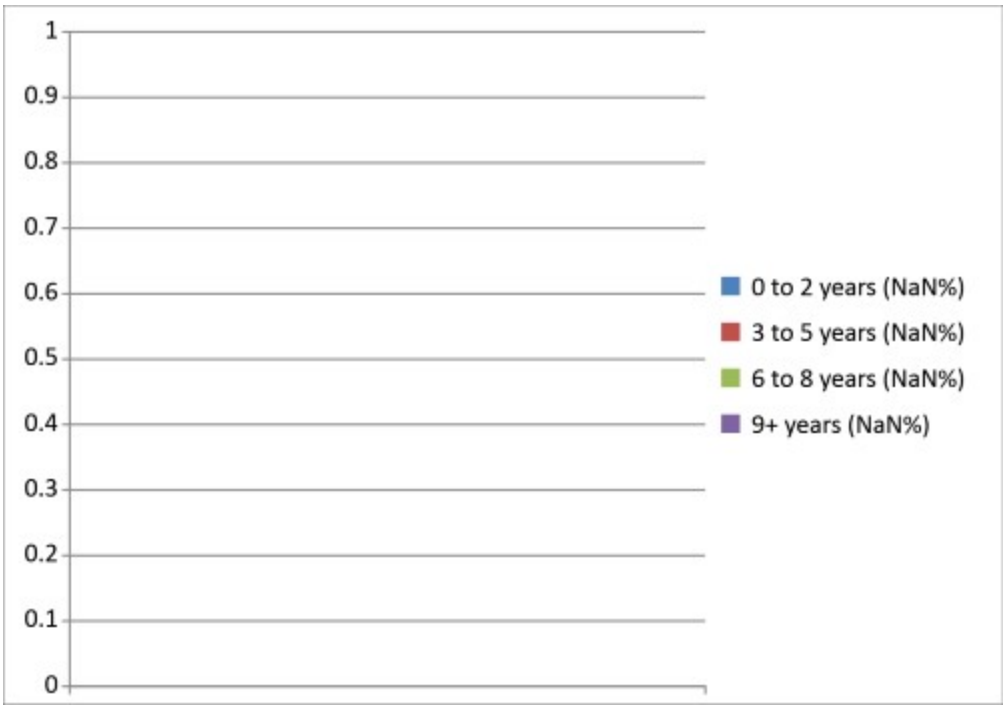
Validate	Programs
Metro Areas (MSAs)	Tucson, AZ
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

JOB POSTINGS BY ADVERTISED EDUCATION (%)



JOB POSTINGS BY INDUSTRY (%)

JOB POSTINGS BY EXPERIENCE REQUESTED (%)



TOP TITLES

Experience Level: All Experience

Title	Postings	Market Share (%)

TOP EMPLOYERS HIRING

Experience Level: All Experience

Employer	Postings	Market Share (%)

VALIDATE: KEY COMPETENCIES

PROJECT CRITERIA

Validate	Programs
Metro Areas (MSAs)	Tucson, AZ
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

TOP 15 SPECIALIZED SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

TOP 15 BASELINES SKILLS

Skill	Postings

TOP 15 SOFTWARE PROGRAMMING SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

TOP 15 SKILL CLUSTERS

Skill	Postings
Animation and Game Design	0 (0%)
Augumented Reality / Virtual Reality (AR / VR)	0 (0%)
Simulation	0 (0%)
Uncategorized	0 (0%)
Physics	0 (0%)
Art and Illustration	0 (0%)
Programming Principles	0 (0%)
Product Management	0 (0%)

Computer and Information Technology Industry Knowledge	0 (0%)
Java	0 (0%)
Quality Assurance and Control	0 (0%)
User Interface and User Experience (UI/UX) Design	0 (0%)
Product Development	0 (0%)
Software Development Principles	0 (0%)
JavaScript and jQuery	0 (0%)

TOP 15 SALARY PREMIUM SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

No skills available

TOP 15 COMPETITIVE ADVANTAGE SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

No skills available

TOP 15 CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

TOP 15 SALARY PREMIUM CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

No certificates available

TOP 15 COMPETITIVE ADVANTAGE CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

No certificates available

VALIDATE: EMPLOYMENT POTENTIAL

PROJECT CRITERIA

Validate	Programs
States	Arizona
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

HOW MANY JOBS ARE THERE FOR YOUR GRADUATES?

For your project criteria, there were 4 job postings in the last 12 months.

Compared to:

- 875,530 total job postings in your selected location
- 275,216 total job postings requesting a Bachelor's degree in your selected location

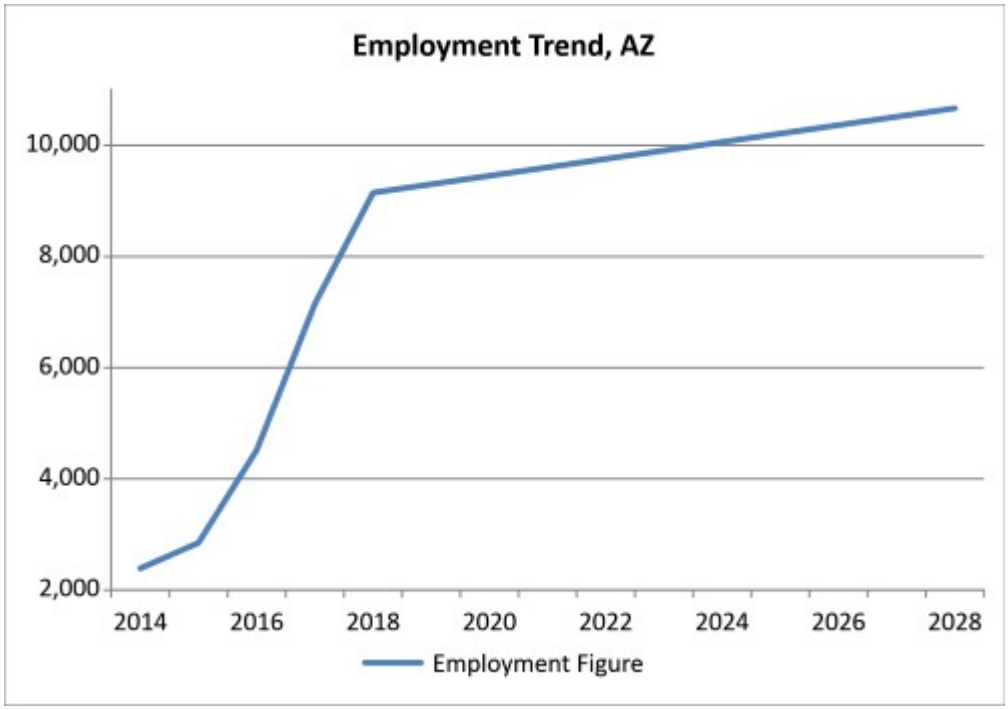
The number of jobs is expected to grow over the next 8 years.

GROWTH BY GEOGRAPHY

Geography	Selected Occupations	Total Labor Market	Relative Growth
Arizona	16.60 %	14.97 %	Average
Nationwide	9.30 %	5.78 %	Average

HOW HAS EMPLOYMENT CHANGED FOR CAREER OUTCOMES OF YOUR PROGRAM?

	2014	2015	2016	2017	2018	2028
Employment (BLS)	2,390	2,850	4,520	7,150	9,150	10,669



Employment data between years 2019 and 2028 are projected figures.

DETAILS BY OCCUPATION

Occupation Group	Postings	LQ	Employment (2018)	Employment Growth (2017 - 2018)	Projected Employment Growth (2019-2028)
Front-End Application Design	4	0.1	9,150	28.0%	16.6%

HOW VERSATILE IS MY PROGRAM?

Graduates of this program usually transition into any of the 1 different occupation groups:

Occupations Group	Market Size (postings)	Percentage of Career Outcome demand
Front-End Application Design	4	100.0%

WHAT SALARY WILL MY GRADUATES MAKE?

The average salary in Arizona for graduates of your program is $96,320

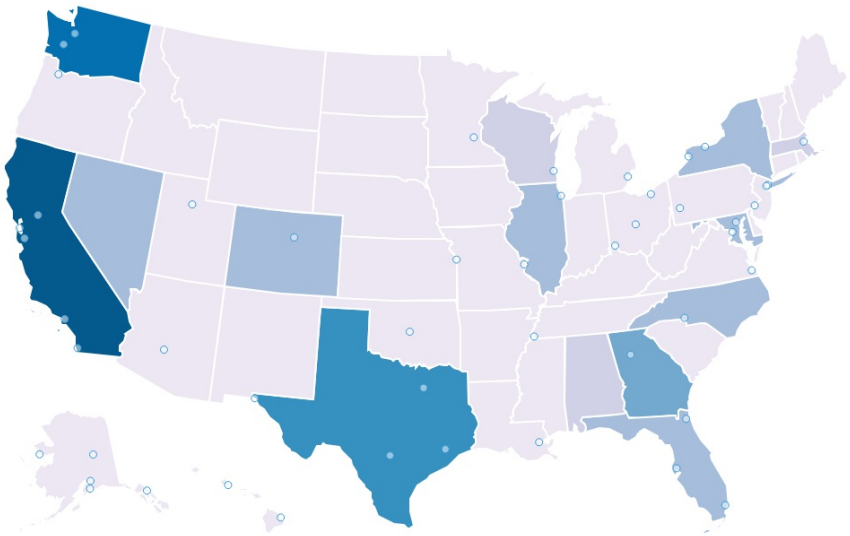
This average salary is Above the average living wage for Arizona of $32,531

No experience salary information is currently available

Salary numbers are based on Burning Glass models that consider advertised job posting salary, BLS data, and other proprietary and public sources of information.

Occupation Group	25th Percentile	Average	75th Percentile
Front-End Application Design	$0	$0	$0

WHERE IS THE DEMAND FOR MY GRADUATES?



TOP LOCATIONS BY POSTING DEMAND

Location	Postings
California	934
Washington	228
Texas	148
Georgia	54
New York	44
North Carolina	31
Maryland	31

Florida	30
Nevada	27
Illinois	24

VALIDATE: COMPETITIVE LANDSCAPE

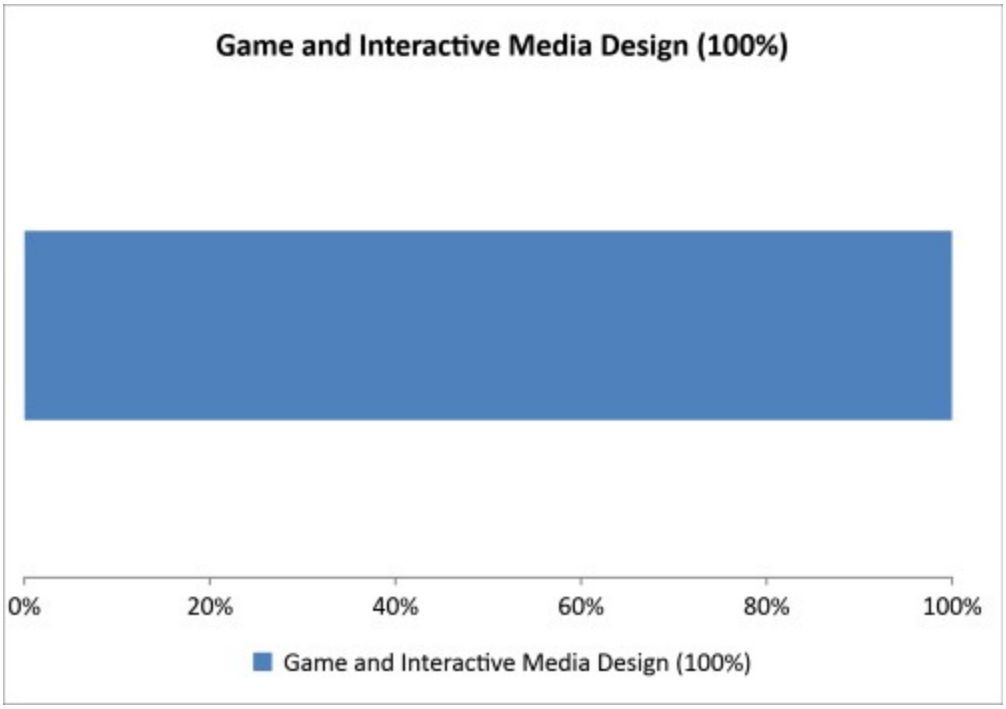
PROJECT CRITERIA

Validate	Programs
States	Arizona
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

OVERVIEW

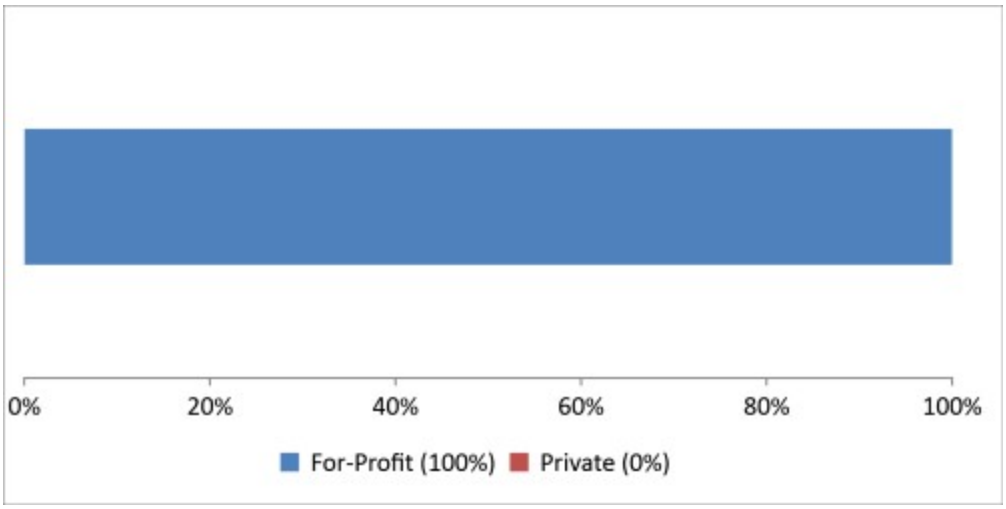
	#	% Change (2013-2017)
Degrees Conferred	21	-63%
Number of Institutions	3	50%
Average Conferrals by Institution	7	-75.90%
Median Conferrals by Institution	3	-89.70%

MARKET SHARE BY PROGRAM



Program	Conferrals (2017)	Market Share (%)
Game and Interactive Media Design	21	100.00%

MARKET SHARE BY INSTITUTION TYPE



Institution Type	Conferrals (2017)	Market Share (%)
For-Profit	21	100.00%
Private	0	0.00%

TOP INSTITUTIONS

Institution	School Type	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)
The Art Institute of Phoenix	For-Profit	85.71%	66.74%	18	63.60%
The Art Institute of Tucson	For-Profit	14.29%	14.29%	3	100.00%
Collins College	For-Profit	0.00%	-81.03%		-100.00%

Embry-Riddle Aeronautical University-Prescott	Private	0.00%	0.00%	0	0.00%

TOP PROGRAMS

Program	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)
Game and Interactive Media Design	100.00%	0.00%	21	-63.80%

ACTIVE COMPETITORS

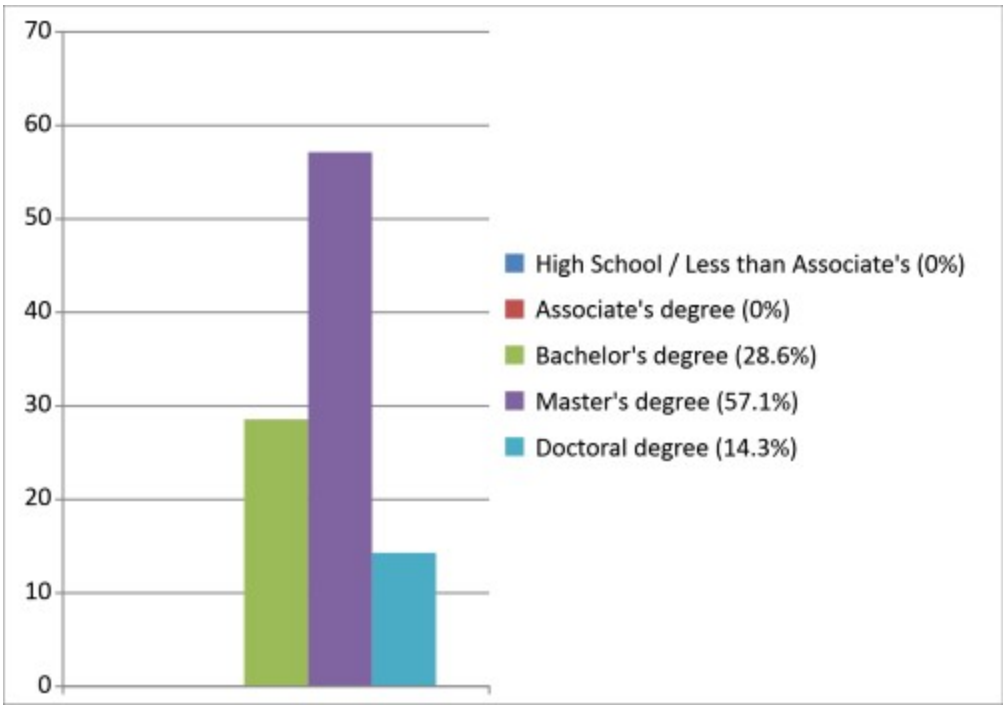
Institution	School Type	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)

VALIDATE: MARKET ALIGNMENT

PROJECT CRITERIA

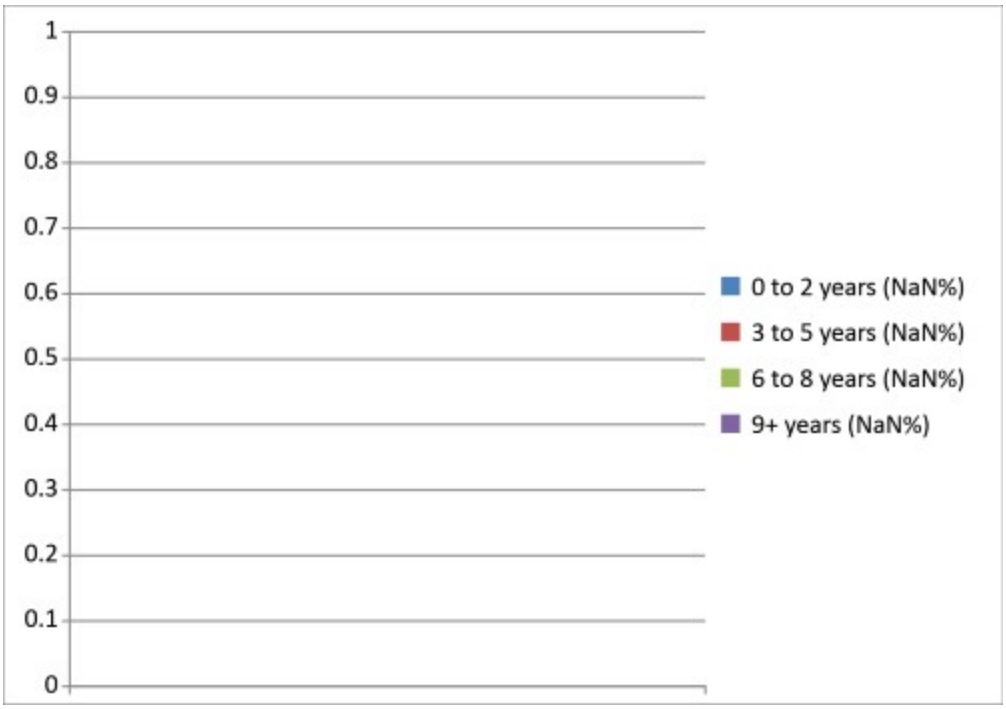
Validate	Programs
States	Arizona
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

JOB POSTINGS BY ADVERTISED EDUCATION (%)



JOB POSTINGS BY INDUSTRY (%)

JOB POSTINGS BY EXPERIENCE REQUESTED (%)



TOP TITLES

Experience Level: All Experience

Title	Postings	Market Share (%)
Senior Engineer	2	100.00%

TOP EMPLOYERS HIRING

Experience Level: All Experience

Employer	Postings	Market Share (%)

VALIDATE: KEY COMPETENCIES

PROJECT CRITERIA

Validate	Programs
States	Arizona
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

TOP 15 SPECIALIZED SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage
Unity (Programming Language)	7 (175%)	48.49%	No	No
Microsoft C#	6 (150%)	-25.69%	No	No

Gaming Industry Knowledge	3 (75%)	-25.87%	No	No
Object-Oriented Programming	3 (75%)	5.43%	No	No
Unity 3D	2 (50%)	-8.52%	No	No
Object-Oriented Analysis and Design (OOAD)	2 (50%)	-28.56%	No	No
Unity	2 (50%)	39.69%	No	No
Atlassian JIRA	1 (25%)	74.16%	No	No

TOP 15 BASELINES SKILLS

Skill	Postings

TOP 15 SOFTWARE PROGRAMMING SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage
Microsoft C#	6 (150%)	-25.69%	No	No
Object-Oriented Programming	3 (75%)	5.43%	No	No

Object-Oriented Analysis and Design (OOAD)	2 (50%)	-28.56%	No	No
Unity	2 (50%)	39.69%	No	No
Atlassian JIRA	1 (25%)	74.16%	No	No

TOP 15 SKILL CLUSTERS

Skill	Postings
Animation and Game Design	4 (100%)
Programming Principles	3 (75%)
Augumented Reality / Virtual Reality (AR / VR)	0 (0%)
Simulation	0 (0%)
Uncategorized	0 (0%)
Physics	0 (0%)

Art and Illustration	0 (0%)
Product Management	0 (0%)
Computer and Information Technology Industry Knowledge	0 (0%)
Java	0 (0%)
Quality Assurance and Control	0 (0%)
User Interface and User Experience (UI/UX) Design	0 (0%)
Product Development	0 (0%)
Software Development Principles	0 (0%)
JavaScript and jQuery	0 (0%)

TOP 15 SALARY PREMIUM SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

No skills available

TOP 15 COMPETITIVE ADVANTAGE SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

No skills available

TOP 15 CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

TOP 15 SALARY PREMIUM CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

No certificates available

TOP 15 COMPETITIVE ADVANTAGE CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

No certificates available

VALIDATE: EMPLOYMENT POTENTIAL

PROJECT CRITERIA

Validate	Programs
Location	Nationwide
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

HOW MANY JOBS ARE THERE FOR YOUR GRADUATES?

For your project criteria, there were 1,698 job postings in the last 12 months.

Compared to:

- 31,389,607 total job postings in your selected location
- 11,211,265 total job postings requesting a Bachelor's degree in your selected location

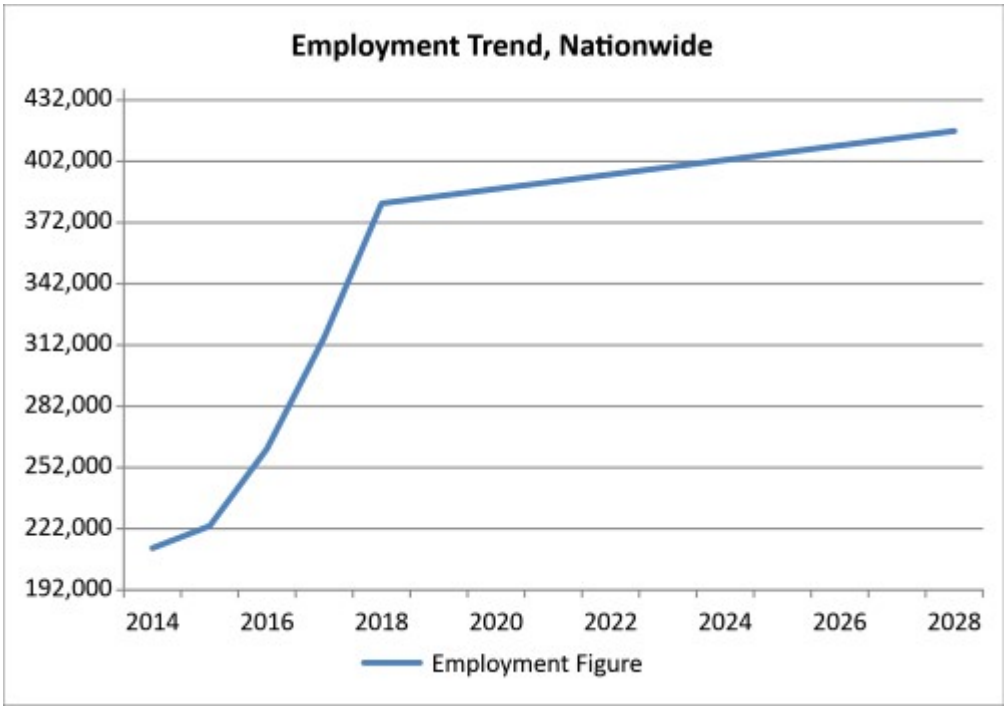
The number of jobs is expected to grow over the next 8 years.

GROWTH BY GEOGRAPHY

Geography	Selected Occupations	Total Labor Market	Relative Growth
Nationwide	9.30 %	5.78 %	Average

HOW HAS EMPLOYMENT CHANGED FOR CAREER OUTCOMES OF YOUR PROGRAM?

	2014	2015	2016	2017	2018	2028
Employment (BLS)	212,510	223,370	261,210	315,830	381,380	416,848



Employment data between years 2019 and 2028 are projected figures.

DETAILS BY OCCUPATION

Occupation Group	Postings	LQ	Employment (2018)	Employment Growth (2017 - 2018)	Projected Employment Growth (2019-2028)
Front-End Application Design	1,698	NA	381,380	20.8%	9.3%

HOW VERSATILE IS MY PROGRAM?

Graduates of this program usually transition into any of the 1 different occupation groups:

Occupations Group	Market Size (postings)	Percentage of Career Outcome demand
Front-End Application Design	1,698	100.0%

WHAT SALARY WILL MY GRADUATES MAKE?

The average salary in the nation for graduates of your program is $83,943

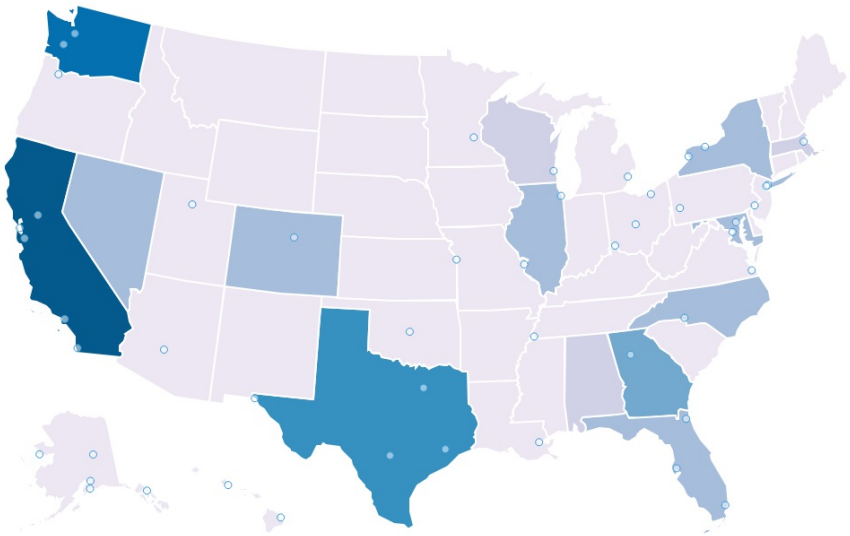
This average salary is Above the average living wage for your region of $31,450


Front-End Application Design
76K
90K92K
21k
0-2 Years
3-5 Years
6+ Years
102k

Salary numbers are based on Burning Glass models that consider advertised job posting salary, BLS data, and other proprietary and public sources of information.

Occupation Group	25th Percentile	Average	75th Percentile
Front-End Application Design	$76,136	$89,551	$91,559

WHERE IS THE DEMAND FOR MY GRADUATES?



TOP LOCATIONS BY POSTING DEMAND

Location	Postings
California	934
Washington	228
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Georgia	54
New York	44
North Carolina	31
Maryland	31

Florida	30
Nevada	27
Illinois	24

VALIDATE: COMPETITIVE LANDSCAPE

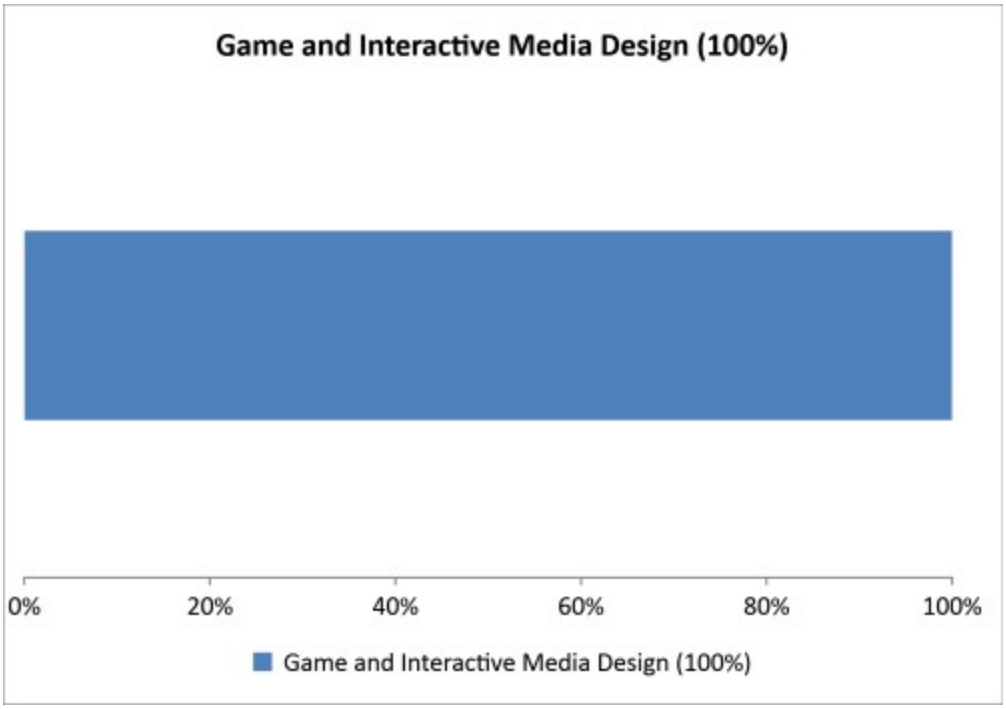
PROJECT CRITERIA

Validate	Programs
Location	Nationwide
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

OVERVIEW

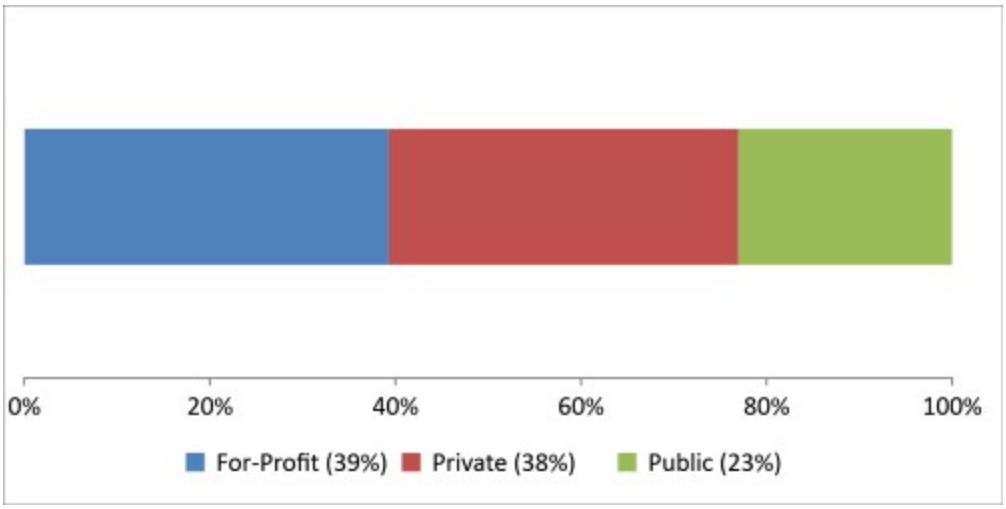
	#	% Change (2013-2017)
Degrees Conferred	1,347	0%
Number of Institutions	103	33%
Average Conferrals by Institution	13	-23.50%
Median Conferrals by Institution	8	-27.30%

MARKET SHARE BY PROGRAM



Program	Conferrals (2017)	Market Share (%)
Game and Interactive Media Design	1,347	100.00%

MARKET SHARE BY INSTITUTION TYPE



Institution Type	Conferrals (2017)	Market Share (%)
For-Profit	529	39.27%
Private	507	37.64%
Public	311	23.09%

TOP INSTITUTIONS

Institution	School Type	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)
The University of Texas at Dallas	Public	14.48%	5.30%	195	58.50%
Savannah College of Art and Design	Private	6.83%	1.68%	92	33.30%
Becker College	Private	5.64%	5.64%	76	100.00%

Drexel University	Private	3.56%	3.56%	48	100.00%
The Art Institute of Pittsburgh-Online Division	For-Profit	3.34%	0.80%	45	32.40%
California State University-Chico	Public	3.12%	3.12%	42	100.00%
University of Southern California	Private	2.38%	0.59%	32	33.30%
Rensselaer Polytechnic Institute	Private	2.30%	0.06%	31	3.30%
SAE Expression College	For-Profit	2.23%	0.59%	30	36.40%
Champlain College	Private	2.15%	-0.24%	29	-9.40%

TOP PROGRAMS

Program	Market Share (2017)	Market Share Change	Conferrals (2017)	Conferrals Change (2013-2017)
Game and Interactive Media Design	100.00%	0.00%	1,347	0.50%

ACTIVE COMPETITORS

Institution	School Type	Market Share	Market Share Change	Conferrals	Conferrals Change

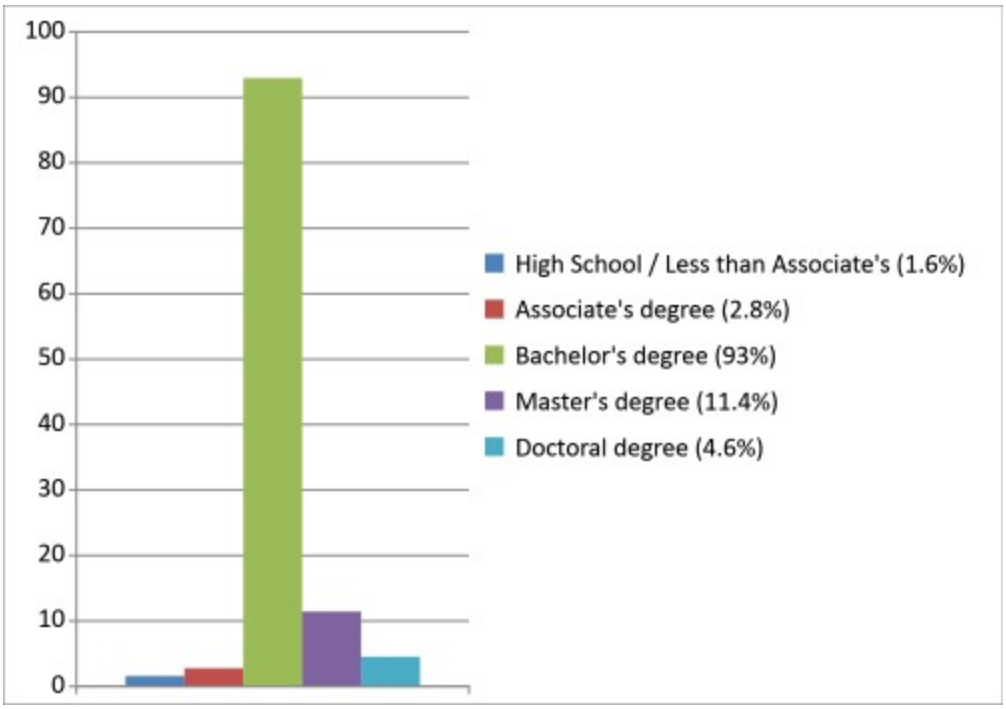
	(2017)	**(2017)**	**(2013-2017)**

VALIDATE: MARKET ALIGNMENT

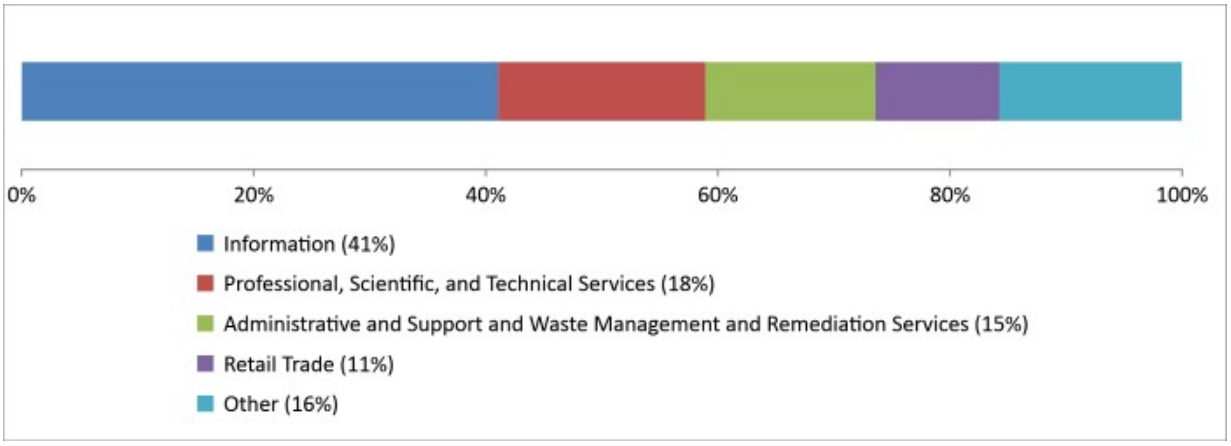
PROJECT CRITERIA

Validate	Programs
Location	Nationwide
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

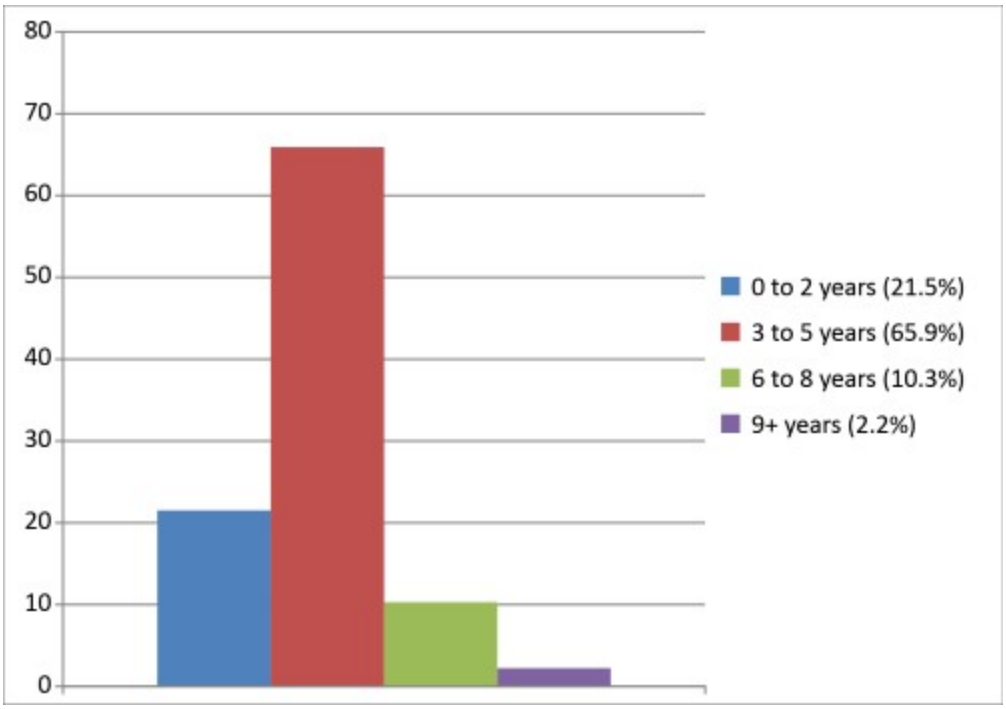
JOB POSTINGS BY ADVERTISED EDUCATION (%)



JOB POSTINGS BY INDUSTRY (%)



JOB POSTINGS BY EXPERIENCE REQUESTED (%)



TOP TITLES

Experience Level: All Experience

Title	Postings	Market Share (%)
Game Designer	183	28.86%
Senior Engineer	77	12.15%
Gameplay Engineer	47	7.41%
Engineer	38	5.99%
Environment Artist	32	5.05%
Concept Artist	26	4.10%
Lead Engineer	26	4.10%

Summer Instructor, Video Game Design	19	3.00%
Senior Environment Artist	14	2.21%
Lead Game Desinger	11	1.74%
Development Engineer	10	1.58%
Game Engineer	10	1.58%
Senior Concept Artist	10	1.58%
Lead Concept Artist	7	1.10%
Lead Environment Artist	7	1.10%

TOP EMPLOYERS HIRING

Experience Level: All Experience

Employer	Postings	Market Share (%)
Amazon	28	4.42%
Activision	17	2.68%
Time Warner	17	2.68%
Electronic Arts Incorporated	15	2.37%
Booz Allen Hamilton Inc.	13	2.05%
Survios	13	2.05%
Sony Electronics Incorporated	12	1.89%
Blizzard Entertainment	11	1.74%

SAIC	11	1.74%
Cryptic Studios Incorporated	10	1.58%
Facebook	9	1.42%
Wargaming	9	1.42%
Zenimax Media Incorporated	9	1.42%
Big Fish Games, Inc	7	1.10%
Disney	7	1.10%

VALIDATE: KEY COMPETENCIES

PROJECT CRITERIA

Validate	Programs
Location	Nationwide
Degree Level	Bachelor's degree
Time Period	9/1/2018 - 8/31/2019
Selected Programs	Game and Interactive Media Design (50.0411)
Career Outcomes mapped to Selected Programs of Study	Video Game Designer

TOP 15 SPECIALIZED SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage
Game Development	785 (46%)	-9.49%	No	No
Level design	519 (31%)	7.16%	No	No

Adobe Photoshop	431 (25%)	-22.36%	No	No
C++	421 (25%)	-24.09%	No	No
Maya	382 (22%)	7.51%	No	No
Microsoft C#	251 (15%)	-25.69%	No	No
Zbrush	232 (14%)	20.69%	No	Yes
EPIC Unreal Engine	216 (13%)	53.88%	No	No
Art Direction	198 (12%)	-31.29%	Yes	No
Software Engineering	168 (10%)	7.27%	Yes	No
Scheduling	158 (9%)	1.88%	No	No
Painting	152 (9%)	5.51%	No	No
Painting (Art)	152 (9%)	4.49%	No	No
Physics	140 (8%)	-16.38%	No	Yes

3D Modeling / Design	139 (8%)	6.84%	No	No

TOP 15 BASELINES SKILLS

Skill	Postings
Teamwork / Collaboration	747 (44%)
Creativity	709 (42%)
Communication Skills	607 (36%)
Problem Solving	301 (18%)
Organizational Skills	208 (12%)
Writing	189 (11%)
Research	144 (8%)

Detail-Oriented	116 (7%)
Editing	111 (7%)
Time Management	105 (6%)
Microsoft Excel	97 (6%)
Written Communication	80 (5%)
Troubleshooting	74 (4%)
Meeting Deadlines	72 (4%)
Planning	69 (4%)

TOP 15 SOFTWARE PROGRAMMING SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

Level design	519 (31%)	7.16%	No	No
Adobe Photoshop	431 (25%)	-22.36%	No	No
C++	421 (25%)	-24.09%	No	No
Maya	382 (22%)	7.51%	No	No
Microsoft C#	251 (15%)	-25.69%	No	No
Software Engineering	168 (10%)	7.27%	Yes	No
3D Studio Max	117 (7%)	-23.06%	No	No
Python	116 (7%)	61.12%	No	No
Unity	102 (6%)	39.69%	No	No
Microsoft Excel	97 (6%)	17.03%	No	No
Java	92 (5%)	-13.18%	Yes	No
Software Development	87 (5%)	5.78%	No	No

Debugging	86 (5%)	7.39%	Yes	No
JavaScript	80 (5%)	6.81%	Yes	No
Object-Oriented Analysis and Design (OOAD)	60 (4%)	-28.56%	No	No

TOP 15 SKILL CLUSTERS

Skill	Postings
Animation and Game Design	1031 (61%)
Software Development Principles	325 (19%)
Art and Illustration	282 (17%)
Programming Principles	147 (9%)
Product Development	147 (9%)
Physics	140 (8%)

Quality Assurance and Control	121 (7%)
Simulation	100 (6%)
User Interface and User Experience (UI/UX) Design	95 (6%)
JavaScript and jQuery	95 (6%)
Java	92 (5%)
Augumented Reality / Virtual Reality (AR / VR)	62 (4%)
Product Management	55 (3%)
Computer and Information Technology Industry Knowledge	16 (1%)
Uncategorized	0 (0%)

TOP 15 SALARY PREMIUM SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage

Art Direction	198 (12%)	-31.29%	Yes	No
Software Engineering	168 (10%)	7.27%	Yes	No
Quality Assurance and Control	121 (7%)	39.46%	Yes	No
Prototyping	112 (7%)	10.91%	Yes	No
Simulation	100 (6%)	9.66%	Yes	No
Java	92 (5%)	-13.18%	Yes	No
Debugging	86 (5%)	7.39%	Yes	No
JavaScript	80 (5%)	6.81%	Yes	No
Virtual Reality (VR)	57 (3%)	91.72%	Yes	No
cryEngine	52 (3%)	-100%	Yes	Yes
Product Management	45 (3%)	28.58%	Yes	No
User Interface (UI) Design	39 (2%)	-23.75%	Yes	No

Scrum	27 (2%)	39.96%	Yes	No
Information Technology Industry Knowledge	16 (1%)	51.77%	Yes	No

TOP 15 COMPETITIVE ADVANTAGE SKILLS

Skill	Postings	Projected Growth	Salary Premium	Competitive Advantage
Zbrush	232 (14%)	20.69%	No	Yes
Physics	140 (8%)	-16.38%	No	Yes
cryEngine	52 (3%)	-100%	Yes	Yes
Augmented Reality (AR)	34 (2%)	93.19%	No	Yes

TOP 15 CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage
Security Clearance	35 (2%)	No	No

Casino Gaming License	1 (0%)	No	No
Certified Teacher	1 (0%)	No	No
Driver's License	1 (0%)	No	No

TOP 15 SALARY PREMIUM CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

No certificates available

TOP 15 COMPETITIVE ADVANTAGE CERTIFICATIONS

Skill	Postings	Salary Premium	Competitive Advantage

No certificates available