Education Through Games and Simulations

by

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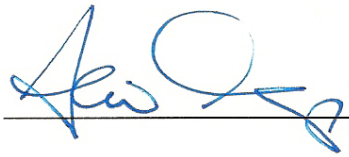
Approved by: 

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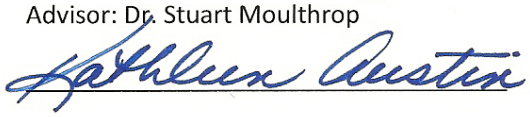

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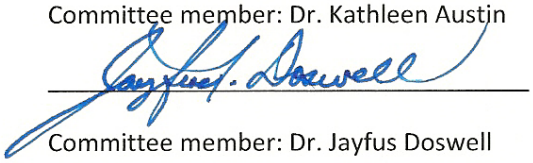

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Abstract

Through an examination of the underserved urban population, this paper takes a look at how the use of games and simulations may provide a means of closing a gap in education which has lingered for several decades. Discussion on how this engagement might look as both a class learning algebra through game programming and gameplay is reviewed. As well, several companies who have aligned themselves with state and national mathematics standards are discussed. Thus, showing how the districts who have taken the gaming plunge are reaping the benefits of serious games. These districts have found a means of turning their students around and pumping up their test scores. By adopting such an engaging approach, this paper presents how learning not only algebra, but any subject matter through an intervention which entertains and educates may be the answer to a growing problem…. the failure of the educational system and the fading family. Finally, the paper provides an account of a game development team and the learning and obstacles which took place as they built a learning game intended to teach about the college experience with embedded algebra concepts.

Chapter One: The Rationale

Hypothesis: Urban students age 14-18 will appropriate the medium of games and simulations to learn, understand and apply the concepts of Algebra 1 and Data Analysis in everyday life while learning about the college experience.

Problem Statement

Persistent High School Assessment (HSA) failures, the overall decline in the values of education in high school and college students, especially in an urban setting, have drawn my interest to this research and project. As students across the country continually fail to learn and understand how to use the concepts of Algebra and Data Analysis with any proficiency, the students level of mastery is not suitable to support the learning of upper level math and rarely sufficient to solve daily problems related to math. Research has proven, the urban and underserved population continues to fall into the lower percentile of test passers (Teale & Gabrell, 2007). Likewise, the urban community fails to improve in this area producing a regenerative community of substandard progress.

Introduction

Urban schools, now synonymous with non White schools, typically have a high number of students receiving free and reduced meals (FARMS). According to the Academic Pathways to Access and Student Success, “underserved students are defined as students who do not receive equitable resources as compared to other students in the academic

pipeline. Slow learners, rebellious students, homeless students and impoverished students have become synonymous with the urban student. Typically, these groups of students include low-income, underrepresented racial/ethnic minorities (African American, Asian Pacific Islander, Latino(a), and Native American students), and first generation students as well as many others." These same students are expected to drop out of high school before completing the 9th grade. Twelfth grade classes continue to dwindle resulting in a cohort of less than 50%, in some cases of the originating 9th grade class. Some Latino students do not matriculate to the high school level; dropping out before completing the 8th grade. This is a reality across the country.

Cultural differences and inequities continue to be a distracting and distressing factor in the low success rate of urban and underserved populations. As African American students continue to underperform their White counter parts, often times, this low level of performance is likened to race. However, poor relationships, the lack of nurturing and poor diet have largely attributed to this dismal data. Bainbridge & Lasley (2002) propose that every child's journey is initiated with the same or similar promise and that there is no predetermined path set for any child but rather socioeconomic status dictates the turns in a child's life. These researchers also state that children of mixed races, Asians, Latinos, etc… suffer from the same issues when faced with the same socioeconomic status dilemma. Therefore, according to these researchers, then, it is not race, but rather environment which impacts the lives of urban students. Given the same

opportunity as any other middle to upper class family, urban students would perform just as well.

Parent involvement and the parents' educational status play a key role in how well urban children perform in school. Frequently, the child has parents who cannot assist them with their home assignments for varying factors including but not limited to illiteracy, working multiple jobs, or preoccupation with other things. In most cases, the child needs only nurturing, encouragement and directed social behavioral and environmental adjustments. As many children in the urban setting have little to no structure at home, the school environment is not only a place where cognitive stimulation is provided, but a place where affective social supports of wide-spread arms of love, nurturing and encouragement are needed. For urban students, relationships and situated learning are paramount. They need culturally stimulated instruction to assist with deep learning. The opportunity to associate learning to familiar surroundings and situations could be the spark to the behavioral changes necessary to compete in open society. Culturally relevant pedagogy equates to urban success (Denbo & Beaulieu, 2002).

Annually, billions of dollars are invested into the education of America's youth. In 2007 alone, $553,000,000 was invested for this purpose. The average educational cost for elementary and secondary students per pupil was $9, 266 per year as reported by Kim (2008). Unfortunately, as spending for educational enrichment is on the rise, student academia is declining. It is incumbent upon today's researchers and educators to

contribute to the research efforts in developing solutions to not bridge, but eliminate the inequities which have lingered for decades. As stated by Seemann (2004), “teachers are expected to model innovation and foster an array of contemporary skills”. Learning occurs in a context, learning is active, learning is social and learning is reflective (Driscoll, 2002). According to Haberman (1991), The *Pedagogy of Poverty is* the regimented and rudimentary act of delivering instruction through a means which does not offer differentiated instruction or promote deep rooted learning or student interaction, does not support peer mentoring or other interventions known and is given with little to no variation. This form of instruction needs to be removed from our educational systems model of teaching. “Youngsters achieve neither minimum levels of life nor what they are capable of learning” through the employment of the *Pedagogy of Poverty* (Haberman, 1991).

The Brown vs the Board of education of Topeka, Kansas court decision was won in 1954. The argument of this case was that all students should be equally educated. To this day, the educational divide between African American and Whites continues to grow. As stated by Bainbridge & Lasley (2002), African Americans are three times more likely than whites to come from poor families. While there are many factors which are responsible for this saddened state of learning and production of mathematicians, scientists and educators; it must be pointed out that the declining family, ill-prepared teachers and deficient curriculum of urban students have helped to drag the academic status of urban America to its current state. According to the Programme for

International Student Achievement (PISA), an evaluation of 41 countries revealed that students aged 15 performed better than only 12 other nations scoring "significantly lower in mathematics achievement than the international average." A startling fact when over the next ten years, 2 million teachers will be required to educate our booming population (Wassdorp, 2008). Who will these new practitioners be? What will the classroom look like? Will teachers be better trained to deal with the behavioral differences and needs of this population? How and when will the masses be trained? Which pedagogies will be preferred and/or accepted for disseminating information to the technologically adapt "millennial" of tomorrow? While this dissertation cannot address all of these questions, research states that "successful functioning in mathematics requires a combination of knowledge processing and the application of skills."

Anyone that has ever participated in or analyzed gameplay can see instant parallels in the forgoing statement. Gameplay requires the experimentation or learning of a process or processes followed by the application of knowledge. Throughout gameplay, this iterative process continues. A good game captivates a person for hours… and a game infused with good math instruction will likely do the same with value and meaning lasting far beyond the classroom or gaming experience. However, to make this experience effective, many factors must be examined and understood. Producing a game of this magnitude, which adequately considers and captures the intended demographic and audience, demands that several factors and dilemmas be examined.

2a. Literature Review: Supporting Background Demographic Information

Therefore, in efforts to move closer to understanding how games , specifically *the Pledge* game, may assist in the learning process of the underserved urban population, the following have been considered: the brain and how it develops; child development; cognitive, social, environmental and emotional intricacies of the urban population aged 14-18; how urban students learn; and recent research conducted using serious games as a basis for understanding how to employ instructional design in serious games for the purpose of teaching algebra and data analysis concepts. Information gleaned from the literature and empirical research of gameplay will help to inform the design and build of the Pledge game and future emerging technology projects. Jump starting the mental engines of students that have turned off has proven to be extremely difficult for most.

Brain and child development

There are several factors which effect a child's attention span and ability to learn. Cases where students are unable to focus, seem angry and are unmotivated low achievers are likely attributed to malnutrition and a low protein diet. Development of a healthy brain and system makeup starts with attentive pre-natal care and continues through birth with proper nourishment. Just as proteins are crucial to the embryonic stages of brain development, the minerals --iodine, zinc and iron must be supplemented by diet to insure suitable cognitive development. Children suffering from iron deficiency (dopamine metabolism) which can turn into anemia, could develop problems with attention, perception, memory, motivation and motor control (Black, 2009).

To further understand the process of learning and childhood development, I reviewed Piaget's developmental theory. This theory was based upon a child's cognitive ability which increases with the aging process. Piaget, known for his model of child development and learning, listed four developmental steps in his theory. They are, the sensorimotor stage (birth-2years old), preoperational stage (age 2-7), concrete operations (7-11) and formal operations (11-15) stages. The brain, a very complex organ is one that learns and adjusts to patterns. As we use our brains and focus on various tasks, the neurons make certain connections creating memories, making recall easier at a later time (Seemann, 2004). This cognitive phenomenon makes it possible to apply what one has learned to new situations in effect abstraction and generalization.

In fact, the brain is an interesting organism which affords learning through many scenarios. Howard Gardner's multiple intelligences theory, ways in which people perceive information, was sparked by a brain research finding which revealed that damage to a portion of the brain would not necessarily render a person as unable to learn. In fact, learning could continue through other areas of the brain by means of the multiple intelligences. Gardner identified verbal –linguistic, logical-mathematical, visual-spacial, body-kinesthetic, musical-rhythmic, interpersonal and intrapersonal as the multiple intelligences. In the book *Intelligences Reframed: Multiple Intelligences for the 21st Century,* Gardner expanded the multiple intelligences to eight; adding naturalistic as the eighth sense (Rule & Lord, 2003).

There is no doubt that teaching the urban millennial is and will continue to be a challenging and at times laborious task. Addressing various learning styles, considering multiple intelligences teaching, mentoring and maintaining the academic interest of this population certainly requires crafty planning and engaging presentation. The following chart represents Gagne's "Nine Events Applied to Games" as presented by Becker (2005).

Event	**Descriptor**
Gaining attention (reception)	"attract mode," the set-up of the game
Informing learners of objectives (expectancy)	How to win the game.
Stimulating recall of prior learning (retrieval)	A keen storyline to tie things together and the use of accumulated knowledge and skills to continue through the levels of the game
Presenting the stimulus(selective perception)	The desire to play the game. The player must be drawn to the game for learning and engagement to occur.
Providing learning guidance (semantic encoding)	Built in guidance and cues of how the game is to be played typically without the need to consult a manual.
Event	**Descriptor**
Eliciting performance (responding)	Motivating game play which will activate learning
Providing feedback (reinforcement)	Scoring, heads up displays (HUDs), queries are examples of feedback. This is an important step to maintaining the interest of the learner.
Assessing performance (retrieval)	Assessing the progress of the learner and providing feedback as the learner moves through the game.
Enhancing retention and transfer (generalization)	Using knowledge and skills gained to navigate and move from level to level and the demonstration of these skills in other games

Could the theories of Gagne and Gardner be the catalyst of change in the world of Education whereby games are accepted as an intervention in the classroom? Becker (2005) certainly believes that this may be the key. Both Gagne and Gardner have made great contributions to the field of education and from what some are saying games as well. Learning games naturally align pedagogically to the ideas and concepts of Gagne and Gardener. It is no wonder that so many people are moving toward the development of learning games, serious games and intentional games.

Becker explains that an alignment of pedagogy and game design in consideration of Gagne's Condition of Learning (verbal information, intellectual skills, cognitive strategies, fine motor skills development and attitudes) and Garner's Theory of Multiple Intelligences will be one way to begin breaking down the barriers and reducing the hesitancy of the use of games for education. Becker quotes Gagne in saying "an instructional plan can generate both appropriate environmental stimuli and instructional interactions, thereby bringing about change in the cognitive structures and operations of the learner."

One such plan might include taking measures earlier in a child's educational process to prevent the lag in understanding which is vital to achievement in successive course work. Brahier (2005) believes that a remedy to eliminating the need for remediation is "early intervention," stating that it is important to present this baseline information as the brain matures and that remediation is more difficult to implement with successful measureable results as the child advances in developmental stages.

While there is much more that could be iterated here about the brain, its development and foundation of learning, it is also noted that learning theory is quite expansive. For that reason, select offerings have been outlined as this section of the paper has attempted to provide relevance and support in reviewing key components in the development of the brain, how a person learns in general and is intentionally brief. To delve too deeply would take attention from the purpose and focus of this section which is to provide baseline insight into the initial reasons why the vast majority of underserved urban students have problems learning in a traditional academic setting. To further uncover scenarios which effect this population, the next section will discuss the cognitive, social, environmental and emotional characteristics of underserved urban students' ages 14-18 which impact their ability to learn algebra. This section will be followed by a brief section on serious games research.

Cognitive, Social, environmental and emotional intricacies of the underserved urban population aged 14-18 and how this population learns

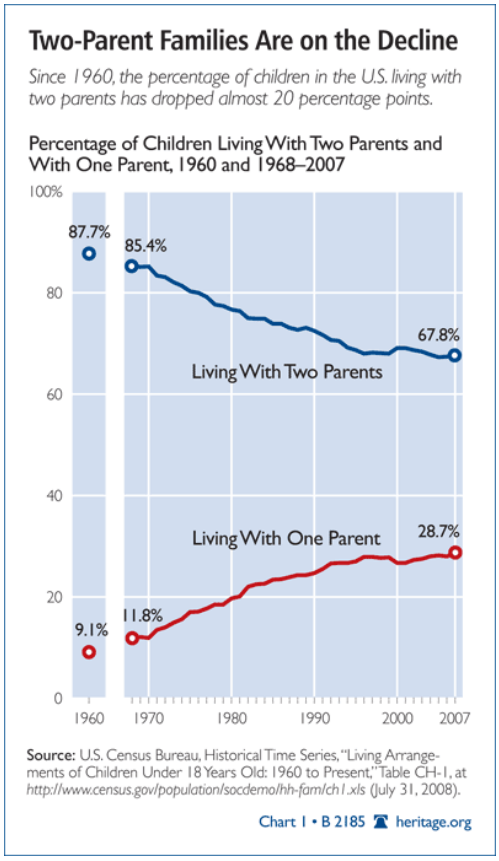
The purpose of this section is to provide background information on why the underserved urban population is a strong candidate for learning through games and simulations. In taking a look at how the typical underserved urban child is raised, it will become evident why they are in need of additional constructs to promote and support learning. Frequently, underserved urban students come from family environments which are not stable and are impoverished. While some families struggle to provide guidance, structure and meals, others provide little to none of these. It is this variance which continues to set the status quo of the apathetic student which exhibits low

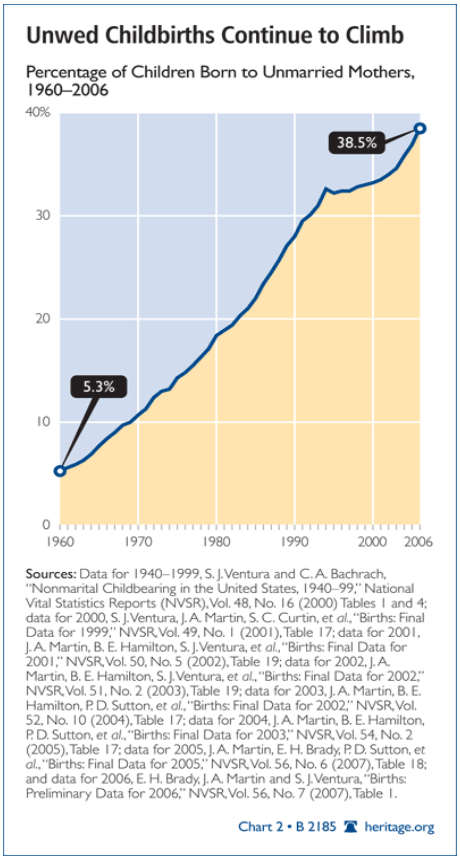
performance. As previously stated, good nutrition is a staple of cognitive development. Not yet stated is the ingestion of lead, usually from peeling paint in ill kept low income dwellings, and its adverse and debilitating lasting effects on lifelong learning. The over arching fact is that students, many of them, are not completing school or not completing with the skill and knowledge levels necessary to lead productive and intellectually advancing lives. For a population which has not met with success in school, serious games may help to supplement the learning and development process. The following sections support why most of these students are not successful and paint the picture for why the attraction and stimulus of serious games could help.

Family Structure

Family life and parental involvement in all facets of a child's life hugely impact the actions and abilities of a child. Children raised in homes with married biological parents typically possess a chance of developing better cognitively, emotionally, and behaviorally (Kim, 2008). According to family facts.org, in a study of three year olds, children born to continually married parents suffer fewer instances of depression, aggression, and anxiety than those born to mothers in a cohabitant living arrangement. During this study, the affects of the family's financial status was also observed. Socioeconomic Status (SES) has a significant impact in the academic success of the student says Rothman (2003). Stating that the students from low-income homes do not generally have the knowledge base necessary to support the subject matter taught in school. Rarely are their guardians able to assist with home assignments nor do they set

expectations for their child's academic success. The following charts provide research data collected on this matter by the University of Cincinnati, Center for Urban education in 2006.





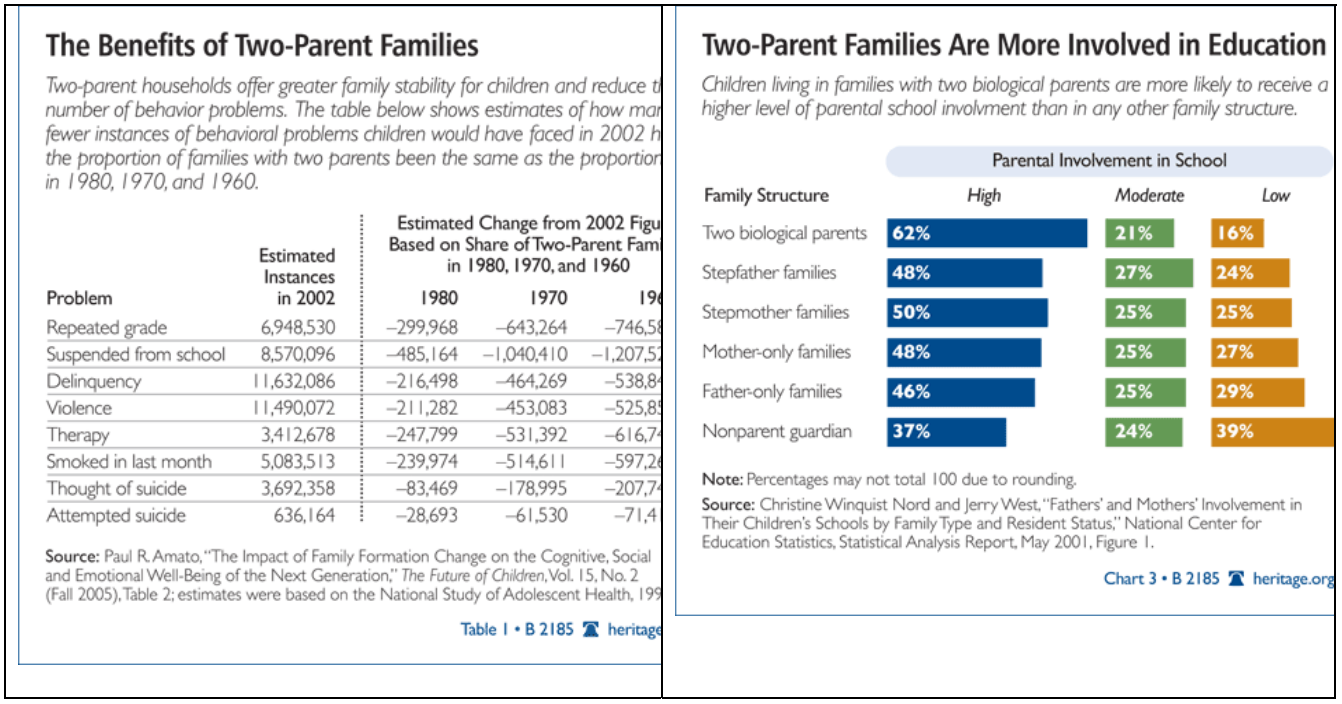
http://www.strivetogether.org/documents/roadmap_bibliography.pdf

Stemming from the fallout of the Great Society -- the War on Poverty, set in motion by the Johnson administration in 1964; black fathers found it necessary to leave their homes so their families would receive the services necessary for their survival. This action set the trend for single mother and unstable homes. This continues to be a challenge today. Changes from stable to fluctuating family structures over the past 40

years has fueled distraction in student behavioral and emotional status thereby adding to the increased failures and dropout rates.

> *In 2002, nearly 7 million children between the ages of 12 and 18 repeated one grade. Based on this figure, Professor Amato estimates that if the share of two parent families had remained unchanged between 1980 and 2002, some 300,000 fewer teens would have repeated a grade. Some 750,000 fewer students in 2002 would have repeated a grade if the share of two-parent families remained at the level it was in 1960.*

Kim (2008)



The Benefits of Two-Parent Families

Two-parent households offer greater family stability for children and reduce ti number of behavior problems. The table below shows estimates of how mar fewer instances of behavioral problems children would have faced in 2002 h the proportion of families with two parents been the same as the proportion in 1980, 1970, and 1960.

Problem	Estimated Instances in 2002	Estimated Change from 2002 Figu Based on Share of Two-Parent Fami in 1980, 1970, and 1960		
		1980	1970	196
Repeated grade	6,948,530	–299,968	–643,264	–746,58
Suspended from school	8,570,096	–485,164	–1,040,410	–1,207,52
Delinquency	11,632,086	–216,498	–464,269	–538,84
Violence	11,490,072	–211,282	–453,083	–525,85
Therapy	3,412,678	–247,799	–531,392	–616,74
Smoked in last month	5,083,513	–239,974	–514,611	–597,26
Thought of suicide	3,692,358	–83,469	–178,995	–207,74
Attempted suicide	636,164	–28,693	–61,530	–71,4

Source: Paul R. Amato, "The Impact of Family Formation Change on the Cognitive, Social and Emotional Well-Being of the Next Generation," *The Future of Children*, Vol. 15, No. 2 (Fall 2005), Table 2; estimates were based on the National Study of Adolescent Health, 199

Table 1 • B 2185 heritage

Two-Parent Families Are More Involved in Education

Children living in families with two biological parents are more likely to receive a higher level of parental school involvment than in any other family structure.

Note: Percentages may not total 100 due to rounding.

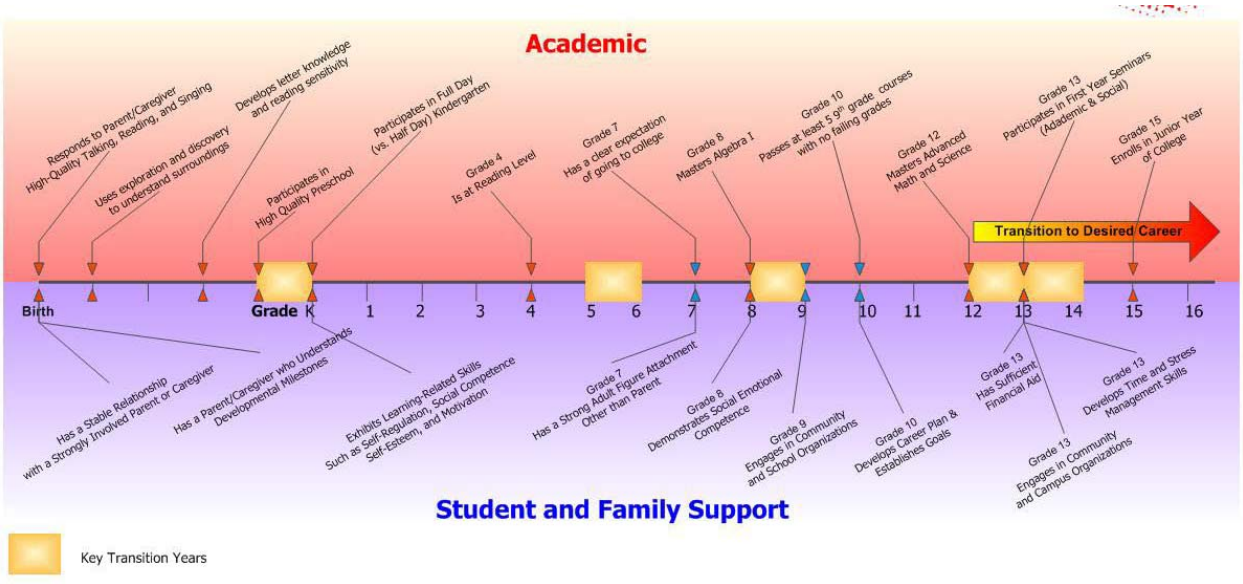
Source: Christine Winquist Nord and Jerry West, "Fathers' and Mothers' Involvement in Their Children's Schools by Family Type and Resident Status," National Center for Education Statistics, Statistical Analysis Report, May 2001, Figure 1.

Chart 3 • B 2185 heritage.org

Parent and Family Engagement

Children develop social behavior early and perform better when the parents are involved in these early developmental stages and continue throughout their school life.

Behaviors learned at an early age set habits in communication and social behavior as they age. Learning to share and play nicely sets a child on a course of more positive communication oppose to a negative discourse which results when the child is subjected to yelling, profanity and discourteous behavior. Early reading is an excellent means of promoting linguistics and vocabulary skills and a child's will to learn, attention span and behavior can be drastically improved through nurturing, positive feedback and reinforcement, and interactive involvement. Parents who volunteer at school, regularly check and review home assignments and class work, read to and with their children, otherwise engage in educational activities and support, and set and reinforce high expectations generally produce students which excel and outperform children who do not experience this type of stimulation.



Urban learning and algebraic concepts

Learning is social. The urban and undeserved population tends to need higher supports

for social, emotional and cognitive development according to Brown (2003). This population exhibits the need for relationships, structure and support to build confidence and the will to gain metacognition. Lacking math skills like collecting terms, clearing fractions, multiplication, division (Broussard, 1928), many urban students struggle with algebraic operations. As a result of these deficiencies, the students are slower to understand algebraic concepts resulting in low in-class participation, incomplete class and homework assignments and poor test grades. Because they are disengaged, they tend to display disruptive and inattentive behavior and have erratic attendance. Because the urban student is classified as a low achiever and possibly demonstrates emotional and behavioral problems, they are often targeted for special education and/or iterative remediation.

Trends in teaching urban students

School systems across the country struggle to hire and maintain highly-qualified effective urban teachers. According to Brown (2003) "the teacher turnover rate in urban schools is much higher than in the suburban school systems." The effective urban teacher must possess additional skills and will than those who teach in the typical traditional suburban classroom.

The lack of care, supervision, understanding, nurturing and attention were a few rearing staples Brown (2003) noted as void in the life of a typical urban student. Affective constructs must be put in place to capture and focus the learning journey of urban students. Urban teachers must be crafty in their delivery of instruction and composition

of the learning environment. The urban teacher must be willing to get to know each and every student. The urban teacher must be willing to customize learning and develop true relationships with his or her students to assist with academic gains. One teacher interviewed by Brown stated "you're here to teach kids—not subjects."

Harkness (2005), a member of the PRIME (Prompt Intervention in Mathematics Education) cohort, pointed out that "good teaching is the best intervention for all students." Culturally relevant pedagogy, relating material to the cultural connections of the students and not being concerned about what makes them feel good is important to developing higher levels of academia for students. As Kaput (2000) states, "school algebra has traditionally been taught and learned as a set of procedures disconnected both from other mathematical knowledge and students' real worlds". This approach has left decades of students wondering why they should learn algebra and how the time spent learning the subject matter will benefit their future.

Learning theories for mathematics

Learning is defined as "a change in knowledge and skills and enables new and different kinds of performance" (Lovett &Greenhouse, 2000). According to Horton (1959) there are several theories by which learning can occur. In his paper, he offers the following learning theories for math- - "conditioning (learning based upon repetitive practice and memorization), connectionism (learning based upon the implementation of prior knowledge and trial and error to solve a problem), and field and learning as reorganization (the learner evaluates the entire problem and systematically sequences

steps to solve the problem. Prior knowledge and experiences also influence the success rate in solving problems though this method). “Horton also goes on to describe several other processes involved in the path to understanding and learning math, they include: concept formation; memory versus higher mental processes; relational, symbolic and abstract thinking; problem solving; and a psychological basis for curriculum development.

Lovett & Greenhouse (2000) believe that learning is based upon two principal forces which need to be joined together to build and guide effective instruction-- education and psychology. They state five principles of learning, “derived from cognitive theory” as:

- Students learn best when they practice and perform on their own.
- Knowledge tends to be specific to the context in which it is learned.
- Learning is more efficient when students receive real-time feedback on errors.
- Learning involves integrating new knowledge with existing knowledge.
- Learning becomes less efficient as the mental load students carry increases.

Cummins theory is also discussed by Lovett &Greenhouse (2000) which states “that by comparing problems, students end up reflecting on the deep (rather than superficial) relationships between problems and develop a more generalized “schema” for how problems are solved.” According to Kaput (2000), traditional algebra continues to offer *artificial* problem solving tasks with little “opportunity to reflect on a student’s experience.” Memorization of procedures which the student only relates to as a string

of symbols does not support the student's ability to articulate how they arrived at the answer to a problem solving task. The result, is a student unable to neither reflect on nor see the relevance of his /her math education or the relevance math has to real life experiences.

Algebra is the springboard to higher mathematics and science (Kaput, 2000). All resources have agreed that new methods of teaching mathematics needs to be developed and deployed to assist in true learning and appreciation of math. Kaput (2000) suggest that the following outline be considered based upon what is already known:

- begin early (in part, by building on students' informal knowledge),
- integrate the learning of algebra with the learning of other subject matter (by extending and applying mathematical knowledge),
- include several different forms of algebraic thinking (by applying mathematical knowledge),
- build on students' naturally occurring linguistic and cognitive powers (encouraging them at the same time to reflect on what they learn and to articulate what they know), and encourage active learning (and the construction of relationships) that puts a premium on sense-making and understanding.

Instructional design process for developing effective mathematics content and interventions

Few pedagogical strategies have been addressed to facilitate the learning of mathematics. Caspersen & Bennedsen (2007) discuss the instructional design of a programming course and the concepts of *how people learn* needs to drive pedagogical methods. It is also noted that textbooks provide a static approach to problem solving,

providing little to no support in assisting the student with producing the correct answer. Three learning theories presented by these researchers in consideration of their instructional design model which is based upon the human cognitive architecture are :

- cognitive load theory (the efficient use of "*working memory"* while allowing *"schemas"* to be produced),
- cognitive apprenticeship (observation ,
- re-enactment of tasks and teacher guided practice)

These researchers have also taken a strong look at the following principle techniques: work samples (examples/models/samples of a problem/situation for a student to review or study to gain a clearer understanding of how to solve a problem), scaffolding (*support* provided by the instructor to assist a student in completing a task), faded guidance (the act of providing less and less support to the student as time goes on allowing the student grow and take on more responsibility), cognitive apprenticeship (affords the students the ability to "practice and interact" with the instructor while solving a problem) and emphasis of patterns to aid schema creation and improve learning because they are believed to provide a richer understanding of the subject matter.

Chipperfield (2004) explains that working memory can retain up to seven units of information and can be extended if information is reorganized through "chunking and recoding" thus creating a schema. Schemas, memory structures which allow us to process large bits of information as one (Caspersen & Bennedsen (2007)), by definition can compact the information for continual information intake. Cognitive load is divided

into three types, intrinsic cognitive load *(I)* (relates to addressing the task at hand and pulls on the working memory); extrinsic cognitive load *(E)* (extraneous cognitive load refers to external distractions which do not support learning, but rather drain working memory); and germane cognitive load *(G)* ("a non-intrinsic cognitive load which contributes to learning and supports schema acquisition" the act of moving from a beginning level of understanding to a more advanced level of understanding)(Chipperfield, 2004; Caspersen & Bennedsen, 2007).

Where the concepts of mathematical learning theories and the instructional design process are well noted, consistency in the delivery of instruction in school systems across the United States is a concern. This consistency dictate the successes of *ALL* students. *The No Child Left Behind Act* has interceded but supports the skill and drill, meet the requirements for the next test mode. Seemingly, the elite inner city schools receive challenging curriculum while the neighborhood schools receive watered down curriculum which barely meets the need of basic competency and skill building. Thus, this demographic is deprived of the robust curriculum to which they should also have access.

However, if someone were to develop a systematic approach which guaranteed that all students had the same accessibility to high quality curriculum and instruction, decades of inequitable educational practices would be brought to an end. The infusion of these concepts into a medium -- video games -- which consistently delivers instruction regardless of socioeconomic status, gender, or ethnicity is one which could net the

largest gains in knowledge obtainment and a progressive movement toward more stable learning and career preparation. The concluding portion of this section takes a look at Gee's (2004) concepts and how this may be possible.

Addressing the Educational Needs of the Underserved Urban Population

As previously stated, the purpose of this section, 2a, was to provide supportive and background information for the target audience and demographic of this project ,the underserved urban population, as well as learning theory for how math concepts should be taught and learned. This target audience and demographic represent an *affinity group*. An *affinity group*, according to Gee(2004), has a certain way of thinking, acting, interacting, valuing and believing. This group, as with any other group, has its own social practices, code and understandings which is considered a *semiotic domain*. Semiotic domains according to Gee refer to "a set of practices that recruits one or more modalities to communicate different types of meanings". Video games are, according to Gee, a type of semiotic domain, each genre acting as a specific type of semiotic domain. Learning through semiotic domains invokes active learning where the student are forced to experience the world in new ways, form new affiliations, prepare them themselves for future learning and to be able to think critically about what has been learned and experienced, thus enabling the learner to use this new information in a new and profound manner.

The underserved urban population's interpretation of situations, text and ways of life are based upon what they have defined or have come to except and recognize as their way of life and learning. Their ways of thinking is the point, concern and focus of this entire project. This population is in desperate need of reeducation and constructs to remove the defeated attitude.

In reading the book entitled *What Video Games Have To Teach Us About Learning and Literacy* by James Gee (2004), he discusses literacy and thinking as not necessarily a "mental" experience but rather a "social one". Stating that the context or glossary that one is referring to or the state of mind one is in is what will give meaning to information. It is the environment if you will, that will color the information and means by which one understands and interpolates the context that they are reading or the situation they are observing. Gee goes on to state that as someone aligns themself with certain social groups, it is the experiences of a social group which influence their thought patterns and interpretations about certain things. This association also dictates their behavior and beliefs. In considering how one thinks and the cognitive connections of inquiry, deep learning and conceptual understanding, less of this type of learning occurs in today's classrooms as the drive to pass tests is at the helm of instruction and is the Captain of measurable learning. In his personal recount of gameplay, observation and interaction, Gee discusses the intense learning which takes place. To play the game one has to learn the game. To learn the game one has to figure things out, learn and apply knowledge. These are things that should occur in the classroom but in general is not happening with

the frequency necessary to develop lifelong learning. However, in using game development as a semiotic domain, these concepts of learning, abstraction and generalization could be realized. Video games typically require a person to stay on task for hours. How many hours will the unmotivated student spend studying a ditto or reading a book? Where is the challenge and motivation to attract the student to this mode of learning? Where is the inquiry and curiosity needed to build that deep learning that cognitive science speaks to? As stated by Gee, "What we are really looking for is … the theory of learning built into good video games".

Video games allow the learner to build identity and learn within a social environment which allows them to project themselves onto characters to which they can relate to. Through gameplay, social attitudes can be adjusted… life skills can be taught an learned….and lost learners can be recaptured and redirected to lifelong successes rather than the continued streak of failures, death and/or incarceration.

> If the principles of learning in good video games *are* good, then better theories of learning are embedded in the video games many children in elementary particularly in high school play than in the schools they attend. Furthermore, the theory of learning in good video games fits better with the modern high-tech, global world today's children and teenagers live in than do the theories (and practices) of learning that they see in school.
>
> Gee(2004).

Situated cognition ("thinking tied to a body that has experiences in the world"), New Literacy Studies (argues that reading and writing is not only mental but learning as attached to the social and cultural practices with economic, historical and political implications) and connectionism (argues that humans tend to generalize best based upon information rooted in experience not abstract logic) are all concepts which can be learned through the medium of video games.

Gee states that video games will not replace books, but suggests that video games might share the same shelf where people can choose which medium they will appropriate to support their learning and understanding of subject matter. Gee refers to video games as "a new art form " which will find their place in society.

2b. Literature Review: Education through Games and Simulations

As we move toward classroom 2.0, we must consider the effects of cognitive overload relative to intervention design. Dual coding and the contiguity effect must be considerate of not only how material is presented, but what is presented and in what combination. Failure to consider the effects of this combination could transform a potentially prescriptive intervention into an ineffective and useless one.

Recent research conducted using serious games as a basis for understanding how to employ instructional design in serious games for the purpose of teaching algebra and data analysis concepts

"Serious games are designed with the intention of improving some specific aspect of learning, and players come to serious games with that expectation (Derryberry, 2007)."

In consideration of the foregoing literature review which outlined the background of underserved urban students, a primary vehicle in moving the urban population to a higher level of academic acceptance and learning could be the very tools that many school districts and teachers try to restrict or ignore. It is certain that games and simulation will not, at least not at this point, replace teachers; but they can certainly enhance education and gain the attention of the urban millennial that most systems have apparently hopelessly lost. Through the employment of such robust interventions, educational systems across the world might win back a large population that they have lost. There is no doubt that the humanistic interaction should never be removed, but a more regimented and consistent formula of teaching must be introduced. Typically one which will consistently deliver the level of education today's student requires and will affectionately appropriate.

Teaching Algebra Using Culturally Relevant Virtual Instructors

A study conducted by Gilbert et al in 2008 researching "Teaching Algebra Using Culturally Relevant Virtual Instructors" focused on the use of ethnomathematics (the

use of a culturally based math curriculum). After determining that games were a match for the African American demographic, based upon statistics and empirical observation, African American distributed Multiple Learning Styles System (AADMLSS) City Scroll was completed. Developed for the purpose of supplementing the classroom teacher's pedagogical delivery, the project (system) addressed learning styles particular to culture and the pedagogical environment utilizing animation technology to provide a game-like experience. A learning system, AADMLSS "uses case-based reasoning to personalize instruction via adaptive instruction (Gilbert et al, 2007)". The AADMLSS systems provide access to several instructors per student, thereby giving them access to multiple types of pedagogy from one platform. They consider this a "Many to one or M-1 format". The game includes familiar surroundings, in this case based upon a Chicago neighborhood that the student might find in their culture. The environment included "murals, candy stores, and rap".

The game also included Speech Application Language Tags (SALT), Artificial Intelligence Markup Language (AIML) and SitePal characters. Coaching agents were assigned cognitive abilities to assist in understanding language and terminology. Initiating the game by entering their name, the students progress into the game to meet Malik. "Malik is the virtual representation of the student in the game". The student sees a culturally relative environment as they explore the 3D space.

An algebra lesson is composed of three components –Instruction (interaction through sound and rap which gives the students the opportunity to answer their questions

through the art form of Rap), Practice (interaction through voice recognition and tutor guides to solve math problems) and Assessment (a computer based or pencil and paper assessment with a pass/fail threshold of 80% "based upon Mastery of Learning Theory"). These types of progressive interactions assist in moving the student from what is comfortable and familiar to what is the tested societal norm. The first of the components (Instruction) involves entering the store where a linear equation must be solved. The student (Malik) presents the answer in the form of a rap. Through the assessment component, if the student's score is "below the threshold," the student will repeat the section again utilizing a different pedagogical agent thereby adjusting to the students learning style and utilizing he M-1 instructional model. This process is repeated throughout the world until all areas have been completed. The student has the ability to "pause and repeat the animation as needed".

Though the student participants reported that the AADMLSS system aided them in learning more about algebra, the researchers say that "this finding should be taken cautiously because the participants, Juniors and Seniors, had already taken Algebra 1". Overall, the students thought the format, especially the raps, was a good way of teaching. The raps really helped them to remember the information. The researchers found this tool to be a relevant means of connecting culturally with the students and report that "*it is clear that culture influences learning style. There is a direct correlation between culturally relevant teaching and an increase in the achievement of students that benefit from this type of teaching".*

Presentation can be the determining factor of success and failure. Tabula Digita (TD) has found its niche in presenting pre-algebra and algebra content to inner city students through its DimensionM video game series. More about this company, Maryland Public Televisions *Lure of the Labyrinth* and Nicaud, Bouhineau, Varlet & Nguen-Xuan (1999) Interactive Learning Environments (ILE) research can be found in chapter two of this paper where I compare the learning of algebra through game programming to the learning of algebra through gameplay.

While private industry and the military have been utilizing this intervention for years, it is not surprising that a major employer of teens has turned to this vehicle of games to attract and teach today's workforce. Companies like McDonalds recognize the importance of training its workers through the process and utilization of serious games. In as much, McDonalds uses this tool to train its workers in customer service, store operations and employee supervision (Derryberry, 2007). Who might their workforce be? More than likely a good percentage fall into the demographic *The Pledge* game intends to reach.

Whether it be a Virtual Instructor (VI) introduced by Doswell & Harmeyer (2007) discussing the interest in pairing serious games assigning a virtual 3D character as the pedagogical agent to guide fun and learning; an augmented reality (AR) which allows objects to be added to real environments; virtual reality (VR) which is a simulation of a real world or virtual world which can be interactively explored; mobile augmented reality system (MARS) linked by wireless networks affording the user the ability to move

about free and interact with other users; context aware-augmented reality system (CAARS), where goggles which contain a video camera and is capable of transmitting and presenting information to assist participants with various tasks including learning and game based information as required, or a game as simple as the "Pledge", the marriage of these concepts could be the catalyst in change for instructing underserved populations.

3. The Pledges Game: A Proposed Educational Intervention

Purpose and objective of The Pledges

An adventurous game of a fraternity kidnapping mystery set on a Historically Black College and University (HBCU) campus; the overall expectation is that a bridge between academia and entertainment will be obtained. The intended demographic and audience of this project is underserved urban students aged 14-18 and a subset of this population which has either dropped out or has fallen into the percentile of students meeting with less success than desired in any school system. In attempts to create and provide a stimulus for critical and deductive thinking, it is hoped that the engagement, enjoyment and applied principles of math and science necessary to move through the various levels of the game will establish, or in fact rekindle, academic interests which may have been lost through advancing years of middle school and secondary school tutelage. Lagging academic success is a phenomenon evidenced through research which reports that urban students continue to meet with challenges which affect their ability and will to excel in school. These effects are now spilling over onto the college campuses. Students

are displaying a reduced level of quality in reading and writing, using emoticons in their writing and spending less time studying while expecting to receive high marks for completing a minimal amount of work. These same students invest more energy into their social activities than their academic advancement. Reports across the country reflect the push to implement an intervention or interventions to recapture this growing population. Developing an effective means of education for this massive population is imperative as the numbers of failures and dropouts grow and the graduation rates continue to decline on both the secondary and post-secondary level.

How might the Pledges Game extend prior research and make an impact on the underserved urban population?

The Pledges game expects to extend prior serious games research and projects by providing a preview of college life. Most teens have seen the movie "Stomp the Yard". Though this game is not intended to be a video game of that particular movie, it does resemble many activities portrayed. Putting the player into an environment which captivates them through familiarity and curiosity, the game promotes responsibility, commitment and applied knowledge. Game interaction requires the player to apply data analysis and algebra concepts to solve problems and make key decisions in steps to finding their mysteriously disappearing big brothers. The successful student, through gameplay, will experience problem solving as it relates to everyday life; take a glimpse at what it means to pledge a fraternity, learn about Historically Black Colleges and Universities (HBCU) and Black Greek Letter Organizations (BGLO) – including aspects of

service and mentoring, social and professional advancement; experience the primary reasons most people fail to complete college; and develop a stronger understanding and appreciation for data analysis and algebra.

Because this game not only addresses a serious problem in the deficit of learning in this audience but the next logical steps in these young people's lives as well; The Pledges opens avenues for students to think more wisely about their future whether it be the college they may attend, careers they may enter into or how their decisions directly affect the outcome of their future. The Pledges game is full of rewards and traps for making the right or wrong decisions. Where most students are not aware of college or do not believe that they will attend college; this game provides a glimpse at what some feel is improbable. Another source which is opening the eyes of youngsters as to what they can do is the Ben Carson project. Though this source falls outside of the serious games arena, it does address an overarching problem found throughout my research regarding literacy. While The Pledges game focus is Algebra, literacy was a constant named as a down fall of many students and their ability to excel in math and school in general. Additionally, this project reaches out to students at an early age and plants the seed that college is not only something that they should do, but something that is accessible.

Clearly, the preparation for college starts long before the completion of high school. Thanks to people like Ben Carson, MD, and his Ben Carson Reading Project, over 40 reading rooms have been opened across the country providing a safe place for students,

community and educators to read together. In 1994, Carson and his wife initiated the Carson Scholars Fund awarding students in grades 4-11 with $1000 scholarships to students who achieve academic excellence and demonstrate commitment to their community. Students like these are taking a look at college as early as elementary and middle school because they are being guided in the right direction and are receiving the nurturing support they need to be successful. Likewise, serious games like *The Pledge* not only provide opportunities to recapture a stumbling population, but prepare them for the next steps of life. Metcognition is detrimental to their success and well being. As technology continues to evolve, introducing a continuing change and state of flux; job security is nonexistent. These students will have to learn to develop the ability to adapt and overcome their issues on several continuing levels. To do this, they will have to become lifelong learners, learning to make decisions and learning to build healthy relationships.

The Pledges game helps to open the door of decision making while supporting the use of a much needed academic tool—Algebra and Data Analysis. The introduction of life on an HBCU campus and the personal level of decision making required to be successful college students all make for a powerful serious game of learning.

How was the Pledges Game Designed?

To develop a product which is appealing to the audience and demographics of the project as well as address concerns similar or the same as the target population, a

student production/research team was paramount. To insure the consistency and success of the game two teams where developed.

- Team one, the game production team was composed of students who had obtained some mastery in game design skills such as spriters, level designers, programmers and storywriters. These students where interviewed for the purpose of building a team which would assist with the building of the game. As the game is intended for an underserved urban population and audience aged 14-18, the average age is expected to be no more than the mean target age group.
- The second team was the grounding team. The purpose of this team was to continue to identify and inform the project manager and production team of difficulties found in struggling algebra students. This process was expected to be guided by a written survey-based questionnaire. This team would survey math teachers and students to identify immediate areas of difficulty to localize the complexities pertinent to the research school.

The selection of the student participatory group was based upon the following criteria:

- Skillsets
- Interest in the project
- Letters of recommendation from teachers and administration
- HSA Test scores

How does The Pledge game align to mathematical standards?

According to the High School Assessment Field Test report, students need additional supports in several concepts including writing equations to model a situation or to represent a pattern, using a table of a linear function to find the y-intercept of the equation, using two points from a graph to determine the slope of a line, interpreting

the slope of and y-intersect of lines in the context of a problem, reading and understanding box and whisker plots. The following table shows how *The Pledge* game will incorporate several of these concepts throughout gameplay.

Game Section	Standard	Assessment Limit
Woods Scene Finding the Library as the location for the next ckue	**1.1 The student will analyze a wide variety of patterns and functional relationships using the language of mathematics and appropriate technology.** **1.1.1 The student will recognize, describe and/or extend patterns and functional relationships that are expressed numerically, algebraically, and/or geometrically.** **1.1.3 The student will apply addition, subtraction, multiplication, and/or division of algebraic expressions to mathematical and real-world problems.** 1.1.3.1 The student will add, subtract, and multiply polynomials.	Quadratic Equations/2nd degree polynomial Equation/Binomial Equation $Y=x^2 + c$ ➢ The algebraic expression is a polynomial in one variable.
The player will plot the next clue on a graph to identify what the next location is to finds the clue piece. This will single lines as well as intersecting lines.	**1.2.3 The student will solve and describe using numbers, symbols, and/or graphs if and where two straight lines intersect**. ➢ give the meaning of the point of intersection in the context of the problem ➢ graph the system, determine the solution and interpret the solution in the context of the problem ➢ use slope to recognize the relationship between parallel lines. ➢	Ax + By = C, Ax + By + C = 0, or y = mx + b.

Game Section	Standard	Assessment Limit
The Woods clue to locating the library	**1.2.5 The student will apply formulas and/or use matrices (arrays of numbers) to solve real-world problems.** ➢ Given a formula, students will substitute values, solve, and interpret solutions in the context of a problem.	➢ Formulas will be provided in the problem or on the reference sheet. ➢ Formulas may express linear or non-linear relationships. ➢ The students will be expected to solve for first degree variables only.
Using patterns and the box and whisker plot the player will predicting which brothers will be abducted?	**3.1 The student will collect, organize, analyze, and present data.** 3.1.2 The student will use the measures of central tendency and/or variability to make informed conclusions.	➢ Measures of central tendency include mean, median, and mode. ➢ Data may be displayed in a variety of representations, which may include: frequency tables, box and whisker plots, and other displays.
Using the resulting information from the above the player will predict the order of abduction in attempts to foil the abduction.	3.1.3 The student will calculate theoretical probability or use simulations or statistical inferences from data to estimate the probability of an event. ➢ Using given data, the student determines the experimental probability of an event.	

Algebra skills in order of difficulty of mastery are fractional equations, formulae, quadratic equations, simultaneous equations, substitution, reasoning, radicals, subtraction, factoring, simple equations, exponents, parenthesis, expansion, collecting terms, clearing fractions, multiplication and division according to Broussard (1928). As the choice of content, presentation and measurability of true learning and transfer will be the deciding factor of repeatability and curriculum adoption, the curricular content included in the game was based upon available data relative to HSA 's and the Maryland

Algebra 1 curriculum. For the purposes of the prototype, the follow concepts were incorporated. The decision to include these concepts was largely based upon discussions held with high school mathematics department heads, teachers and students as well as the Mathematics High school Field Test report (http://mdk12.org/instruction/curriculum/hsa/algebra/field_tests.html).

4. Conclusion

Essentially, for those that were not born with the gift of wanting to learn, serious games may be the answer for them. For those that may suffer from malnutrition and vitamin deficiency, serious games may be the caveat for them, for those that have ingested lead and cannot keep still and display disruptive behavior which most would consider unacceptable classroom decorum, perhaps serious games may be the magic key for them. As a part of the Integrated Disabilities Education Awareness program (IDEA), special education students must be taught in the least restricted learning environment. Serious games may assist with their needs as well. Whether serious games are used because students of today have become accustom to iPods, cell phones, PC games, console games, etc… or because their learning style demands a more engaging presentation of content, serious games is an intervention with which students may appropriate.

21st century learning experiences should reflect the needs and lives of 21st century learners (Derryberry, 2007). Many researchers have pointed to culturally relevant

pedagogy as a means to reaching the urban student. If the students are expected to abstract and generalize information, they need to start with familiar surroundings. As they make connections, information may be presented from differing perspectives with greater successes. Games are one way to captivate this audience. Making connections through visuals, music and activities that are familiar will make them want to learn. As with any other game, the students will enter a "flow state" and not want to move through their scheduled day. Each class should provide relevant intrinsic situated learned constructs for them. It is through these connections and the use of inherent scaffolding and faded guidance that we can not only better prepare the students for the HSAs and SAT's but life as well.

Chapter Two: Game Programming versus Gameplay

Introduction

Historically, as students move through school, few have seen the relevance in learning Algebra. Though used on a daily basis, there is little to no correlation to the perceived value of Algebra, the gate keeper of higher math and everyday problem solving. This continues to present a staggering problem which many have attempted to address as the United States continues to slide in the number of mathematicians, scientists and of late, qualified teachers it is producing. In keeping with math, Algebra specifically, a subject with which most struggle; it is hoped that the implementation of learning through activity (Simon) or learning by doing (Aldrich) will be the stimulus needed to trigger a change in how people are taught and subsequently, learn.

Dynamic systems, not static text, are the wave of current and future learning according to Hertz. The static pages of a book neither capture nor stimulate the majority of today's youth. Games allow you to expand your thinking providing environments similar to a holo-deck which allows one to learn about and experiment with concepts we may otherwise only dream of. As stated by Prensky, "simulations and games bring dreams to life". Gameplay promotes the will and want of students to take charge of and in most instances show off their talents demonstrating that they are smart where classrooms tend to hinder this process. Social interactions become more animated through gaming.

People learn better while playing games because they are immersed in the environmental context of the content of the game.

Some liken this type of learning to learning a new culture (Gee, 2004). Your immersion in the actual culture will net a much richer result than learning about it in a book. Gameplay simulates learning through several events and problem solving requirements if you will; making decisions, thinking critically, reflecting on their actions and making choices while responding and reacting to a program -- their teacher.

In working with game development, the students learn on a more academic level utilizing

the raw components of math, logic and programming syntax to develop games and simulations.

In learning through gameplay, the students learning is based upon the intentional placement of components which are embedded in a transparent manner. Whether the player intentionally or unintentionally solves math problems, employs math concepts and principles and critical thinking, learning is taking place. While learning algebra through the art and science of game programming may be considered a more academic approach by some, both game programming and learning through gameplay allow the learner to be participants of “Stealth Education”. According to Huffaker & Calvert (2003), “Stealth Education” is evidenced when “children are actively engaged in a seamless entertaining learning application”. As such, both approaches allow students to not only learn in the classroom, but outside of the classroom as well. With today’s

generation, we have to adapt to and provide an anytime- anywhere transfer of information (Huffaker & Calvert, 2003).

In this paper we will discuss how learning takes place regardless of whether the student is learning through the process of programming a game or playing a game. We will also examine mathematical skills typically learned through both programming and ludology as well as the impact of these game interventions on cognitive load, abstraction, transfer and generalization and their ability to create schemas.

Game Programming

As millennial students demands a different type of learning experience, these students will gain a clearer understanding of algebraic concepts and demonstrate the ability to abstract and generalize through the use of game programming. Game programming, an innovative means of imparting knowledge, introduces opportunities for more efficient facilitation and adaptations to learning styles and one-on-one support as well as differentiated and varied instruction. If taught algebra using game programming and conceptual analysis, the student may be better enabled to relate mathematical concepts to real life situations. This type of situational learning will assist the students with maneuvering through and understanding the purposeful uses of algebra. An example of constructivism at its best; game programming is, according to Forester, “a motivating power of relevant and authentic learning harnessed in a setting where:

- Students largely select their own goals
- Students largely self motivate and self assess
- Collaboration and mentoring arise naturally
- The teacher has a major role in assisting the development of metacognitive skills ("students monitor their mastery of skills and their comprehension, implementation strategies to improve learning," Huffaker & Calvert (2003))
- Cross curriculum learning arises naturally through programming, story line, music, art
  and the mathematics content of games
- Through creating a game to be played by others, students become aware of their social relationships with their audience"

Game programming, an intriguing yet complex proposition, is all about relationships. Game programming, because of its inherent nature and parallels to math, provides a concrete basis for the learner to relate to, learn and employ simple to intricate math concepts. Students finding it difficult to understand abstract mathematics, according to Witzel & Millers' (2003) need to learn the concepts through a method of concrete-to-representational-to- abstract (CRA) means. Witzel & Millers' (2003) process of developing students' knowledge through CRA is explained as allowing "a student to use manipulative objects to display and solve math problems. Once the student understands a topic concretely, they work with the same concept using a pictorial representation". Fortunately, the very nature of programming affords students the

opportunity, almost immediately, to relate subject matter to something more concrete bringing instant understanding and feedback to the equation of learning. One can literally see the relationships and connection from one principle to the next as the product evolves while principles and concepts are applied. Learning through game programming directly relates to Witzel & Millers, 2003 concept of CRA.

Though it may be easy to see why the visual representation and transition through the use of CRA might facilitate the students deeper understanding of algebra, the manner in which the mathematical concepts are taught and learned through game programming and ultimately used in the production (programming) of a game may not be quite so apparent. Specifically, how is information for a unit on slopes presented in the gaming/algebra classroom? What would this information look like in game code and how would this representation be implemented or reflected in gameplay? game design? Would these concepts learned be evidenced in an assessment of algebraic learning through game programming?

Learning and using Algebra through Game Programming

In this section of the paper we will discuss how algebra is learned and used to produce games. Steps in learning algebra and higher maths through game programming typically begin with various basic logic, mathematical and scientific concepts such as Cartesian plane, ordered pair, slope and vectors (position, distance, speed) and physics (acceleration, velocity, gravity). Analysis also plays a large part in programming and it is

not uncommon for the student to study and dissect someone else's code to further understand how to build components or understand a concept, emulate and solve situational problems which provide insight into building and applying code for new applications. As the students employ critical thinking, analysis, programming skills and concepts, they are calling upon algebra, geometry, calculus and trigonometry which enable the students to program object movement, draw to the screen and solve many other complex problems.

A warm up exercise to ensure math curriculum connectivity might include the following types of motivational prompts to get the students thinking about math as it applies to game programming.

1. The students will plot two enemies on the line and identifying the slope of the line.
2. Using mental imagery, visualize the game programming concepts involved in moving characters on the game screen as compared to plotting coordinates on a grid.
3. The students will solve for the slope of the characters as they move up and down the screen.
4. The students will repeat the same mental imagery process, while solving for the slope on the traditional grid.
5. Using the exercises above, the students will write traditional equations to solving for the slope of a line, transferring the knowledge of plotting game characters on

a game screen to plotting coordinates and solving for the slope on a Coordinate plane.

6. The student will both demonstrate in written and oral form these concepts to insure that mastery has been obtained.

These types of problems interjected throughout the learning process will insure that the students are learning lessons relative to math while learning and practicing the computer science concepts of game programming.

Following are samples of comparative lessons and programming concepts which a programming student may encounter through the process of programming a game using XNA and C#.

Algebraic concepts	Game Programming	Code explanations
Numbers Use of variables	*Health* *//this code would be placed in the main game class //to declare your variables* SpriteBatch mBatch; Texture2D mHealthBar; int mCurrentHealth = 100; *//this code would be placed in the update method* //Get the current keyboard state (which //keys are //currently pressed and released) KeyboardState mKeys = Keyboard.GetState(); //If the Up Arrow is pressed, increase the //Health bar if (mKeys.IsKeyDown(Keys.Up) == true) { mCurrentHealth += 1; } //If the Down Arrowis pressed, decrease	Comment Variable declarations and assignments Comments Variable declaration Comments Conditional/Testing statement Assignment

	the //Health bar if (mKeys.IsKeyDown(Keys.Down) == true) { mCurrentHealth -= 1; } //Force the health to remain between 0 and 100 mCurrentHealth = (int)MathHelper.Clamp(mCurrentHealth, 0, 100); base.Update(gameTime); *//this code would be added to the draw method* mBatch.Begin(); //Draw the health for the health bar mBatch.Draw(mHealthBar, new Rectangle(this.Window.ClientBounds.Width / 2 - mHealthBar.Width / 2,30, mHealthBar.Width, 44), new Rectangle(0, 45, mHealthBar.Width, 44), Color.Red); //Draw the box around the health barmBatch.Draw(mHealthBar, new Rectangle(this.Window.ClientBounds.Width / 2 - mHealthBar.Width / 2,30, mHealthBar.Width, 44), new Rectangle(0, 0, mHealthBar.Width, 44), Color.White); mBatch.End();	Comments Conditional/Testing statement Assignment Comments Use of integers to code the display of health values based upon the game timer Calling a function Utilizing division and coordinate pair to set the width and location of the health bar Using code to draw a primitive, set location and size
Algebraic concepts	Game Programming	Code explanations
Cartesian Plane	Basically a rectangle, the Cartesian plane represents the area, or space, in which the game takes place. Integers are used to identify position, direction and acceleration. Visual representations of this have been included below	

Algebraic concepts	Game Programming	Code explanations
Vectors	Linear algebra the study of vectors is very important to game programmers as vectors store position, direction and velocity. A vector is just a coordinate. It takes on a definitive meaning when placed in a context. Vectors can be added, subtracted or multiplied and are useful in physics development for games. Examples of equations used in vector math 1. Adding Vectors (0,1,4)+(3.-2,5) = (0+3, 1-2,4+5)=(3,-1,9) 2. Subtracting Vectors (4,3)-(1,2) = (4-1, 3-2) = 2 3. Multiplying Vectors using a scaler (single number) Calculating air resistance 0.9*(10,20) = (0.9*10, 0.9*20) = (9, 18)	
Measurement, Chance and data Equalities and inequalities	*For Loops* for (int i=1, i=>5 , i--){ } for (i = 1; i <= 10; i += 2) { // ... } Random()	Assigns an integer which can be leveraged in a conditional situation.

Fun with Physics

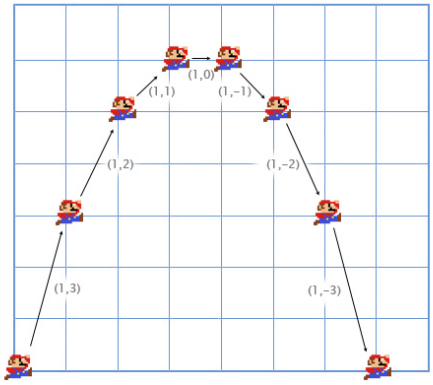
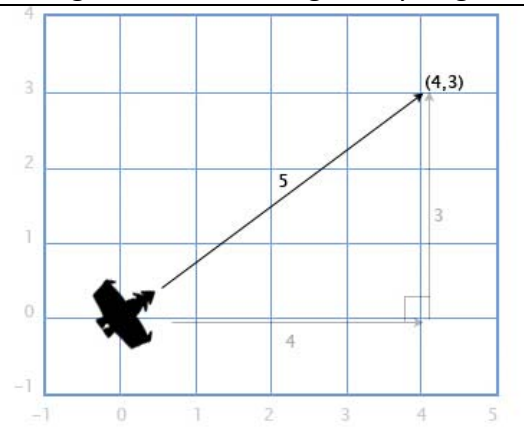


Fig 2 http://blog.wolfire.com/2009/07/linear-algebra-for-game-developers-part-1/

In this example of Mario, we can see that he is jumping and landing. Questions raised through the analysis of this process may include:

1. What is the rate of his acceleration?
2. How high is he jumping?
3. What is deceleration? (How is gravity, as a variable, affecting this rate of change?)
4. What scientific method does this process represent?

Solving for distance using the Pythagorean Theorem

 http://blog.wolfire.com/2009/07/linear-algebra-for-game-developers-part-2/	A ship has a velocity vector of (4,3). To Identifying how fast it is going we would use the Pythagorean Theorem. Think of V as a right triangle with sides 4 and 3, and use the Pythagorean Theorem to find the hypotenuse: $x^2+y^2=h^2$. This is the length of a vector H with components (x,y) as the sqrt(x^2+y^2). Use the formula: $\|V\|=sqrt(4^2+3^2)=sqrt(25)=5$ To calculate the speed of the ship. The speed of our ship in this case is 5

Through these experiences, the students are able to take a more in-depth look at how mathematics relates to the sequencing of events and concepts of game programming which make up the inner workings or the brain of games and simulations. Teaching algebra by means of the computer science of game programming will allow students to create schemas and reduce cognitive overload through the use of relational concepts, real life interest and environmental stimulation. Additionally, the use of Stealth Education enables the student to develop metacognitively. This learning to learn approach facilitates, guides and builds lifelong learning.

> *Student's goals influence what they attend to. Their activity and reflection afford them a way to extend current conceptions and create new ones. Teacher understanding of learning through activity can contribute to affective selection, sequencing, and modification of mathematical tasks.*

Simon (2006)

> *A strength in programming is that the "conjecture, formulation, solution' cycle is very short. The reason why computer programming is so engaging, and it is very engaging, is this short development cycle. The short development keeps the learner in an almost constant state of cognition conflict. This is a state of intense learning.*

Forster (2005)

A struggling district decided that that this intense learning is what was needed and recheached out to and partnered with a post-secondary institution to try and turn things around. Students had not been successful on their tests and just as the story continues across the country something had to be done to better assist with student learning and future successes on testing and graduation. In 2003 Los Angeles School District declared Crenshaw High School a High Priority/Program Improvement School. Crenshaw had been identified as a low performing school where only 10% of the kids tested proficient or higher on the required No Child Left Behind Assessments. The retention of teachers was low and graduation rates were in the fifty percentile. As this is a startling scenario and rings true across the nation, several post-secondary institutions like the University of Chicago, MIT, the Indiana University and Ohio State University have begun to partner, with K-12 schools to stimulate learning using digital tools. With the launch of GameDesk in January 2009 a pilot program conceptualized by the

University of Southern California's professor Victor Lacour, students are learning state standards of art and math while building video games. This project, led by USC undergraduates employed the free program Gamemaker and the results were astounding. They found this tactic to be quite effective and the students demonstrated marked gains in learning and understanding of mathematical concepts and principles.

Gameplay

Before discussing effective learning through gameplay, let us examine what is meant by gameplay. As stated by Bayliss (2007), "gameplay is something of an indeterminate term, with a variety of different meanings". Some would say there is no real definition for gameplay "referring to it as a nebulous concept (Bayliss, 2007). Sid Meier has referred to gameplay as a series of interesting choices, while others like Rouse have stated that "a games gameplay is the degree and nature of the interactivity that the game includes", and Salen & Zimmerman (2003) define gameplay as "the formulized interaction that occurs when players follow the rules of a game and experience its system through play". For all intensive purposes, in this paper, we will consider gameplay to be "one or more casually linked series of challenges in a simulated environment for gameplay" (Rollings & Adams, 2003).

While students learning math through gameplay may not receive the raw concepts of algebra, geometry, calculus and trigonometry; depending upon the design of the game and interaction, students can learn and be made to understand not only the concepts of

these maths, but the importance of them and how they can be used in their day-to-day-activities as well as.

Granted, there is no magic formula to insure a successful game, however there are qualities that a successful game must possess. These qualities include considerations of learning style which are inherent due to the infusion of balanced learning theory and "just in time" or "on demand" feedback and instructional hints (Gibson, Aldrich & Prensky, 2007). But why stop at learning styles? The "intelligences" are used throughout gameplay and create inherent stimuli and motivations to play and learn. Good design will most certainly guarantee that learning will take place.

Tabula Digita (TD) is one company who has developed a product which aligns gameplay with pedagogy and considers these principles. Offering reports and the accessibility requirements of teachers, administration and districts, TD offers the anytime-anywhere access through its online subscription deployment. TD's approach also offers the ability to play individually or MMORPG addressing social aspects and concerns, teaching the students to interact with others while they learn pre-Algebra and Algebra concepts.

Tabula Digita has introduced its product up and down the east coast. From New York and extending to Florida, DimenxianM is all the rage. With articles abound praising the success districts are seeing through the use of Tabula Digta's DimenxianM, perhaps the research community is finally on the cusp of receiving the qualitative and quantitative data necessary to quantify the serious game platform as a viable learning tool.

How are students learning algebra through gameplay

Learning through the intervention of playing games can be a rich and motivating process. Most well designed games have been designed with the end product of learning and assessment in mind. Because today's students and people of all ages love to play games whether casual, serious or Commercial of the Shelf games (COTs), it is easier to immerse them in the chain of learning through gameplay. Games have become so popular that many designers are creatively getting around the violence factors some many have raised red flags about in the past. Creating first person shooters (FPSs) with weapons ranging from light freezing rays to ray gun analyzers, they are able to maintain excitement and addiction. These cool designs have students playing and learning far beyond the school day, and have brought a new problem into the horizon of schools. The kids do not want to stop playing. Playing in this case equates to learning. Hum… how do you tell the students to stop learning …go to class? Or for that matter ... stop learning and go to bed? It is an interesting twist but a welcome one no doubt.

It is clear that what is learned…how it is learned… and whether it is learned at all is solely dependent upon the design and content presented within the game environment. As a point of reference, I will use DimenxianM as my test subject for how people can learn algebra through gameplay.

Cleverly, Tabula Digita's (TD) gameplay is centered on standards which need to be met. Through gameplay, the students are presented with various scenarios which are linked to the local and/or national standards. Using Tabula Digita's approach for their

DimenxianM game, they used the following chart to describe, display and convey how their game linked to the Sunshine States standards and Benchmarks for math:

Sunshine State Grade 9 Math Standards Legend:

Geometry and Spatial Sense

Standard 3: The student uses coordinate geometry to locate objects in both two and three dimensions and to describe objects algebraically.

Benchmark correlation: MA.C.3.4

Algebraic Thinking

Standard 1: The student describes, analyzes, and generalizes a wide variety of patterns, relations, and functions. Benchmark correlation: MA.D.1.4

1.1: Describes, analyzes, and generalizes relationships, patterns, and functions using words, symbols, variables, tables, and graphs. (MA.D.1.4.1)

Standard 2: The student uses expressions, equations, inequalities, graphs, and formulas to represent and interpret situations. Benchmark correlation: MA.D.2.4

Data Analysis and Probability

Standard 1: The student understands and uses the tools of data analysis for managing Information. Benchmark correlation: MA.E.1.4

1.1: Interprets data that has been collected, organized, and displayed in charts, tables, and plots. (MA.E.1.4.1)

Standard 2: The student identifies patterns and makes predictions from an orderly display of data using concepts of probability and statistics. Benchmark correlation: MA.E.2.4

Learning can take place through several methods: learning by doing and learning through immersion or cognitive apprenticeship are two strategies which are working. As the millennial twitch speed is already adapted through prior and continuous gameplay, tweeting and texting; they are already in tune with the rapidity of gameplay and are well versed at adapting ludic skills from other games to this opportunity. Some students have stated that they would prefer to learn through the process of gameplay. Following are a few observations I documented after playing the DimenxianM game:

> The game has a great look and feel, one that a kid would want to play. This game seems well suited for the demographic considered. Gameplay is guided by visual and aural cues (Dual coding). Research points to low literacy performance as a concern and reason for poor student progress in school. Tabula Digita has addressed this area of concern by reinforcing text with narration. An effect has been applied to various voices within the game which help set the tone of the game and helps to maintain the attention of the player. While this use of dual coding could be looked upon as an aid to someone with low literacy skills, it may not be as strong a support as expected simply because ,to my knowledge, there is no option to highlight the words as they are voiced. This type of spoken and

visual reinforcement would further assist in word recognition and coding. Regardless of this fact, the guiding voice helps the player navigate the objectives, and on screen instructions which support gameplay.

Feedback is an important part of learning. Whether the learner requires just in time or on-demand learning, the absence of adequate feedback hinders deep processing and understanding of content and target information. At times I would forget my objective and/or the steps that I had taken while playing the game. I found that the journal and objectives provided solid feedback and helped me (the player) by providing up todate feedback which made it easier to maneuver the game and complete the mission assignments. The journal keeps track of all events and is accessible by typing the letter “J”. The current objective can be accessed by typing “o”.

Math concepts for the game are provided so the player has a basis of understands what concepts they will encounter throughout the mission. The modules/levels are set in an engaging interactive environment for the player to demonstrate an understanding of even and odd numbers, perfect squares and prime numbers. The player’s visor assist with game play by displaying helpful hints and information which assists the player in locating information and solving problems. The player can activate and de-activate the visor by typing “V”.

Mission 1: Wayfinder – Coordinate System and Scatter Plots				
Topics	Gameplay	Learning Objectives	NCTM Correlations	FLA Correlations
1.1 Coordinate Systems 15–20 minutes	Game Objective: The player must locate four weather stations. Math Process: The player is given an ordered pair and shown his location on a coordinate system. By using a grid overlaid on the island, along with a smaller graph, the player moves toward the given location. As the player approaches the first station, he is prompted to enter his current location using an ordered pair. After reaching the first weather station, the player "syncs" his information with the guide by clicking on quadrant II. While moving towards the final weather station, the player is asked which axis, if any, he must cross to reach the last station.	Objective(s): 1) Identify the parts of and points on the Coordinate System and Ordered Pairs Sub-objectives: 1) Identify x and y-axes 2) Identify quadrants in the coordinate system 3) Locate a point given and ordered pair 4) Give the ordered pair for a plotted point	Geometry Standard Grades 9-12: Use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations.	Geometry and Spatial Sense Standard: 3 (MA.C.3.4)

Topics	Gameplay	Learning Objectives	NCTM Correlations	FLA Correlations
1.2 Graphing 15-20 minutes	Game Objective: The player must input the weather station data into a Time-Temperature graph. Math Process: The player watches as the computer labels and numbers the x-axis, labels and numbers the y-axis, plots the given points, and checks the results. Then the player gradually takes over, first by plotting points, then by numbering the axes and plotting points, and finally by completing all of the steps	Objective(s): 1) Translate real world data into a Graph Sub-objectives: 1) Accurately label x and y-axes 2) Appropriately scale x and yaxes 3) Plot tabular information in a coordinate plane	Geometry Standard Grades 9-12: Use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations. Representation Standard for Grades 9-12: Create and use representations to organize, record, and communicate mathematical ideas	Geometry and Spatial Sense Standard: 3 (MA.C.3.4)

Tabula DIgita is not the only company attempting to revolutionize learning through games. A recent release and free to the public is a pre-algebra learning game entitled *Lure of the Labyrinth*. *Lure of the Labyrinth* is a Learning Games to Go (LG2G) product which was funded by the Star Schools Grant from the United States Department of Education. The project was lead by Maryland Public Television who worked with lead game designer Scot Osterweil and his team of MIT's Education Arcade, FableVision who built the game and ORC-Marco who evaluative services. *Lure of the Labyrinth* was developed as a supplemental product for anytime learning whether in the classroom or anywhere else the student might gain access to the content. Web-based, *Lure of the Labyrinth* has been aligned to Maryland state and national mathematic standards and has free lesson plans and resources that teachers can access. The lead game designer Scot Osterweil of MIT's Education Arcade explains that learning through gameplay affords the student the ability to experience a flow state or engagement that any teacher and parent would want to witness in the classroom. Osterweil and Thinkfinity ,a Maryland Public Television affiliate, suggests that the student plays an assigned segment of the game prior to in class instruction thereby giving the student an opportunity to participate in classroom discussion as an expert rather than one that needs to be lead through the concepts. Because the student has already interacted with the content, the classroom learning would be more engaging and the students learning would be more deeply rooted. Reversing learning if you will, the students are in charge of their education and mastering the content through the form of fun.

The game also includes literacy building concepts utilizing the Tasti Pet Communicator (TPC) which is an in game chatting device and overall graphic novel presentation. The authors of this game have devised this tool to assist families and teachers with the daunting task of capturing the attention of youngsters everywhere in hopes of turning them into young *mathematicians*.

Interactive Learning Environments (ILE), the primary objective of Nicaud, Bouhineau, Varlet & Nguen-Xuan (1999) referred to as the APLUSIX team, focused on the knowledge of solving problems (eg., "factorization, equation solving, calculus of primitives") through the transformation of algebraic expressions. This type of "domain Knowledge" has also been referred to as "cognitive formal knowledge: the formal feature comes from the restriction to *problems that are solved by transforming algebraic expressions*, the cognitive feature comes from the restriction to humanlike reasoning". This intervention has several modes including an observation mode (the student watches the process of a problem being solved inclusive of the rules applied in the process of solving the problem.) and an action mode(the student completes the steps of solving a problem using a point and click selection process. On screen feedback is provided as the student progress, correct answers being solved according to the student selected responses and incorrect student selections leading to prompts which allow the student to step backwards or request assistance. The action window allows expression input while reporting any syntax errors.)

. The team considers this approach as a complement to the traditional paper and pencil problem solving task.

Conclusion

Students learn best from gameplay when interacting through a virtual environment which replicates content in a context which the students can best relate to. This deepened state of interactivity allows the students to enter into a flow state which brings about a heightened cognitive awareness and understanding. Because the students are utilizing intrinsically motivating interventions, the students are willing to utilize the game as an anytime-anywhere learning and playing vehicle.

It is understood that learning will take place through game programming or gameplay. Where game programming may have a slight edge over GAMEPLAY, as math is heavily used to create games and simulations, it is certain that there is a need for both options. Due to the variables in what a game designer maybe intending to teach in a game, this paper can only speculate what a student might learn in a game, providing examples of how others have utilized the vehicle to teach. Because of this variable it seems fair to say that students learning through game programming may receive a consistent and deeper understanding of mathematical concepts. However, because the designer does have control over what is included in the game, learning can be directed explicitly and can be as narrow or as broad as required to reach and teach the targeted audience. For

this very reason both interventions are valuable. Student for student however, it is believed that gameplay will reach more students. This belief is leveraged upon the statistics of people that create games versuses the number of people of all age groups purchasing and playing games today.

As more companies begin to develop and design products which support district and systemic needs… and as more colleges partner with high schools to broaden the scope and success of high school learning through digital interactions, students will begin to better understand Algebra and HSA test scores will improve not only in Algebra, but in English, Biology, Government and AP courses as well. Teaching in context and inviting the students or better yet allowing the students to learn wherever and whenever they are most comfortable is the wave of the future.

Companies like Tabula Digita have come a long way to begin to close the margin of speculation in whether games can be successful in the classroom, but it will take more than one or two companies to sway the entire education and research community.

CRE8TIV GAMES

Chapter Three: Design Document for:

The Pledges

A Unique Look At Pledging at An HBCU

Written by: Lynn Patterson

Version # 2.00

Tuesday, July 13, 2010

An action adventure game with a few RPG tendencies, “The Pledges” offers suspense, mystery and is action packed. Providing a historical background about HBCUs, pledging and the “Algebra Project,” this game cleverly engages mathematical and scientific concepts which will keep the enthusiasts on the edge of their seats challenging both their minds and their crafty gaming skills.

Table of Contents

Design History

In this section I will list the changes and updates to the design doc to show evolution and progression.

Version 1.10

Version 1.10 includes some tuning and tweaking that I did after making my initial pass at the design. Here is what I changed.

1. I rewrote the section about what systems the game runs on.
2. I incorporated feedback from the team into all parts of the design however no major changes were made.
3. Just keep listing your changes like this.

Version 2.0

Version 2.0 included an overall update of the design document including the addition of information on:

- Algebra and Data Analysis

- The Woods
- The Party
- The Characters

Game Overview

Philosophy

Philosophical point #1

Why create the game?

Through game play, the creators of this game hope to engage the player in mathematical thinking which is measurable and transferable to activities encountered in their everyday life. Additionally, through cut scenes and game play, it is hoped that the player will learn about Historically Black Colleges and Universities (HBCUs), the pledging process, how to make sound decisions and balance time to successfully complete the college experience while preparing for a career. The importance of giving back to the community will also be presented through cut scenes and possibly gameplay.

Philosophical point #2

Game platform

Our game is built using the XNA Game Studio software for the purpose of producing a product which can be used on the XBOX 360, PC and/or Zune platforms. This diversity is expected to add to the marketability of the game while attracting the targeted age group and demographic of urban 14-18 year olds.

Common Questions

What is the game?

The game is a project which will provide an alternative and supportive method of learning mathematics and problem solving by applying these concepts to a familiar and entertaining situation. Learning will be achieved through an interactive mixture of action, adventure and the role player game method. Through game play, the participant will take on the role of a CSI/FBI investigative team where in attempts to solve the kidnapping mystery of missing big brothers. The first kidnapping victim is the Step Master.

Why create this game?

While both black men and women have made small gains with regard to college acceptance and completion; persistent High School Assessment (HSA) failures, the high number of high school and college dropouts and the overall decline in the values of education, especially in an urban setting, have drawn my interest to this research and project. As research has proven, the urban and underserved population continues to fall into the lower percentile of test passers (Teale & Gabrell, 2007). These same students are expected to drop out of high school before completing the 9th grade. Twelfth grade classes continue to dwindle resulting in a cohort of less than 50%, in some cases, of the originating 9th grade class. Some Latino students do not matriculate to the high school level; dropping out before completing the 8th grade. This underserved population is considered to be African American, Latino and Native American students. Cultural differences and inequities continue to be a distracting and distressing factor in the low success rate of urban and underserved populations, and the No Child Left Behind Act

has been equally ineffective. A startling fact: over the next ten years, 2 million teachers will be required to educate our booming population (Wassdorp, 2008). Who will these new practitioners be? What will the educational classroom look like? Which pedagogies will be preferred and/or accepted for disseminating information to the technological "millennial" of tomorrow? Processing tomorrow begins today and the 21st Century student is ready to learn on a different level.

Where does the game take place?

Gameplay will take place on an HBCU campus based upon Morgan State University. It's over world will be based upon Morgan's interactive map (http://www.morgan.edu/About_MSU/Visit_Morgan/ Campus_ Map.html) and the smaller levels will be based upon various campus locations including but not limited to the Engineering building, the wooded path connecting the engineering build to the south portion of the campus, the math and science building, proposed business complex at Northwood Shopping Center, campus police, student union building, frat house, library and dorms. Other game play areas may include the City police headquarters located at the southeast edge of the campus, a nearby club (The Haven) and two high schools Mervo High School (outreach for robotics) and Frederick Douglass High School (math tutoring and game design).

What does the player control?

- The player will control the pledges. Gameplay will randomly start with any one of the pledges but the player will be allowed to select any one of the pledges to step in and help solve the mystery based upon their strengths just by tapping them. Only one pledge can be active at a time.

- The player will also be able to compete in step competitions by using the controller and mastering a sequence of patterns to win the challenge round. Multiple animations would be available and assigned to the controller. More difficult moves gain higher points while basic moves would net lower points. A graduated ranking scale would return the step ranking based upon the points racked up at the end of the competition. (Not in the prototype)

- The player will be able to control the robot to be built within game play.(Not in the prototype)

- The player will be able to play the game to be built within the game. (Not in the prototype)

How many characters do I control?

The player will control one player at a time but can switch between line brothers at anytime by tapping him. This option affords the player the ability to utilize each brother's strengths in gameplay and to solve the mystery.

What is the main focus?

While learning and applying math (Algebra 1 and Data Analysis) and CSI deductive reasoning skills; the pledges will recover their kidnapped Step Master so they can cross over and continue preparing to go over and for the upcoming spring step competition. The Sigma Sigma Pi's are the 10 year reigning champions and they aim to continue the tradition.

What's different?

A game based upon an HBCU is not only rare, but it will be informative on many levels. Though the primary focus is a clever way of teaching and assessing algebraic comprehension and thinking, at the same time, the game will teach about the history of HBCU's, campus life, Black Greek Letter Organizations (BGLO), the importance of community service, making good choices and balance of oneself.

Feature Set

General Features

- Huge World
- Teleportation Winds
- Knowledge Mentor – the old grounds keeper
- Locking party invitation

Game Play

What does campus life look like:

- People walking to and from
- Sitting on benches
- Coming out of and going into buildings
- Security officer on a segway
- People throwing a ball around

What does community service look like:

- One on one tutoring of algebra and geometry
- Building robots and programming autonomous movement – teaching math
- Programming video games and creating models – teaching math

Crazy man giving clues (grounds keeper)

- This character when approached will provide clues and hints in the form of a riddle to the player as an assist in solving the mystery

What does a cut scene look like

- Cut scene about the history of HBCUs
- Cut scene about the Algebra Project
- Cut scene about robotics
- Cut scene about college life
- Cut scene about Rush week (this will open the game) and pledging

Special features

- Marching band
- Football team (steal the mascot during the football game getting the costume becomes a part of the inventory. A good way of telling a tidbit about the school)
- Basketball team
- Cheerleaders
- Step show as a cut scene

What does the pledging activity look like:

- Recite the Greek alphabet
- Recite the fraternity code or history
- Recite a chant
- Learn the secret handshake

- Someone messes up and the whole line has to:
    - Do pushups
- Preparing for the step show (conditioning)
    - Go on a mile run
        - During the course of the run a big brother (The Step Mster) is abducted.

Game Win State

The player wins the game by solving all riddles, locating all clues, collecting the robot CPU count per level, completing the required amount of community service hours for each level and defeating intermediate villains as defined. The ultimate win of the game is awarded when the big boss has been defeated (a confession will be put into the inventory) and the Step Master is released.

Game Lose State

A player loses the game by failing a level two consecutive times and failing to defeat the big boss which leads to the non-release of the Step Master.

Game Affordances

The affordances in the game are the ability to tap into the strengths of the line brothers, the use of teleportation to move about the campus, the crazy old man who helps to decipher some of the clues and gives warnings.

The Game World

Overview

The game world is rich with technological wizardry, intellect and black holes. The player will have to apply analytical, scientific and creative thought to maneuver the campus, solving the clues and riddles and interacting with the non player characters (NPCs) and artificial intelligence (AIs) throughout gameplay.

Overworld

The overworld stretches from the woods at the rim of Parking lot A to the gymnasium (Hill Field House) of Morgan State University's campus. A large campus, locations have been chosen which are consistent with the fraternity vision, mission and storyline.

Woods

This is not a place to go. You will have to fight to the death to get back to civilization. Keep in mind you are on a tight timeline. You don't have time for the woods as time is never on our side. In this epic world you will meet with creatures from the other side as well as animals guarding their territory which don't take kindly to intruders:

- Zombies
- Fox

- Wild dogs
- Raccoons

Community Service

The pledges must participate in community service activities as part of the fraternity mission. The Sigma Sigma Pi fraternity has adopted two high schools to work with:

- Mervo – Robotics and math
- Frederick Douglass High School – Algebra, game programming and modeling

The Physical World

Overview

The world will contain all of the amenities of a campus such as buildings, parking lots, benches, light poles, walkways. Additionally, the marching band might be heard and/or seen practicing on the field or marching across the campus.

Key Locations

The key locations of the game are the proposed business complex, engineering building, woods, math and science building, library and student union building with alternate locations including Mervo, Frederick Douglass High School (FDHS) and The Haven.

Travel

The player can walk and run to locations....but the more popular means of transportation will be teleportation. There are 3 modes of teleportation based upon wind:

- Stepping into the wind funnel with the building unlock codes in the player inventory and punching in the building number would take the player to a specific building. For this to work, the player would have to already have the code to the building they want to enter in their inventory. This is only possible if the player has solved the riddle to the building lock codes prior to attempting to transport there. Not having the building unlock codes in the player inventory, stepping into a wind funnel and entering an incorrect building code sends the player to the woods.

- Stepping into the wind funnel with an invitation in it sends the player to a party.

- There will be randomly appearing teleportation pads popping up from time to time instead of the wind funnel. These pads will teleport you somewhere but it may not be to your preferred destination. Using this mode of transportation nets random results and the player could end up anywhere whether the player possess the unlock codes or not. What is the probability that the player would end up at the building intended, a party, the woods or any other building within the game world? Hum… that's a good question, maybe the pledges should answer that one for bonus points.

Scale

While the character sizes will be adjusted through the spriteBatch call for each spriteBatchDraw, the screen size will be set in the constructor of the character class.

Objects

The following table represents a sample of objects that will be used in the prototype:

Weapons	Collectables	Robots
• Paintball Gun • Paintball pellets • Wrench • Screwdriver • Ray gun	• Map • Ruler • Compass • Pencil • Wrench • Screwdriver • CPUs	• Grass Cutting Snooping Robot • Trash collecting Snooping Robot

See the *Character Appendix* for a listing of all objects considered to date and which may be found in the game world.

Weather

Sudden gusts of wind will occur which will signal opportunities to teleport to other areas. The game will begin in mid to late fall and end early spring.

Day and Night

Game activity will take place at various times. Classes and community service will typically take place during the day while most pledging activities and step competition preparations will take place at night. Disappearances occur at any time.

Time

Once a clue has been given, the players will be timed to complete each task and locate the next piece of evidence. Missing the time line subtracts from the score and puts the player back at the beginning of the level. If the player has progressed far enough and has created a save state, the player will continue from their last save state. Completing the level mission and solving the clue before time runs out earns bonus clock points.

Rendering System

Overview

The Pledges game will be developed in Xna and is designed based upon the principles of Object Oriented Programming (OOP).

2D Rendering

The game will be modularized and is expected to have the following classes which will be called to action through the SpriteManager and game class.

OOP Class	Descriptor	Assignment
SpriteManager Class (Drawable Game Component)	This class is the king pin of all the classes. The use of this class keeps the game class from being extra crowded while providing a game component which can be plugged into	All sprites in the game are controlled by this class.

AutomatedSprite Class	This class provides the functionality for the collectable items. These items will randomly appear initially in the woods.	Map, Triangle, Ruler, Pencil
ChasingSprite Class	This class provides functionality that will enable AI that will chase the PC based upon the PC ordered pair(x, y coordinates).	Zombies, Foxes and Raccoons, Guards wild dogs and Big Boss
EvadingSprite Class	This class provides functionality for the pledge line non player characters (NPC). The NPCs will be in wander mode and move away from the userSprite (PC) at a speed slow enough that the PC can catchup to tap in. This type of sprite will move towards the automatedSprite. It will attack and move away from the chasingSprite. Once tapped in, it becomes the userSprite (PC) and the current userSprite becomes another NPC.	All inactive pledges

	other games.	
OOP Class	Descriptor	Assignment
Sprite Class	This class provides the basic functionality of all sprites.. The act of deriving for a class eliminates repetitive code.	The UserControllerSprite class, AutomatedSprite class, ChasingSprite class and EvadingSprite class Sprite all derive (pull characteristics from this class).
UserControlledSprite Class	This class provides the functionality of our player	Player Character (PC)

Game Engine

Overview

Where the Pledges game will not be using a middleware engine, as stated above, it is designed with a modular object oriented construction. See the *Code Snippet Appendix* for more information on how the SpriteManager class and other classes have pooled their resources to fuel The Pledges game.

Collision Detection

Collision detection is handled through the SpriteManager Class in the update method. Using the rectangle assignment for each sprite the update method detects whether a collision has occurred or not.

Scoring

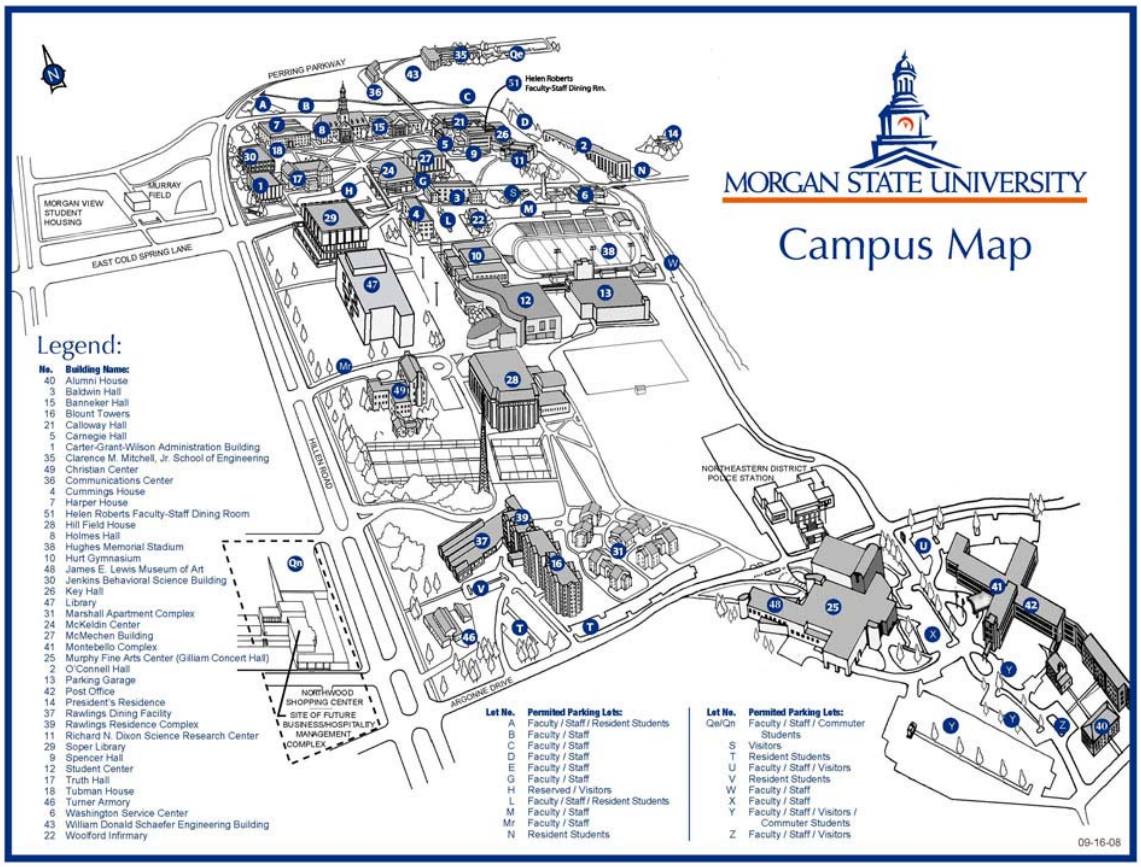
Scoring for the game is handled in the Game.cs class update method.

Inventory

The World Layout

Overworld

The open area of the overworld will be the scene of typical college life such as people studying and sitting on the benches talking, the marching band might be marching across campus or a few people might be tossing the ball around. Additionally, this is where the snooping robots would collect the majority of their information to feed back to the villian, Adam Westley, to learn more about the frats and prepare continual clues for the kidnapping mystery and framing.



World Layout Detail #1

Future site of the Business/Hospitality Management Complex

The pledges lair is located in a secret location of the soon to be business building just off campus and is where the action of the full game starts. The pledges and big brothers begin their conditioning run from this location.

World Layout Detail #2

The woods the rim of Parking Lot A and B

Filled with zombies, wild dogs, rabid foxes and raccoons; the woods are a nomads place. This is an area where the dejected are sent. Failures and people infected with poor decision making skills and no motivation to succeed are sent here from the game. Someone who has failed a level two times in a row might end up in the woods. In the instance of a transportation fluke the player would have to fight their way out of the woods to resume the mystery solving tasks. Players taking too long to get out of the woods lose all hopes of following the clues supplied and will be turned into zombies.

World Layout Detail #3

The Soper Library

The library is the location of the first actual clue to begin the journey of finding the abducted Step Master. The Step Master was the fifth pledge on line in 2007. Hidden in the stacks of the library; book #QA-S150.52007 holds the first clue. If the pledges do not get to the library within the designated mission time, the clue will move to another location. Should the pledges reach the clue late, a message in the form of a text will be sent by the villain to inform the pledges of the next steps to be taken. Upon locating the first clue and executing all assigned tasks, the player will have completed the first level.

World Layout Detail #4 – 9

Where each detail # is expected to be a level, the initial build will only progress through world layout detailed #3. The final level will be the engineering and science building where the

player will have to disarm the big boss, the villain, Adam Westley.

Game Characters

Overview

7 Pledges	3 big brothers including the Step Master	Zombies	Foxes	Wild Dogs	Raccoons
Big Boss	Guards	Old Grounds Keeper	Snooping Robot Grass Cutter	Snooping Robot Trash Collector	4 high school students (Mervo and FDHS)

Creating a Character

My eleventh grade students will be creating the majority of the sprites to be used in the game. Most of the characters are being created and animated from scratch using the Photoshop, Flash and Illustrator programs. The students will assemble the sprite sheets as specified so Xna can call each animation or texture into the game at run time.

Enemies and Monsters

There will be several levels of enemies and monsters in the game:

Level one	These enemies are those found in the woods (zombies, foxes, wild dogs and raccoons). If the PC or NPC's go to the woods, they will have to fight their way out to safety.	Paint Gun and Paintball Pellets
Level Two	These enemies are snooping robots. While they appear to be emptying trash or cutting the grass, they are collecting information for Adam Westley – the super villain to use in the charade of the kidnapping mystery.	These enemies can be disabled by hitting the robots with a wrench
Level Three	The guards and big boss holding the Step Master.	To disable these guys, the player will have to use geometry concepts and magnets to disarm the guards and angular attacks to overthrow the big boss.

User Interface

Overview

The graphics user interface (GUI) will be relatively simple. We expect to include a score, life remaining, timer, compass and inventory.

User Interface Detail #1

The Inventory

The inventory will be accessible by icon from the player screen. When the inventory is called, it will overlay the player screen with a transparent background allowing the player to select the item and or weapons required to move through the game. The inventory will be self expanding and shrinking based upon the amount of items the player has available to them at the time. Some items will be removed upon use (paintball pellets) and will have to be earned or bought, where others will remain in the inventory for the remainder of the level. Once the level is cleared, all inventory items, except those bought, will be removed.

User Interface Detail #2

The Compass

The compass will assist the player with their current location versus where they have to travel to. This devise will come in handy for estimating and predicting time and responding to data analysis concepts and clues the player will have to solve throughout gameplay.

Weapons

Overview

In keeping with a game rating of teen (age 13+), violence will be kept to a minimum. Weapons like paintball guns, paintball pellets, wrenches, screwdrivers, ray guns and magnets will be used throughout the game to defeat enemies and monsters.

Weapons Details #1

The Paintball gun

The paintball gun and initial pellet supply will be placed in the woods once the game registers a collision between the player and the phone. The paint gun will fire up to 10 rounds before requiring a reload. As the enemies are eliminated, more rounds will be dropped for the player to reload the gun. It will be important that the shooter consider distance, speed and position when aiming/locating the target to preserve ammo.

Weapons Details #2

Wrench and screwdriver

The wrench and screwdriver will be used to disassemble the robots. In order to enter the big boss lair in the engineering building, the player must have retrieved at least two robot CPU chips per level, one from each robot (grass cutter robot and trash collector robot). With these components in the player inventory, they will be able to enter the Big Boss lair and after defeating the Big Boss, release the Step Master from his holding cell.

Musical Scores and Sound Effects

Overview

The game sound will be processed through the Xact program. This is the sound tool that comes with the XNA Game Studio software package.

Red Book Audio

The audio will be preserved at a sample rate of 44.1K.

Sound Design

I definitely hear the marching band in this piece. Morgan has one of the best marching bands in the area. I want to replicate that to give a strong HBCU feel. Hip hop music may also be called upon to fill the air waves. Other sounds may include casual conversation as the player walks by, traffic and any of the sounds included in this list:

Woods	Party	Ambiance
Owls	People dancing	Marching Band
Fox	People talking	Birds
Critters	Music playing	Cars going by
Crackling	Plates and utensils	Bells (not the high school bells) like monument bells
Water rushing by	Bottles popping	

Single-Player Game

Overview

This game offers a twist on the "Player Character"(PC). Where there can only be one active player at a time, the PC can bring other line members to life by tapping them. At that point and time the tapped NPC becomes the PC and uses its strengths to solve that portion of gameplay.

Single Player Game Detail #1

Each pledge has a strength.

Line name	Line#	Strength Description
Statistic	#1	Data Analysis
Tan	#2	Geometry and Trigonometry
Pi	#3	Algebra
Equalizer	#4	Sharp shooter – The shooter uses a site to locate his target and adjust for speed to anticipate location
Cartesian	#5	Boxer and Algebra
Acceleration	#6	Fast runner and data analysis
Ohms	#7	Electronics and Programming

Single Player Game Detail #2

The player can walk, run or teleport from one place to another to save time in reaching the next clue and gain time bonus points.

Story Brief

The game is about a freshmen who has won a four year Science Technology, Engineering and Math (STEMs) scholarship. As he becomes acquainted with the campus he notices a lot of activity and learns that it is Rush week. In learning more about these activities he decides to look a little deeper into the possibilities of pledging. He puts in a bid for Sigma Sigma Pi and is accepted. As the pledging activity is nearing its end, one of the big brothers, the Step Master, goes missing while they are on their competition conditioning run.. Because of the short period of time that the big brother has been missing, they cannot gain help from the campus or local police. The pledges are left to take matters into their own hands. From there the drama begins

See the “Story Appendix” for a full account of the story.

Hours of Gameplay

It is approximated that game play of the fully developed game would take about 40 hours to complete. The abbreviated (prototype/demo) version may take as little as 2 hours to complete.

Victory Conditions

Small victories throughout the game are achieved by locating the clues based upon the information provided, staying out of the woods and limiting time in parties. The ultimate game victory and means of winning would be to defeat the Big Boss and free the Step Master.

Algebra and Data Analysis

Overview

Upon the completion of gameplay, it is expected that the player will demonstrate increased proficiency and use of mathematics and analytical skills, specifically algebra 1 and data analysis. The player will be presented with mathematics through word and data analysis problems which will be solved based upon information presented through math riddles, cut scenes and multiple selection options. In each level of the game, the player can expect to solve at least one data analysis problem, one word problem and two to four algebra/geometry related math problems. It is the job of *The Pledges* game to teach and access knowledge through an entertaining medium.

Gaining access to the building

The player will be presented with a math, word problem or data analysis problem or riddle. Once the player has solved the problem and triangulated the location on the map which can be found in the woods, the unlock codes are added to the inventory. From that point on; the player only needs to punch in the number of the building they wish to access. The player can teleport, run or walk to the door of the building the riddle has led them to. If the player chooses to use the teleportation winds (wind funnel), they would only need to step into the winds and punch in the number of the building they want to go to. Provided the player has solved the problem

correctly and there is no invitation in the funnel, the player will be taken to the front door of the building activating an enabled state for the player to enter the building.

Using Math

What type of math problems might the player be required to solve?

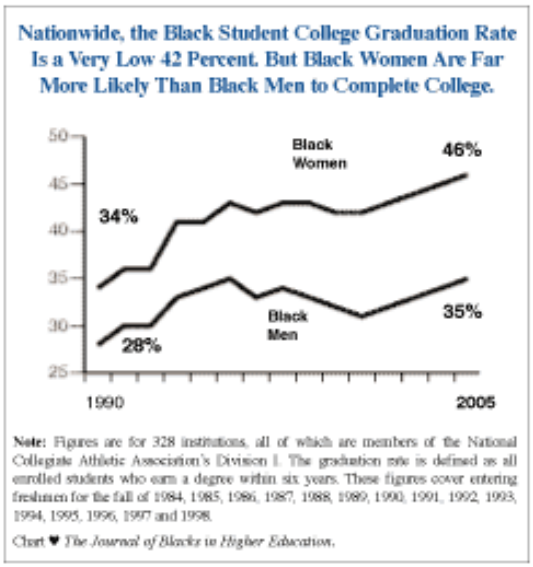
Math problems will range from a simple pattern solving problem to solving polynomials and using relational data. See the sample problems below:

Math problem detail #1 – Parallel Lines Riddle Parallel to 1st thought of what you missed Is your first clue to add to the list Collect the woods items to help you see Where the place is that you must be. Select the correct building # to obtain your first clue piece.	**Math problem detail #2 – 2nd Degree Polynomials** If Step Master (x) was #5 on line and b = 4 solve for y. $X^2 + b = y$ $5^2 + b = y$ 25 + 4 = y Y = 29 Which map location equals y and creates a right triangle when triangulated. 29 = the location of the library The player would choose the correct answer to reveal the location of the library.
Math problem detail #3 –Geometry A map you must find to plot what's on your mind. From winst you missed your Step Master to where you returned even faster. Point 3 is a 90 degree angle. Here you will	

receive a clue and a riddle to the next clue. Select the correct angles in your triangulation.	

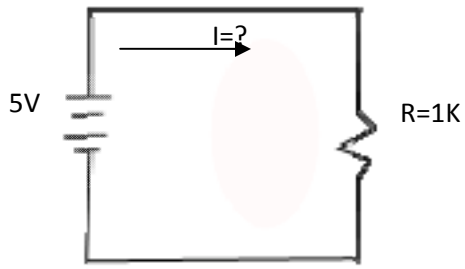
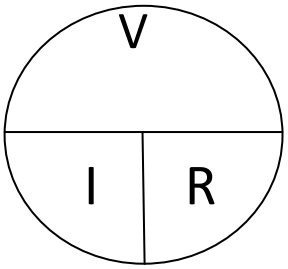
Using Data Analysis

Data analysis will be taught through the use of cut scenes which discuss the history of Historically Black Colleges and Universities and Black Greek Letter Organizations. Included in these cut scenes will be statistics and information to which the player will be prompted to answer questions. One question might look like this.

	Based upon this cut scene, more black college men completed college in the year _____ an improvement of ____% over the 1990 completion rate. Choose your answers the correct answer : a. 1995, 10% b. 2005, 7% c. 2000, 1% d. None of the above

Using Word Problems

Word problems will be created based upon the community service cut scenes revolving around electronics , robotics and game programming. One question might look like this.

Given a circuit of  	Solve for current (i) using Ohms law: 
To solve for current you use the formula I=V/R.	I = V/R I = 5/1000 I = .005A

The Party Invitation

Overview

Statistics prove that one of the biggest reasons students fail to complete college is too much partying. One goal of the game is to teach students to make better choices. For this reason, we have created a repository for habitual offenders…the woods. This section will discuss the party invitation, the party, how to leave a party and the consequences for not leaving the party.

Party Detail #1 – The Party Invitation

A player may get stuck with a party invitation in several ways:

- By entering a wind funnel (teleportation winds) that has a party invitation in it
- By bumping into a NPC that is handing out invitations (only a PC can pick up a invitation of this type)

Regardless of the appropriation, once the invitation is in the inventory, the player will be swept off to the party. The player will then have a predetermined amount of time to leave the party. If the player does not leave the party before the timer clicks down and the window of time runs out the player is whisked to the woods.

Party Detail #1 – The Party Invitation

The party has many dark distracting elements. Drinking, drugs, alcohol and girls. There are many reasons not to partake in this activity – your oath as a SSP pledge, you are under age and are on a mission. You, the player must get out of this party and back to helping solving this mystery.

As soon as you arrive at the party, the host will offer some jungle juice. If the player says no thank you, the player can walk out of the door. If the player accepts the drink, the door is locked and the player will be offered another temptation. The more the player accepts, the longer the player is locked into the party with the fate of being sent to the woods to fight off the woods goons.

The longer the player is in the party the more points he loses and there is a greater chance that he will have to restart the level.

Pledges Appendix

In this section, additional and supportive information can be found as labeled by the table of contents sections below. The developer/reader will be able to gain a more in depth understanding of the game story and Greek alphabet. The Learner analysis provides more in depth reasoning as to why a project such as this is needed.

Character Appendix

Greek Alphabet Appendix

Learner Analysis Appendix

Story Appendix

Character Appendix

Photo	Name	Type	Sub-Type	Strength	Power	Ability
	Statistic	PC	Main Character #1 online	Data Anaylsis		Tap out
	Tan	NPC	#2 online	Geometry and Trig		Tap in
	Pi	NPC	#3 online	Algebra		Tap in
	Equalizer	NPC	#4 online	Sharp Shooter Physics and Math		Tap in
	Cartesian	NPC	#5 online	Boxer and Algebra		Tap in
	Acceleration	NPC	#6 online	Fast Runner (Sprinter) Physics		Tap in
	Ohms	NPC	#7 online	Electronics and programming		Tap in
	Bracket	NPC	Big Brother	Programming		Tap in
	Random	NPC	Big Brother	Programming		Tap in
	Squareroot	NPC	Step Master	Plotting/Layout		
	Cell Phone	AI				
	Wind Funnel	AI				

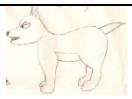
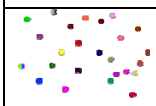
Photo	Name	Type	Sub-Type	Strength	Power	Ability
	Zombie	AI	Enemy		Appears on proximity	
	Fox	AI	Enemy		Appears on proximity	
	Raccoon	AI	Enemy		Appears on proximity	
	Squirrel	AI	NPC		Visibility on cell phone switch	
	Adam Westley	AI	Big Boss			
	G-Cuts	AI	Snooping Robot			
	2-Clean	AI	Snooping Robot			
	Paintball Gun	Weapons	N/A			
	Paintballs	Weapons	N/A			
	Wrench	Weapons	N/A			
	Map	Collectables Inventory Items				

Photo	Name	Type	Sub-Type	Strength	Power	Ability
	Compass	Collectables Inventory Items				
	Ruler	Collectables Inventory Items				
	triangle	Collectables Inventory Items				
	Crazy man	Landscaper and groundskeeper				
	Sorority Girl	Campus activity				
	Football	Campus activity				

Greek Alphabet Appendix

This table gives the Greek letters, their names, equivalent English letters, and tips for pronouncing those letters which are pronounced differently from the equivalent English letters. (There are actually several acceptable ways to pronounce New Testament Greek.

Α	α	alpha	a	"**a**ther"
Β	β	beta	b	
Γ	γ	gamma	g	
Δ	δ	delta	d	
Ε	ε	epsilon	e	"**e**nd"
Ζ	ζ	zêta	z	
Η	η	êta	ê	"h**ey**"
Θ	θ	thêta	th	"**th**ick"
Ι	ι	iota	i	"**i**t"
Κ	κ	kappa	k	
Λ	λ	lamda	l	
Μ	μ	mu	m	
Ν	ν	nu	n	
Ξ	ξ	xi	ks	"bo**x**"
Ο	ο	omikron	o	"**o**ff"
Π	π	pi	p	
Ρ	ρ	rho	r	
Σ	σ, ς	sigma	s	"**s**ay"
Τ	τ	tau	t	
Υ	υ	upsilon	u	"p**u**t"
Φ	φ	phi	f	
Χ	χ	chi	ch	"Ba**ch**"
Ψ	ψ	psi	ps	
Ω	ω	omega	ô	"gr**ow**"

Sigma (σ, ς): There are two forms for the letter Sigma. When written at the end of a word, it is written like this: ς. If it occurs anywhere else, it is written like this: σ.

Learner Analysis Appendix

Players of this game, primarily high school students, are drawn to games as a normal mode of entertainment or exploration.

General Characteristics

The anticipated age range is that of 14-18 and avid RPG and adventure game players. Some may be fans of detective stories as well as the CSI series. Others may be academics or college bound students interested in finding out more about college life and pledging.

Attitudes and Motivation

Several factors may influence the motivation for participants to play this game. The most prevalent however, may include:

- Playing a fun game
- taking on the role of the detective in the stories
- winning the game
- enjoying solving a fictional mystery
- learning more about pledging a BGLO
- learning about HBCU (Historically Black Colleges and Universities)

Entry Competencies (Players)

The literacy-level may range from low to high and the player may possess weak skills in the area of Algebra. Most players may not understand the principles, terminology or symbols of algebra. They will not be interested in playing a formal learning game for fun. Most students will have had one to two science courses. The player may have untapped interest in the science, technology, engineering, math (STEMs) field or Criminal Justice.

Task Analysis

Several aspects of the particular audience intended have been identify as having low to moderate literacy levels and little understanding of how to apply algebraic concepts or why they would need to do so at all. From a cognitive perspective, the game enthusiast is capable of reading but spends little time doing so and from an affective perspective the player is interested in the medium and will move through the challenges of the game to learn, solve the mystery and ultimately to win the game. Empirical studies show that enthusiast will research and read to find cheat codes, will study how to operate a game, will transfer knowledge from one scenario to another, will apply algebraic and geometrical thinking within game play when considering range, grid systems, projectiles and more…. The gamer is also generally capable of explaining how to move from level to level and skills and weapons needed to defeat the protagonist and big boss(s).

How is algebra used in everyday life experiences?

While people balance checkbooks, sink basketballs, parallel park, solve various problems and scenarios as life presents them; very few relate these concepts to algebraic or geometric equations.

The Learner-Task Gap

To effectively utilize math and science skills, chose an appropriate college and determine whether the player will pledge or not, the player will have to be aware of several concepts and information

- The importance of learning and transferring mathematical concepts
- Understanding identifying patterns
- The history and importance of HBCUs'
- The history and contributions of the Algebra Project
- How robotics will shape the future
- What college life looks like
- The history and importance of BGLOs

While some learners may already know these basic facts, we cannot assume that all will. The sections to the Algebra Analysis Tests are listed below. Where all scenarios will not be represented in the Pledges game, several concepts and ideas will be built upon the premise of

the test and real life needs. These same concepts will be assessed upon the conclusion of gameplay to determine how successful this intervention has been.

ALGEBRA/DATA ANALYSIS					
Analyzing Patterns and Functions	2008	2007	2006	2005	2004
Modeling Real-World Situations	2008	2007	2006	2005	2004
Collecting, Organizing and Analyzing Data	2008	2007	2006	2005	2004
Using Data to Make Predictions					

Instructional Objectives

After careful review of the HSA exam and the learner weaknesses uncovered, the following problems will be addressed.

Mathematical problem type		Riddle/Clue	
Polynomials	Binomial or 2nd Degree polynomial	The answer is be four you. Plot this information to find your next clue! If b=4 X^2+ b = y	1st riddle to locate the first clue The correct answer to this clue will store the building unlock code to the old library.
Data analysis	Abstracting information to apply to a real life scenario, the dewy decimal system in the library.	A new text message arrives on entering the building “Pledges only” QA-S150 SM 5th on line in 2007 line name square root. In the stacks here you will find your next clue	1st clue This clue is telling the pledges to look in the stacks for a book on square roots in the section QA (the library of Congress designation for math under science)with the storage significance of .5.2007 So the actual location would be QA-S150.5.2007

After playing the *Pledges* game, players should be able to:

1. Apply mathematical concepts to real life scenarios both consciously and unconsciously.
2. Solve issues and problem s utilizing information supplied.
3. List at least five facts about pledging:
4. Explain the significance the significance in attending an HBCU
5. Identify why it is important to give back to the community and help others to learn.
6. List the most frequent reasons people leave or flunk out of college.
7. Why a college education is important

Instructional Strategy

Proposed Methods of Assessment

Controlled test environment

The research group has been selected from a group of 9-11th graders that have taken and failed the Algebra 1 Data Analysis High School Assessment (HSA) exam

- Pre-Test/Post Test
- Review of HSA examinations after Pledges game play
- Surveys

Uncontrolled test environment

These students have dropped out or are not currently taking algebra and have not taken and passed the Algebra 1 data analysis HSA exam.

Story Appendix

It all started during rush week. There were so many parties and so much action. The Greeks were steppin' and we were all out there trying to get to know one another. I didn't really want to pledge, I just wanted to find out more about what college life was like. I mean …sure… I knew I had to keep my grades up. ..and for real … at the time… that was all that really mattered. I couldn't take a chance on losing my scholarship… If I did…If I did… I was done. It was off to the military for me. My family had already put me on point. I was of age and my next step was college or the military. I am ok with it though because I know I have a future as an engineer. I love things that challenge me. In high school I built robots and developed video games. That's all I did. That's how I landed this full four year Scholarship. I am not going to mess that up for nothing.

The more I check out the Greeks though, the more I want to join one. Well, it can't hurt to talk to them. Maybe I'll find one that has people like me who take their school work seriously. New on the campus, I could really use a good support system. Turns out that the more I looked into the fraternities, the more I realized the importance and historical nature of the BGLO's (Black Greek Letter Organizations). I began to want to be a part of one and to take pride not only in my work, but how I could service my community and better support the needs of others. Besides, I had a full scholarship. It was important to show my gratitude and worthiness of such an endowment. As I participated in the rush process, one of the houses that called me back was

called Sigma Sigma Pi. They were pretty laid back and kind of geeky Greeks…but... I noticed they got respect from all of the other Greeks --the omegas, the Kappa's, the Alpha's …all of them.

The fraternity represents more than the partying aspects most have come to associate fraternities and sororities to on college campuses. This fraternity was all about promoting the advancements of all socioeconomically disadvantaged people. Suddenly, becoming a part of this BGLO was an academically enriching adventure. I had actually found a more fulfilling reason to excel academically. This experience would build upon my social and leadership skills. With a mission to carve a community of leaders and exhibit leadership while remaining committed to the education of those in need of advancement in their socioeconomic status (http://www.baltimore-algebra-project.org/), I put in my bid for Sigma Sigma Pi and was accepted.

Embarking upon an adventure in building brotherhood and a true union of thought and being was really challenging. Attending an HBCU was especially meaningful as it represents the accomplishments in the struggles of African Americans. I was proud to attend an institution which was built on the premise of providing a high level of education to people who were once denied the privilege of learning. HBCUs, initiated in 1837 just twenty-six years before the abolishment of slavery, were founded by Richard Humphreys. According Coleman (2008) Humprheys was a Quaker philanthropist who founded the Institute for Colored Youth to train free blacks to become teachers. Since that time several other institutions have been established. While the Brown vs. the Board of Education court case decision in 1954 put a stop to segregated learning, education has yet to grow equally across the United States as blacks continue to trail in the rate of high school and college completion.

None of us had any idea what we were in for. Though our frat was an academically focused frat, they still had to break us down to think and operate as one so we could understand what true brotherhood is. It was only then that we could truly begin to understand ourselves and the needs of others. Through the activities we were about to engage in, we would emerge men instead of boys with a more directed focus and a stronger vision for success. A stronger understanding of what a true education was all about.

Our line was the 11th line of Sigma Sigma Pi - Alpha Nu Chapter. We had all struggled to maintain our grades and live up to all expectations of our big brothers. Looking forward to crossing over and the big step show of the Spring, we were working harder and bonding more every day. We were truly beginning to exhibit the traits of the expression "Bonded as one for life". Our goal, as pledges, was not only to demonstrate unity through determination to succeed, the support of all, to bond and to be the best line ever, but to continue the tradition of the frat goals of full participation in today's technological society, one-on-one tutoring, building community leaders, exhibit leadership and supplement the STEMs education of the disadvantaged community . All was going well. We were in the final weeks of our 2 month pledging period. We studied together, we had completed our pledge assignments and activities and were about to cross over when our big brothers mysteriously began to disappear. The first big brother to be kidnapped was the "Step Master". Campus and local police were alerted, but without evidence of foul play, they were unable to initiate an investigation. It had fallen upon the shoulders of the *Pledges* to take on the role of the CSI/FBI agents to not only locate the big brothers , but to solve the mystery of who was behind the kidnapping shenanigans. Our collective efforts would determine whether we would be able to enter and win the Spring step competition. Because we had reported the kidnapping, we were being watched by the police

and the Dean for fowl play as fraternities are scrutinized for hazing and other misbehavior on campus. We would have to solve this mystery ourselves. That's were our story begins.

After finishing up our nightly pledging rituals, we embarked on a conditioning run. It was a the usual run for us. On exiting the woods the Step Master received a phone call and was subsequently snatched. No one really noticed he was missing until we reached our destination across from the campus library. We called everyone together and after a massive brainstorm in attempts to gain some clues which would launch us into the right direction, we sent one group back to the woods and another group to the pledges lair just in case he had returned there. The "Step Master" line name square root line#5, was nowhere to be found. We did however find a phone. The phone had a two part message on it. The first part of the message said "pledges only " (meaning only a pledge could solve the riddle or locate the clue) –the second message gave a riddle as to where the first clue could be found.

As the Frat is named Sigma Sigma Pi and is a spinoff of the Algebra Project; the entire line has been given names based upon mathematical principles and concepts. We also considered the frat brothers' names to be possible clues to finding the big brothers. Fortunately the line included a few pledges with a science focus. This would come in handy while pulling clues together to solve this mystery.

Consideration of the forgoing would help us to establish a motive and identify key supporting evidence and information as to what happened and next steps/events which may have followed. As we collected information, we needed to come up with a motive of action in hopes that this would lead us to the actual holding place and culprits' of the abduction. We would need this information to make predictions and calculate distances from point "a" to point

"b" and to establish vanishing times and patterns. As we offered up information to answer these questions, we divided the questions amongst the pledges and remaining big brothers based upon expertise to begin the search. Of course one of the jobs was to call as many of our membership as possible to let them know what had occurred. With a campus as big as ours, the big brothers could be anywhere and we needed more help. There were many wooded areas, off campus and on campus hot spots, buildings and dorms which the big brothers frequented. Even it the text were specifying pledges only, we would use our big brothers as a life line and pool of information to expedite the resolution of this delima.

Why did this occur?

Was this event related to the upcoming step competition-- a jealous act to slow the frat down from preparing for the competition… or was this an act to rub the frat out?

Back Story

Adam Westley – The Villain and Big Boss

There are several people who apply or ask to be a part of a frat that are never invited to do so. Every once in a while someone gets really angry and wants revenge. In the case of Sigma Sigma Pi, they were a STEMS group with a heavy focus on math. This organization was extremely exclusive and only invited those figured to be astute and well rounded in that area. Basically the mediocre need not apply. In other words 1st impressions are everything. Two years prior to the kidnappings, a certain geek applied to Sigma Sigma Pi but was not accepted. Likewise, he

applied to several other fraternities but was not invited to pledge. This individual vowed to get back at all of the fraternities one day……and now the day has come.

Now a graduate assistant at the university majoring in psychology with a minor in math and science, Adam Westley has devised a plan of action to make the Sigma Sigma Pi fraternity as well as the others (Omega Psi Phi and Alpha Phi Alpha) who rejected him pay. He has devised a plan to hit Sigma Sigma Pi in the pride by eliminating them from the big step show. The reining champs, they have won every year for the last ten years. According Adam, last year was the last year that they will ever win. Not only will Sigma Sigma Pi not step this year, but their chapter will be removed from the campus altogether.

> "I will see to this…. You will never step at another competition and you will never reject another ever again. You see… you made a mistake when you made an enemy of me!!"
>
> Adam Wesley

No one would ever suspect him. No one would ever know that it was the rejected geeky guy from two years ago who had masterminded a scheme of deceit and revenge.

Chapter Four: *The Pledge* Game Production Narrative

Introduction

The development and production of this game has been quite a humbling and enriching process and experience. While it is clear that planning is a key component of any successful project, no amount of planning has been enough for *The Pledges* game. The more we attempted to move the project the more we had to research and on some levels rethink. Admittedly, much of this iterative process was the result of entry level knowledge to both XNA and programming.

In this chapter, I will discuss various aspects of the journey of building a game with a high school participatory game team. This account of learning and research will provide insight to the approaches taken to build the game, the learning that has taken place and the organizational strategies employed to move the game through its conception to completion stages.

Participation requirements

The initial student selection process for the participatory team began far before the end of the 2008-2009 school term. The primary concept of a participatory design team came about while in the Proseminar class. Through research, class and doctoral cohort discussions, I decided that if I were going to build a game which would reach an audience of 14-18 year olds of the urban demographic, I had better employ representatives of the same to help build the game and make decisions about its content. So, for the remainder of the year, I kept my eyes open for enthusiastic game developing programmers in my class and my partner's class. Between the

classes, roughly 6 students were identified. I was looking for students who demonstrated dedication, problem solving skills, commitment and skillsets suited for our endeavor. For a project like *The Pledges*, we were going to need a powerhouse team.

How was the team prepped and trained?

As the Game Designer, I began to research and pull resources together which would support the learning and development of the team and project. A disk was created which included:

- Visual Studio C# 2005
- Visual Studio C# 2008
- XNA 1.0, 2.0 and 3.0
- Tutorials for XNA based upon the Innovation Engine

After compiling this disk, I created the concept of a two day orientation period. The purpose of this event was to streamline and identify which students might be really serious about the game project; weeding out those who were casual observers. An Agenda was planned for each day. The first day included an introduction to the concept of the game by watching snippets *of Stomp the Yard* and discussing the movie *National Treasure*. *Stomp the Yard* provided the pledging and stepping concepts while *National Treasure* references provided the concepts of deductive reasoning, analysis and generalization which would be used throughout gameplay. Through discussions of these two mentor movies, the students would be motivated and better understand the pitch that I was making for the game. The second and final day of the orientation, the students were required to complete an application for the position they

thought might best suit their skillsets. The students were also required to take home a parent consent and student intention form to be signed by their parents. Upon the completion of this process, I interviewed each student individually questioning them about the specific job they chose. I wanted to make sure their interest and skillsets were aligned. Each student participated in an overview of XNA learning the basics of how the program worked by completing the XNA 2D tutorial. Upon the completion of this process, the students were given a production schedule and their first job to complete. Where we are not planning to use the avatar support at this time, we were all very excited about the XNA 3.1 upgrade as we would definitely be relying upon cut scenes to provide in-depth information to the player. As soon as I learned of its availability, it was distributed to each team member.

What type of communication system was put into place?

To increase product development and team communication, I created a Ning.com team communication site for the purpose of deploying information and collecting projects. This site also provided a safe place for students to discuss the project successes, problems and concerns. Forums were initiated on this site to include:

- Project Posting - a means of submitting projects for review
- Resources and Tutorials to aid in completing tasks
- XNA inventory – code snippets which might be used in developing the project

A Google docs account was also activated to allow the students to participate in developing project support documents. While the students were only required to come in for Monday

production meetings, they were welcome to report to the school studios if they needed a quiet environment in which to work. Each member was given my cell phone number as well as.

Participatory Team Progress Overview

The brainstorm sessions

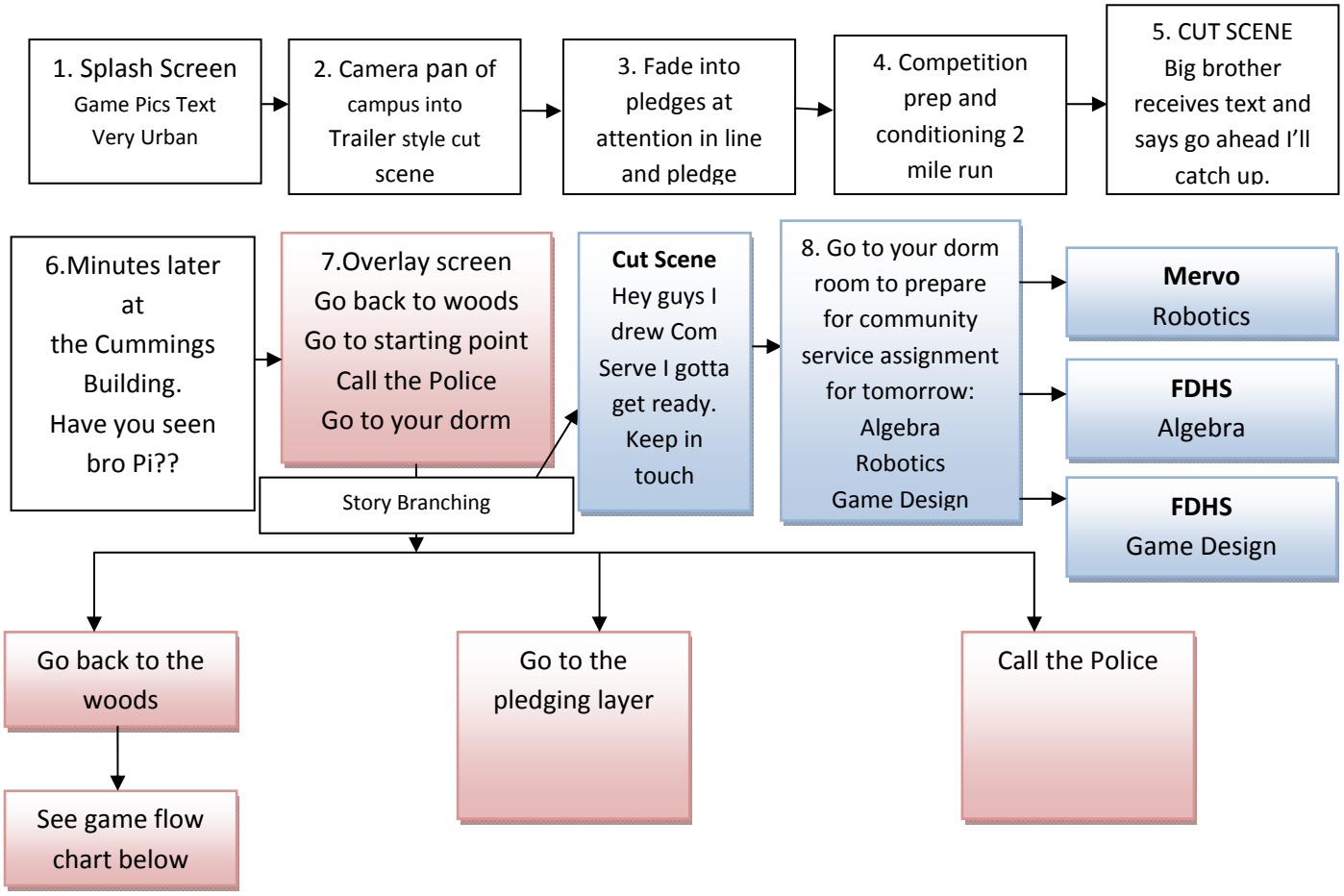
The brainstorming sessions were wonderful. The students were excited about the project and offered great concepts and solutions to problems at each session. After each session I documented the board notes and provided this information via our communication conduits. In the initial brainstorm which took place on June 5th, 2009, we attempted to cover every aspect of the game leaving no stone unturned. We examined and made suggestions for the positions we would need to cover for the development team, names of the pledges and big brothers, offering names like Pi, square root, cube, expo, D for division and Pli's for multiply. We discussed who and what gadgets would be in the game and even had a brief conversation about hazing. A surprising discussion included how to gameplay might tie into the college classroom. One student said that they should take classes to learn how build robots and program video games. Yeah..chimed another…if the GPA slipped, the player would lose points. A big discussion sparked off of the question "why would someone want to play *The Pledges* game?" It was important to all of us that the game be both fun and educational. Ideas were being offered so rapidly, it was all I could do to document them all.

By the end of the session, it was decided that robots and programming would be handled through the community services sessions with the high schools. GPA's would be based upon the PC students success at building robots and programming video games while the ultimate GPA

rating would be based upon the PC's demonstrated ability to apply algebra and data analysis concepts during gameplay.

This was a great session lasting a short period of 3 and one half hours. The team members were true troupers and they stayed focused throughout. The design doc sports many of the concepts outlined in this meeting. The students were in their mode, their "flow state" if you will. "I played a game the other day that did something like that" one said… "Yeah we have to have save states. It makes me mad when you do all that work and have to start the whole level over".

This brainstorm just touched the surface. Our next full brainstorming session was held on June 22, 2009. During this session, we drilled down to the next layer of information. The session started by identifying the villain then the frats which were being setup to take the fall for this kidnapping. Omega Psi Phi and Alpha Phi Alpha were decided upon. Next, we began taking a look at the flow of the game.



A plan of how the game progresses

This session also involved consideration of how math and data analysis would be incorporated into gameplay. We specifically focused on patterns of disappearance and clues given, taking a look at locations and proximity to areas the big brothers frequented. Another long session, upon its conclusion, it felt like we had a solid foundation on which to begin building a game. The session wrap was spent assigning members to more specific tasks directly related to game progress.

We were on fire. We flushed out everything needed to get this project moving. The answers to questions from previous sessions had been cleared up and we pushed the envelope even further. All we needed to do was start programming and modeling. We were all very excited. However, when the smoke cleared, we were spinning ourwheels…real hard…real fast. Frustration set in and people began to quickly drop off. Much of the problem was that I and the team were ill prepared for this task. It was becoming apparent that working with XNA for a quarter with five students was not enough to dive into a full 3D project with the expectancy of true programming success.

It was also really clear that the students were inspired by what they knew, had experienced and felt comfortable with ; but very few were willing to spend their entire summer working to learn programs under the constraints and guidelines offered. Even knowing that they could earn summer cash for their hard work was not a motivating factor for them. Working on this project, I suppose, was somewhat like participating in those work-at-home schemes you see in the newspaper. You get excited about the thought of earning money until you realize the amount of work required to net the return on your time invested, ultimately deciding that that job is not for you. I figured with the talent and interest of these young men, we could conquer all that was put before us. Call it naive, but I really did not think that this project was going to be quite so difficult. This was a big miscalculation on my part.

Strength in experience….One Brick at a time

Even though the prospect of pay for each completed usable component of the Pledge game was offered, the youngsters reacted exactly as they are…youngsters. Working on the Pledge game required hard work and dedication that they were not willing to apply. Of course, there is always

someone that sticks in. By the end of the summer, I had managed to hold onto one coder apprentice and one interested but equally ineffective participant. The disappointment in this team was that the student I had identified as the lead programmer dropped out of the project. This was a real setback as he had been the lead XNA programmer in my class and I was expecting him to mentor and facilitate the learning curve of the other students, leaving me to research answers to stumbling blocks. Unfortunately, this was not the way the team worked.

The students pulled from their personal experiences in the brainstorming sessions. Experiences from gameplay, comics they had read and the knowledge that had accumulated based upon their first year of programming in Game Maker. These experiences are what started and sustained the teams creative juices during our powerful brainstorming sessions. Through all of our planning sessions, we expected that *The Pledges* game would be a 3D game and we would need someone to build models. Because the students were on summer break, I tried to keep everything as portable, and as simple, as possible. Though the studios were equipped with 3Ds max, the student needed something that he could use at home. So, I thought it would be a good idea for him to learn Blender. I found supporting information, tutorials and even supplied a wireless mouse for this assignment. All other students were placed on programming detail. With so many sections of the game, we would need to tag team this effort.

One week went by with no projects submitted. Another week went by with no projects submitted. Blender presented challenges right away. We found it difficult at times to locate menus and settings that the tutorials called for. The spriter/modeler had a very low threshold for inconsistency and gave up within two weeks of the onset of production; even with the urging of his father that he continue with the project. I tried to bring in another spriter/modeler but with the same result. When it came to the programming of the game, the stumbling blocks

where magnified by their lack of experience in the C# syntax and XNA game studio programming as well as the developmental process for building and animating 3D assets. The students possessed little to no references to call upon to overcome the problem solving issues they were faced with. There was a lot of new learning to be done and they needed to dig deep. They needed to apply the concepts that they did understand to XNA game studio, but they were really not in the mind set to do so.

The good news was that I had one faithful student who continued to report daily. Even with his consistency, he was new to XNA and just did not get it. He analyzed the code and attempted to bridge his understanding of Game Maker to the idiosyncrasies of XNA Game Studio project, but made little progress just the same. His persistence and diligence in trying to learn the program were admirable and by the end of the summer he did get the models to load into the sky dome. It became clear, this assignment was too hard for the summer crew and my efforts had failed to hold their commitment. They were more interested in summer vacation than working a summer job and learning XNA. Their dedication and interest had slipped into the basement. Early August concluded the summer session of the student participatory game design team.

Reflection on first phase production

The success of the first phase of the project required several elements…willing participants, creative thinking, strong leadership and a strong understanding of XNA. The team started off with three coders, and three spriters. Hind sight says that I should have addressed things very differently. One option could have been to apply for a Youth Works section of my own where specified students would report to me daily for the purpose of working on the game. This way, the students would have been required to report and deliver a project. I could have taught

support lessons geared toward the project and they could have applied that knowledge immediately. The team would have been inspired to work harder knowing that they would be paid per hour not per project. Additionally, I would have been able to employ more people thereby covering more of the project in a smaller period of time. Another option which might have worked better would have been two levels of a participatory team. The high school students who would bring fresh concepts to the design that their age group could relate to and a college programming team who would focus on programming gameplay based upon the game design doc the high school students produced.

My attempts to teach XNA and develop a game of this magnitude thus far with this group of teenagers had proved to be unsuccessful. A frustrating experience for the students and myself, it has reminded me that the greatest flow state and brainstorms can be undermined, coming to a crashing halt, if the infrastructure of sound knowledge is not present. Had I decided to build the game in Game Maker, the students could have built the game with their eyes closed. We lost the battle with XNA because the students lacked experience and confidence and the leader lacked the knowledge necessary to solve problems with the proposed tool, XNA.

My Next Steps

I certainly was not about to throw in the towel on this project. Too much energy had been put into conceptualizing a project which we were most anxious to play test and share with others. My next steps included becoming more comfortable with the XNA platform and preparing to better lead my team down the road to a successful *Pledge* game. To bring this dream to fruition, I devoted countless hours to understanding how XNA worked. Reading and rereading the planning notes, I completed the design document so that all information could be found in

one place and I completing countless tutorials. For a while, I continued with the notion and mindset of developing *The Pledges* game in 3D space.

I was determined to create a skydome and terrain to import models into: so I did. While 3D has similar to 2D, there are many elements to consider. Your 3D world has to have a camera; the camera has to be positioned so that it is looking at the correct direction; you can zoom the camera in and out and much more. There is so much you can control and the level of difficult increases exponentially. I jumped through many hoops trying to get a model into XNA. Using both .x and .fbx formats proved to present unpredictable results. As a test, I exported a file from 3DsMax as a .dxf file then imported it to Blender only to export it as .fbx file. This was necessary because XNA only accepts .x and .fbx model files. Though this conversion was successful, the program Panda.X made things easier by eliminating the need to bounce between two programs. Though the load was successful, the model did not move. Through the reading I found that models were not fully supported by XNA and third party software would be necessary. Models vs animated models was another topic to research. I was not surprised as this had been the way of the journey in trying to get to know XNA. The constant rug pull.

After weighing very heavily the concepts and skillsets required to build a game in 3D vs 2D, I decided that I would step backwards and not create a game but rather a prototype in 2D space. Expecting to bring the team back on line at the end of September, I pushed it back to mid October and finally brought the teams back early November. I needed time to learn XNA, regroup and develop a stronger strategy for production success. This time, I would have to make a real difference in how the students were included in this project. My senior game students had spent an entire quarter learning XNA through the Microsoft XNA Pilot Program. Surely they understood XNA well enough that they could assist with the programming of the game. They,

along with the coding apprentice, were assigned to program *The Pledges* game. The cut scenes would be completed by the junior video class, the sound tracks would be completed by the junior audio students and the spriting would be completed by the junior game development students focusing on spriting. I would leave the junior programmers to finish up Flash programming as they were about to switch to the XNA Pilot Programming anyway. Revamping the participatory team by expanding it and spreading tasks across the classes seemed to make since.

Based on my early experience, I decided I would look up code samples for menus, game timers, sprite loads, model loads (I may not really need them but I researched them anyway), merging game code etc. From here I could disseminate this information to each department to support the problem solving tasks necessary. From November 15th to November 29th, I researched and documented game code samples for each event the game doc proposed. These starter codes included game state management, classes, NPC and AI movement and control, among many other problems.

Participatory Team Progress Overview - Part2

On November 30th, I had a discussion with the programmers. After disseminating the tasks, we found some holes that needed attention. It was also necessary to readdress the starting point of the game as production time was running short. We had to eliminate some features to meet the committee submittal deadline. One immediate question was: how does the game look upon startup? A rehash from the summer, but with a bit of zest as this time the programmers better understood the concepts of programming with XNA. We needed to answer the following questions:

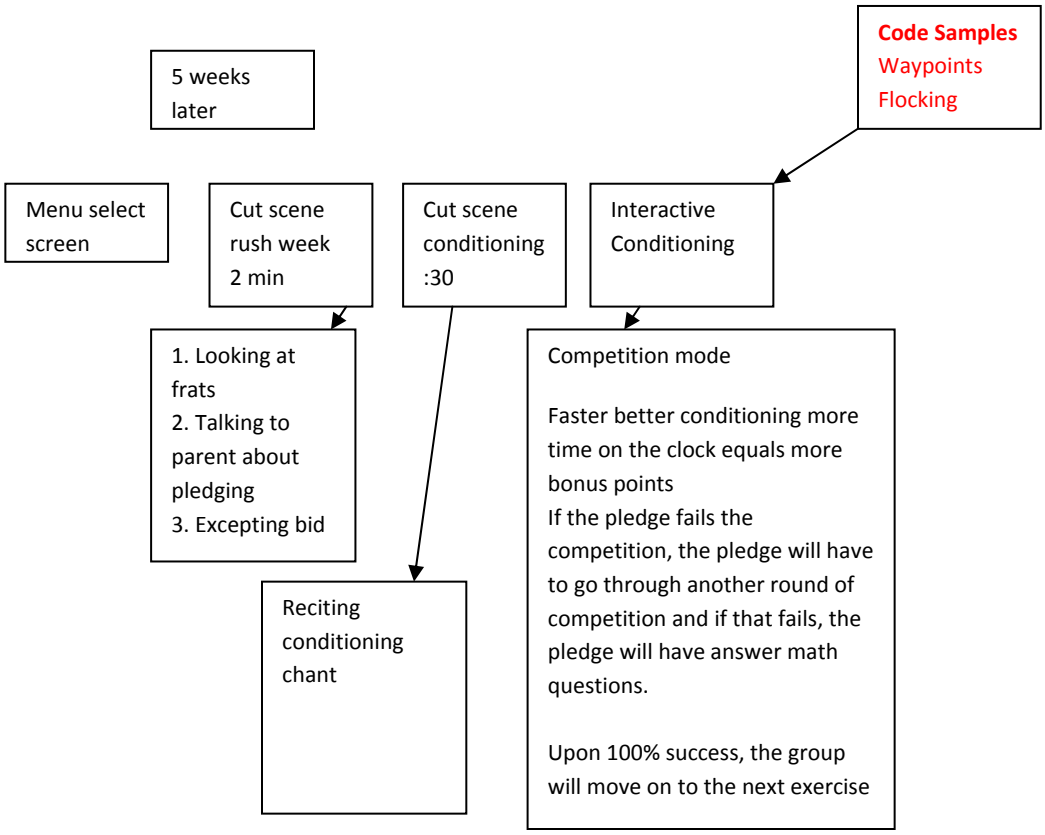
- How do we go from the menu states to gameplay?
- How do you get out of the party?
- How do you find out about the teleportation pads (When does the crazy janitor appear?)?
- How many lives will you get? – this needs to be updated in the design doc. It is set in the code for three lives to start, but it is not set to earn back lives
- How will your time and lives be added or subtracted to benefit your score or to make it more challenging?
- Do you get bonus points for killing the woods characters?
- How much time will you be given to solve each clue?
- how will you solve an equation on the game pad?
- How will the plays receive the clues for to find the big brothers?

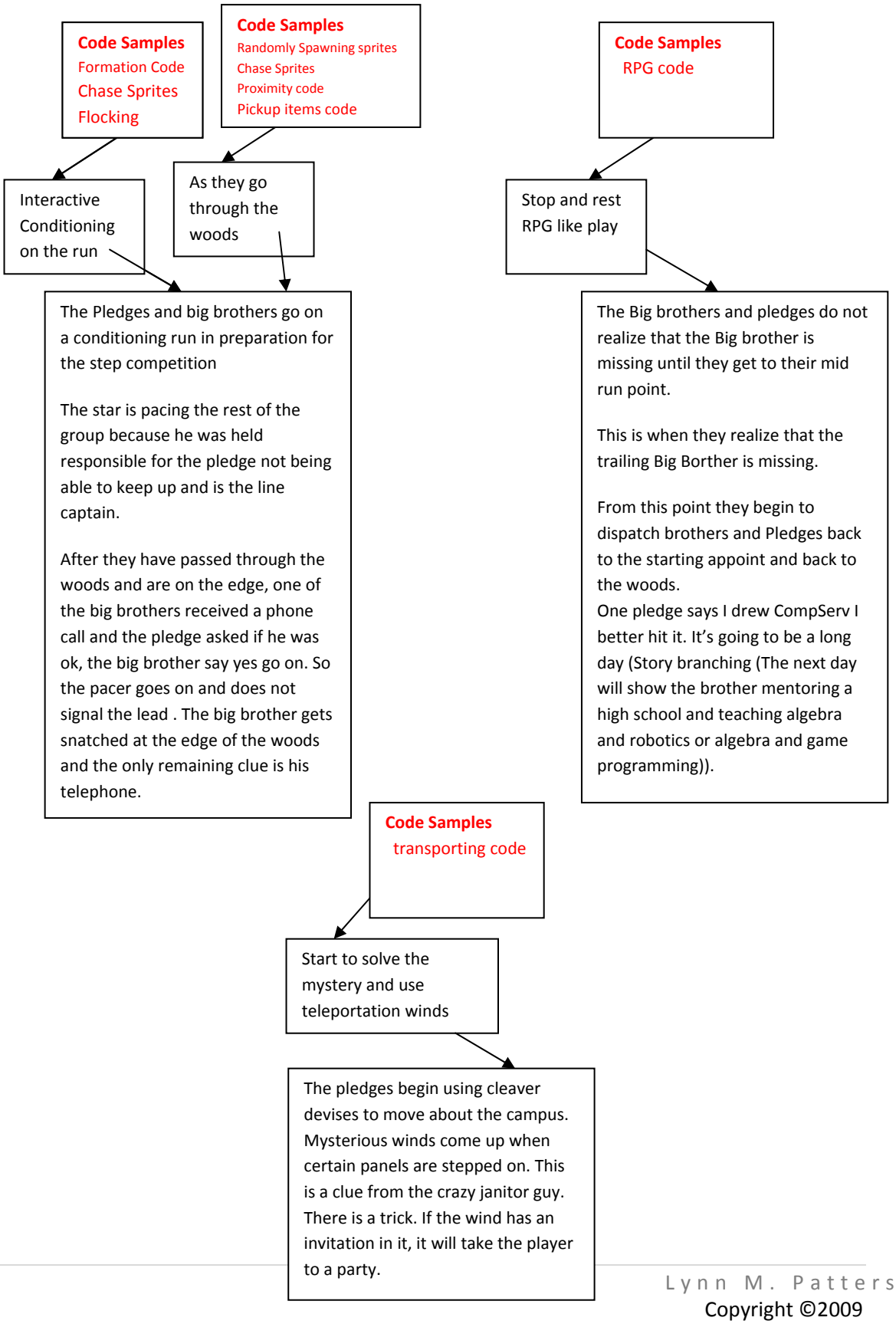
These were all great questions, but I still had a few more after reviewing the notes. Will there be a goon to fight to release the big brothers once the building is unlocked? If so will this happen by punching in the correct building unlock code/sequence in the teleportation wind or will the pledge only need to locate the brother in the building to release him? That seemed lame. I am thinking along the lines of the Zelda games with a little twist. I hope Miyamoto doesn't mind.

In the meantime, we created a chart which would help us to visualize how the code samples supplied might be employed. Because the students understood XNA better, it was easy to assign recent code they had analyzed to the events we were to include in our game.

Brainstorm

With each brainstorm we came closer to the home stretch. This time, I was not going to let things get away from me. To insure that each task was completed, tasks were chunked to eliminate the overwhelming factor. We play tested and analyzed the XNA Game State, RPG, Racing and platform samples together. It was at this point I decided that I must have uninterrupted time to learn more about XNA. I would have to take a week and focus only on XNA. Something I had never done before. I promised the team that I would have answers to their questions upon my return.





Train the Trainer

As the person responsible for guiding and training the team, I needed some professional development quick. During this uninterrupted period of time, I focused on the basic and intermediate skills required to build small applications as well as those skills needed to teach others to use XNA. I looked for resources that not only taught me about XNA, but concepts that I could use to teach my team as well as. Because of this approach, I was able to better understand the intricacies of XNA. I examined XNA during this one-week retreat where I not only analyzed but reused and encapsulated code becoming better acquainted with the whole programming paradigm. I emerged from this experience with a stronger understanding of how game states work, where to place the game start code, where and how to place the level up codes and a whole lot more. It was no longer a mystery. During this time, I read through two and a half books and made monumental progress. I have finally confirmed my understanding of how the game is initiated after you click on the play text in the player menu. A small victory perhaps, but I was taking any and all that came my way. I was quite humble and shameless at that point. Learning XNA had been, by far, the most difficult task I had taken on in quite some time. I had also invested a sizeable amount of time into this event learning these concepts largely, if not solely, on my own.

When returning to the team, I was able to share my progress. This let them know several things, one…in a short period of time I had answered many questions and solved many problems and two… it was possible to solve these issues and build a game in XNA. If I could do it, so could they.

The primary resources consulted during this retreat included a book by Miles entitled “Learning XNA Now.” It along with the mountains of tutorials and games that I had been analyzing were an

enormous eye opener. Knowledge is funny, you think you understand until something else breaks and the iterative cycle of research for knowledge resumes. Though a bit frustrating at times, I was determined to conquer the beast, which for me was not only XNA but programming in general. I was convinced that at the end of this venture, I would not only be able to confidently teach XNA, but lead a team to build games as well.

How will we teach Algebra and Data Analysis Concepts?

While the retreat was beneficial for my learning and understanding of XNA, it left little time for some of the other questions that needed to be answered. One such question was how do you include cut scenes in your game? I learned how to create a cut scene today (December 12th, 2009). Using a tutorial which I found at http://klucher.com/blog/video-support-in-XNA-game-studio-3-1/ .

Bringing it Together… Bridging the Gap

I learned how to properly format (encode/convert) video for use in the XNA 3.1 program. I then added the project to the XNA content pipeline, the required code to the game class and from this point was able to play and manipulate the video from the gameplay window. This was the easiest thing yet and we needed this functionality STAT, but there were still issues to hash out. On December 15th, I met with one of the coders. The purpose of this meeting was to identify how we would incorporate effective and engaging data analysis concepts. Additionally, as time was fleeting, we needed to confirm the prototype starting point. It was decided that gameplay, presented by cut scene, would ensue from the point which the line exited the woods. This was a good example of just-in-time learning.

Cut scene overview

The big brother (Step Master) receives a phone call and tells the pacer to keep going he was ok and would catch-up. When they reached their stopping point, Cummings Building (building #4), they realized that the big brother had not joined them.

Upon completion of this brief clip a selection screen appears for the PC to choose his adventure -- go back to the pledge layer, go back to the woods, call the police, or report to dorm room to prepare for compserve (community service). For the purpose of the prototype, no branching will be available and the PC will have to choose return to the woods.

Player controlled gameplay starts with the following:

Backtracking from the Cummings Building, as the pledges and big brothers come up on the woods, they can hear something off in the distance. They also see another frat running from the woods. They continue to approach the woods and the sound grows stronger. The player Character (PC) locates the sound and it's a phone. The pledges had actually been hearing the ringtone of the missing big brothers phone and a text message had been sent with a riddle. It was up to the pledges to use deductive reasoning and data analysis to solve the series of riddles and clues to come in a race to beat the clock before the level and all information and clues where randomly reset. Now…the phone was just the beginning and also the trigger or switch to the start of the whole woods

interaction. Once the PC picked up the phone, the items required to initiate the solution were turned on and would randomly spawn in the woods. Four items (a map, pencil, ruler and compass) would appear randomly in the woods and remain for about 10 to 15 seconds before moving to another location in the woods. With each iteration of appearance, the items would move deeper into the woods consequently moving the pledges farther from the location to which they would have to travel to find their first clue. This would make it more difficult for them to battle their way out of the woods. Additionally, a guard would be set to watch each spawned item. They too would appear randomly when the NPC and or PC approached the spawned collectable item. To fight the woods ghouls, the NPC and PC would use paint guns and paint balls. Once the player/NPC combo team had collected all of the items required (map, compass, pencil and triangle), they could begin to decode the text message left on the phone. The pledges would have to triangulate map coordinates (building locations). Once complete, the building unlock codes would be entered into the PC's inventory and the PC would need to transport, walk or run to the correct building to locate the first clue piece needed to begin solving the mystery ultimately leading to the location of the Step Master. This problem solving activity would move to a cut scene where they would discuss how to solve such a problem and successive problem solving measures would provide less help employing the scaffolding and faded guidance pedagogical ideology. The lines of the coordinates would be connected revealing a triangle type. The name of each triangle collected and the building unlocks codes will be important information for advancing in the game.

Consistent with all other brainstorms, valuable information was brought to light here. With this great start, on December 25th I finished it off. I decided that the Algebra1 concepts would be used to find clues and solve riddles; Data Analysis concepts would be used to answer questions about Historically Black Colleges and Universities (HBCU) and Black Greek Letter Organization (BGLO) and word problems would be used to teach robotics and game programming concepts. Locating the clues for each level, collecting two CPUs-- one from each of the robots, completing all compserve (community service) calls and staying away from the parties would clear the first. Gameplay on subsequent levels would mimic the prior level with increased difficulty and randomness. The final level can only be initiated if all other levels had been cleared and the required components collected.

Once again we wanted the game to be fun, so to add to the randomized concept; I created several riddles which would lead to the library. Likewise, there would be a complementary set of clues. Clues are given whenever the PC enters the building. These clues help the PC locate the game clue piece hidden at each site. Upon finding the clue piece, it would be entered into the PC's inventory and another riddle/clue set would be activated for the next clue. The game would supply random clues/riddles from an array set to adjust for iterative attempts to complete a level. This riddle/clue set formula would be used for successive levels.

With these particulars wrapped up, for the first time, it seems that we are firmly on our way to pulling together a prototype of *The Pledges* game. At this point, the first estimated play testing is scheduled for January 22nd, 2010.

Conclusion

"From concept to completion" – This is not an unusual phrase for those used to product management and production; but definitely not as easy as it sounds. My initial concept of a dissertation focusing on *Education through Games and Simulation*s sounded quite straightforward. I would have to research, learn and understand how people learned; why they did not learn; and after which conjure up an entertaining intervention through which I would engage people in a learning experience. Focusing especially on the subset of 14-18 year old urban students, I along with my team proposed to build a game which would include several Algebra 1 and Data Analysis concepts; and background information on HBCUs and BGLOs. We would subsequently assess what the player had learned through gameplay. In effect, testing the theory that this audience and demographic would learn better through a game than they were currently learning and performing in the traditional high school setting. Somehow, however, in the mix of things, I allowed myself to lose focus. Even though I considered my team to be a very capable team, it was after all a subset of the very population research has labeled as underperforming and lacking of motivation for learning.

Involving a participatory team was very important to the design process and success of a game of this nature. However, where the team sustained its creative infusion, it was sluggish in the programming department as the students were not properly trained to take on the games demanding programming and modeling needs. To turn things around, I found it necessary to retool myself with a stronger strategic plan and arm myself with the knowledge necessary to better support the XNA learning curve.

I visited several websites and completed many tutorials in my quest to understand XNA and to get a handle on programming concepts. Lessons learned in the aspects of programming were that typos kill and proper code placement in XNA is extremely important. A lesson learned over the summer, and one that I paid particular attention to throughout the fall semester. Additionally, while most of the tutorials I built worked well, there were several that were riddle with problems consequently eating up valuable time and rendering disappointing results. The moral of the story, review the experience of the author before investing your time in to any tutorial. My ultimate push in the right direction came from a book entitled Learning XNA 3.0 by Reed. It was this book that truly put me on the right track with game states, splash screens, the SpriteManager class, class inheritance, and the process of adding the score and power ups in an easy to understand step by step manner.

The trials and dilemmas incurred through this game development process spoke volumes to research I have conducted over the last two years. Whether you are teaching math, English, social studies, science or production, you must have active and willing participants to produce a product. It takes a strong team to top off a half full glass and when this does occur, it is usually because a one has imparted training to effect that change in a team's ability. Metacognition is not something that most students are born with. It is something that is learned through an enriched environment and the need to complete something. Based upon the summer disaster; through this semester, I have tried to build a hunger to learn in my students. Already proven that extrinsic interests are rarely motivating, it was important to pull on the intrinsic interest of the student. In this case that interest was the ability to learn programming in XNA, spriting and modeling with frustration removed. Given an inviting atmosphere without the fear of making mistakes and supportive feedback, we went to work. At times I would have a student who

better understood a concept teach the class. This strategy worked well and helped to push others who lagged behind. It was not long before each student began to work harder at their assignments entering into their own flow state. They began to challenge each other and it was evident that their thirst for knowledge was growing, their want to succeed was increasing and the road to metacognition was initiated. Because of this rethink and because of the reimplementation, I have sprites and conceptual art for the game; and programmers that are willing and able to move forward.

I have more at the conclusion of this team session than the summer session and feel that that is success in and of itself. The summer session assumed the students metacognitive state where this semester has initiated metacognitive millennials. The students are primed now and they are not afraid to look for their answers, nor are they quick to give up when things go poorly. Once a student's mindset is changed, it does not matter how knowledgeable the students or the instructor are because, the team will work to find the answers to the problems and together fill the cup of knowledge. It was clear that students would attend to projects and concepts they understood and knew how to retrieve more information. This speaks to how we learn, I believe. As of course, this entire project is based upon how people learn and how we as teachers and researches can most effectively reach our audience.

I found that my thirst for knowledge and answers to so many questions spiraled into a huge pocket of wasted time. It appears that for the most part, the information I require has been at my fingertips for months. Just as with the writing I have turned into a compulsive research. Constantly looking for what is right in front of me.

In many instances throughout the production process, I am not sure that I did not understand XNA and programming as much as I did not have anyone to confirm that I was right or wrong in my approach. This is quite interesting from and instructor point of view. I find myself wanting to see examples of every problem I am to conquer instead of sitting and thinking them all through myself. Also, sometimes I just did not know how to dissect a problem. Wanting to break the problem into smaller pieces became elusive and frustrating. It seems that no matter the age, without experiences to call upon we all require mentors to confirm and provide feedback to support our level of confidence in our abilities and growth. Because of my uncertainty, I became a habitual researcher. Though I found an answer which seemed to be sufficient, I found it necessary to find at least three other sources which stated the same or similar information.

Chapter Five: The Conclusion

Introduction

All children can learn, but all children will not learn the same way. Education should be equal and education should be consistent but education does not have to be delivered in the same manner. In consideration of varying learning styles and situations, a more creative and flexible means of educating our youth is required for not only my project demographic, but our Nation. It will take more than a village to make the changes needed to capture and redirect the underserved urban population. The school system cannot do it alone and too many homes are disconnected. People like Frederick Douglass succeeded despite everything that attempted to drag him down. He fought his Master and when he came to Baltimore he beat the system and eventually escaped to freedom. It was through cunning, foresight and deep thought that he was able to get far away from those that attempted to keep him from gaining is freedom and the ability to read without oppression. Frederick Douglass won his war. The underserved urban students and families are in a war. Thus, a war with themselves in a down spiral which has and continues to drag down decades of equivalent generations of black men and women; the population has lost themselves in self pity and hopelessness. It cannot be left up to the schools. It is up to our Nation to retake and redirect this situation which will never change unless positive outside forces intervene.

Where will I take this project next?

Games like *The Pledges* have the potential of assisting with this problem. The sheer concept of a game based upon a Historically Black College and University is not only unique; it is something that the target audience of this project can truly identify with. Gee (2004) speaks of identity in terms of the *Identity Principle*. A principle which allows the player to reflect on their reality, make choices and experiment with relationships. I am extremely interested in putting together a team to build this project because this type of game would allow my demographic to reflect upon and envision themselves in these situations. Something that gameplay does inherently. Put together as envisioned, the look and feel of this game would rival any commercial video game currently available while providing a hidden avenue of learning. I feel that this project has the potential of blossoming into a series of learning games which would, under the guise of commercial off the shelf video games (COTs), be as popular as *Grand Theft Auto* or any other blockbuster title on the market.

To build this game, a talented game development team touting advance skillsets would have to be composed. As a typical game could take as long as three years or more to complete; I would first need to identify two people, preferably a graduate student and an undergraduate senior, to head up the project. This measure would insure seamless production from start to finish. From there, and after laying the framework for a plan of action, we would initiate a massive team recruitment process.

The Team Recruitment Process

In consideration of building a team, a request for proposal (RFP) or similar invitation would be developed which would be used to solicit interested parties to take part in the project. The invitation would be extended to prescreened institutions which have a proven track record for grooming high-level talent with a game development and/or digital arts focus. All interested parties would report to an interest meeting in person or via video conference where a project overview and briefing session would be conducted. Upon the completion of the process, production meetings and assignments would ensue.

Taking the Game to Production: Managing the Dream Team

After everyone is on board, the real work begins. Completing the project while utilizing college students on a semester schedule would require creative maneuvering of teams and workflow from one semester to the next. It is expected that some semester schedules may not align and those situations would be handled on a case-by-case basis. Organization and accountability would be key points of concern. Therefore, a game project guide would be initiated prior to the first team meeting and additional information would be added or updates made as the need arose to insure consistency in the look, feel and direction of the project. This document would include pertinent project requirements ranging from items such as the number of polygons a model could have, the number of animations a model should have (required movements/suggested movements) to the look of the game tiles, game dome specifications and even the number of game levels . Where individual creativity will be invited and necessary, I, as well as the co-chairs, will work diligently to insure that the authenticity and continuity of the overall project were maintained. For that reason, various stylistic coaches would be brought in

to insure authenticity. The teams would basically be working in swing shifts. Projects would be due at the end of each semester with check ins and submissions throughout the semester to ensure that each assignment progresses as expected.

To keep the project on schedule, we, at times, might double, maybe even triple, the amount of people working on the project. For example, if we needed 20 models, we might have 30-35 people per semester just working on models. Why would we consider so many people? More people on task equates to more work completed in a shorter amount of time. Because, in most cases, the staff would be changing with the close and start of each semester, the project managers and staff would have to be very meticulous about adhering to asset assignment specifications. This requirement would insure that as the game passed on to the next production point, it could be seamlessly incorporated as intended. Likewise, the participants would be required to maintain a build journal. This journal would be submitted with the project and monitored throughout the semester. Once again, with the staff in constant transition, the current team would need instant access to notes to assist with troubleshooting problems, issues and concerns relative to each project submission and overall project inclusion. The assets and elements would be periodically assembled and tested in preparation for the final project, subsequent revisions and distribution. Building the game in this manner could mean that as many as 100-120 people might have worked on the project. However, the project will have continued to move through the production stages and will have been completed in about half the time as a normal time table for building a commercial video game.

Taking the Game to Production: Product Delivery and Production Meetings

With the possibility of the project participants residing outside of the home team area, communication would be enhanced through the various web 2.0 tools available such as social networking sites like Ning.com and teleconferencing services like Skype and Dim Dim for the discussion and submission of project progress, developments and concerns.

What will I commit myself to next in this project

Though most students may be participating on an independent study credit from their institution, I would like to secure a research grant which would cover participant stipends; the research and development process; and project distribution cost. From the perspective of hands on product development, I would like to participate in the committee decisions of curricular content and assessment and game audio production (engineering and or overseeing the process).

What are the odds that part two will happen?

I believe this chapter speaks to the extreme of game development teams. Is this something that could actually happen? I truly believe that it could be pulled together. The key determining factor of the success of the project would be the obtainment of a grant to support the entire development process. Because of game development's increasing popularity, I believe that staffing a project of this nature would not be difficult. I expect that gaining financial support to fund the project will be the largest challenge. For this reason, I plan to look into the grant

process and philanthropic organizations, NSF and others for possible funding options. At this point I feel that there is a 50/50 chance of the project progressing to the next step.

What would I like to be able to do with this project?

Upon the completion of the project and before global distribution; I would like to test the game in a pilot program which would allow my team and me to collect quantitative data on the performance of the game and the player/ learner. This feedback would inform decisions regarding the value of the game and identify the need to revise any aspects of the project and whether or not to move forward with global distribution. With a game focused on teaching underserved urban students age 14-18, my first concern would be to place the game anywhere that this audience would be able to access it. My initial thoughts of placement include high schools (math department, guidance department, library/media center), public libraries, recreational centers and on line access.

Could you speculate about what the next game/learning effort should be like?

While this placement addresses the vast majority of the intended audience, the foregoing placement not only limits access and availability to the intended audience, it limits the possibility and access by a broader audience as well. My introduction to this chapter stated that it would take more than a village to turn the concerns of educating this failing population around. To address the whole problem would mean that people from all disciplines would need to contribute to the continued education of the general population. Perhaps we need to institute a new paradigm in life. Perhaps we need to institute ways of providing professional development (PD) throughout life which help fulfill the need of lifelong learning. For example,

when hired to work for a firm, there is usually some type of periodic professional development (PD) required to sustain that position and build the skills necessary for advancement. Anytime learning infused COTs could be the premise of this much needed PD for lifelong learning.

This is the principle upon which *The Pledges* game is built; the premise of building learning into COTs so the masses can experience lifelong learning and enrichment. Several companies have already begun to *teach and play* however, more titles need to be created. Games like Call of Duty, Medal of Honor and Soldiers (discussion and history of World War II), Civilization (building and the understanding of empires starting from 4000 BC and reaching into the future), Spore (focusing on science, specifically biology, from the perspective of species development and evolution through space exploration) and the like are providing a wide range of learning concepts to its players while providing hours of entertainment and engagement. Engagement is, from what research reports and I have observed firsthand, what many traditional classrooms seem to lack. The lack of engagement and relativity is the prime contributing factor of why underserved urban students are not learning and consequently losing interest in school. Additionally, most classroom lessons do not provide a relative environment or experience for the students to cling to or identify with. Employing commercial off the shelf games infused with educative material, people across the world would always be stretched to learn.

To build a professional game requires skillsets that most educators do not possess, nor would they want to expend the time, money and resources necessary to develop these skillsets or a game on their own. For that reason I am not suggesting that an educator should just jump right into the business of game development. I am suggesting that the concept of lifelong learning through COTs would require a team effort between pro gaming companies and educators to insure that the educational value was present and the inherent nature of games that make them

so enjoyable was not lost. This partnership would generate games where the player would learn and/or review content pertinent to a particular curriculum however intentional or unintentional it may be and the games remained entertaining and engaging.

New examples of educational COTs games may be the incorporation of gameplay which engages the player in what is generally implied but not acted upon such as the other side of superman's Daily Planet. In this game, the player would be tasked to build, staff and run a newspaper. Where the player would have the ability to play the superman adventure, the focus would be on the writing aspects necessary to present a product. In this case, the player would have to produce a paper for the public to read. Turn that scenario a bit and a game could be created based upon the accounting that goes into running such a conglomerate. After all, someone has to count all of the money that is required to run a business. Another example might be Bruce Wayne's trust fund. Who manages that? What if a Batman game was built around someone charged with the task of managing his affairs? There are many scenarios upon which games could be developed while infusing educational matter and still provide an engaging and entertaining backdrop and environment. Games built in this manner would not only introduce and support learning on various levels, but careers as well. It is almost like blending a casual game with a major video game. Approaching games from this perspective would be a bit different, but might pull a larger audience for the game companies because of the extra benefits of gameplay. Once again, to maintain the look and feel of today's COTs, the major game development companies with the manpower and experience would need to buy into this concept. Thus insuring the quality of the game development industry and the type and quality of game this society requires. While revenues for the big gaming companies may increase, it is hoped that people would be learning. The requirement for games to be built on this level may

alienate some of the indie and entry level game development companies because of the high stakes development required to compete.

What is wrong or different about game programming that makes it so hard for the main stream population to grasp?

Firstly, if game development were easy to do, everybody would be a game developer, and it would not be special. Not only must a person interested in game programming possess a strong command of programming skills; to building a serious or commercial video game, a person must employ strong project management skills and a clear understanding of the game production process as well. Poor management and production process skills can make or break a game and the timeline and budget it rides upon. In this section, I will discuss why I believe the entry point into game programming is so difficult.

Game programming reminds me of the explosion of electronic music production in the 80's. With the production of synthesizers and drum machines incapable of communicating with each other; it was difficult for song writers and engineers to interface the instruments. With each manufacture producing instruments with unique sounds and ports, connecting one instrument to another was difficult. Consumers and manufactures needed a common and consistent method of communications between them. The ability to universally control electronic devices was a move which not only made instrument communications easier, but saved production time and money as well. This fix was called MIDI (created in 1983), an acronym for music instrument digital interface. This invention standardized the communication between electronic devices (keyboards, drum machines, mixers, etc…) allowing them to talk to each other and is the basis of the concept of universal serial bus (USB), firewire and the like.

It is apparent that many people struggle with the concepts of game programming and that there is a need for ground level standardization. Visits to the forums tell the story. There are thousands of strands with a broad range of questions relating to this topic. How do I get started in game development? What is a sprite? How do I add particle effects to my game? How do I use XML in my game to make a journal? I am not an authority on this matter, and only offer information based upon the observations I have made through the use of the forums as well as my struggle to learn the art of game programming. To me, game programming is hard because there is no real entry point or standardization. There are no sequential steps and/or baseline information for people to refer to and, if it exist, it is quite frequently missed altogether. Game programming, a subset of computer science, is an art form many people are interested in learning. The vast majority of the participants have not gone through nor are they interested in sitting through computer science classes. Though there are several game programming books on the subject, many people have turned to the internet to assist their learned process.

With web 2.0, the internet creates many authors. In fact, anybody and everybody is an author, or so it seems. Finding information is as simple as inputting keywords into a browser and instantly the information require is presented. Whether there is a need to find out about a medical condition, directions from one location to another or even how to build a game, there is usually an instant response which can lead you in a direction which may assist you or help you to complete a task. Sometimes the information is provided in logical steps and written on a level you can understand and sometimes it is not. Where many people have been quite successful with tracking down the information needed to move from one aspect of game programming to the other, many people have gone through great lengths to find information which in too many cases barely meets their needs. Where the forums and volumes of tutorials attempt to help,

most tutorials are not written by teachers and often lack the true support needed to fully understand what is being taught. These searches often require a huge time investment and all too often the tutorials do not work.

The process of developing a game is quite involved as there are many aspects to consider. When you are trying to learn a task that is as inherently difficult as game programming and you know little to nothing about the subject, it is difficult to know exactly where to start or even which questions to ask to retrieve the information needed.

I see the following as important aspects and concerns in understanding why game development, specifically programming, is so difficult. Firstly, the cognitive drain programming presents is extremely high. The requirements of problem solving increase the possibilities of cognitive overload exponentially. Secondly, I believe, to truly understand the problems with game programming, we have to answer the following questions:

- What information should be learned and in what order?
- What is the process of learning game programming and by what method(s) should this information be delivered?
- Should this be a tutorial, lecture, guided-lecture or experimentally based lesson?

I recently found information which speaks to the forgoing questions. A site which offers information and may be of help to others seeking baseline information in getting started in the game developing field http://www.make-video-games.com/ . The information at this site,http://www.make-video-games.com/ebook/howtomakeavideogame.pdf, provides some information for the noob (a person that is new to video game development). This site

http://www.make-video-games.com/game-school/1c-textures-in-video-games.htm gives the learner some background information on game development and concepts necessary to begin game creation. Resources like these would have been of great assistance twelve months ago. I believe that its inclusion in this document might help others who follow and require guidance in their game programming quest.

How do I feel about the direction we are heading in with game development?

Where game development continues to present challenges and barriers to entry; several companies like Microsoft, Nintendo, Unity and others are offering, for free, opportunities for all interested to become indie game developers. Prior discussion points to the difficulties most have in understanding and building games, none the less the tools are readily available. These opportunities are attracting more and more people to the game development arena. Already, people with little to no formal game development training are creating and publishing small games and mobile apps attracting more and more people that are interested in doing the same. Some companies are even making claims that you can build a game in 60 minutes. I personally find this claim to be a bit misleading. One such claim (http://msdn.microsoft.com/en-us/library/bb975644(XNAGameStudio.30).aspx) requires that you complete three tutorials before the starting point of tutorial four. If you do not build the first tutorial you will lack the support knowledge to understand and complete the balance of the lesson. The total build time definitely adds up to more than 60 mnis.

Claims of this nature perpetuate grandiose ideas and false hope. So many people approach game development with miss-guided thoughts of creating *Grand Theft Auto* or the like almost

straight away. While there is much information available to support learning of game programming and development, it is not as easy as the naive may think. With all the intricacies involved in producing a game, people new to gaming do not realize that the completed games that they buy and play are the direct result of teams who have worked toward one common goal for months, probably even years.

To build games on a pro level requires superior knowledge and understanding of all facets of the game development team and their work flow. Where the better indie programmer may be able to build a pretty cleaver game engine, Unreal and Unity provide an opportunity to put out some top notch titles.

New markets for game development

The thought of building a game to many is very exciting, so exciting that people fanaticize of building games for the PS3, XBOX and Wii. Until recently, the reality of building commercially competitive games has been cost prohibitive for the Indie game developer. With the Epic Games recent release of its Unreal Development Kit (UDK) and Unity's free release of its 2.6 software game development options have been broadened. The price tag to build commercial games has been significantly lowered and these tools are available to everyone for the best price ever. They are FREE!!! Better yet, the possibility of building a game for the PS3 now exists for the Indies. Microsoft and Nintendo have also recognized the needs and interests of a growing population to try their hand at creating games. These manufactures have opened their systems availability for integration and game development through the use of programs like XNA Game Studio using Visual Basic C# as the programming language which enables the developer to create and build games for the PC, XBOX 360 and the Zune. Nintendo has made available a

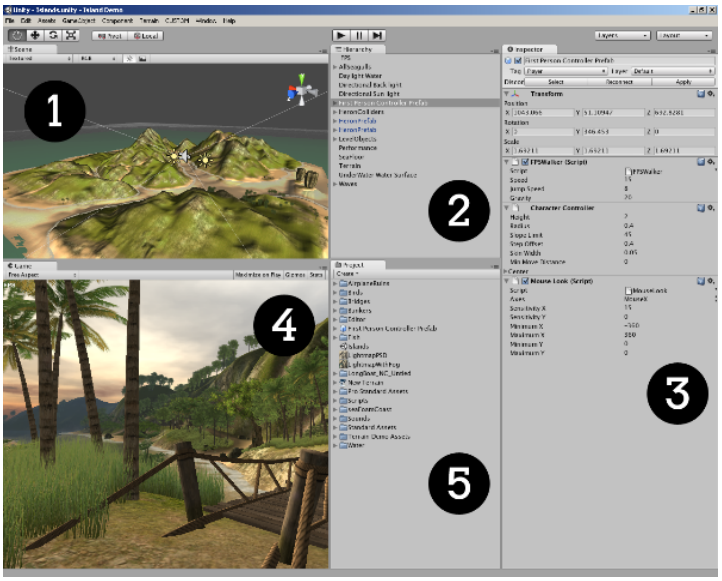
program entitled WiiWare, intended for people that have some understanding of game development and allows people to create games for the Wii. Unity allows the user to build applications (games) for the PC, MAC, Wii, iPhone, and has expectations of adding Xbox development as well.

Through the development of more simplistic programs, these manufactures are making it possible for the general populous to create video games. This is a great step which allows many to try the art of game development but once again requires people to understand the concept of game development to make the best use of the tools.

Unity, a program which is growing in popularity, has brought some interesting options to the indie game developer. After struggling with the XNA software for so long, a recent demo of the Unity software provided many supports that seemed to make the task of understanding and building games a bit easier. I especially liked the graphic interface; a feature which, to me, makes game development a bit easier. In XNA typing F6 to debug or F5 to debug and build provides some fairly quick feedback, but I really liked the Unity interface overall.

Unity's slogan, *develop once—publish everywhere* holds true not only for the operating systems, console and mobile apps, but for web browser deployment as well via its web player plug in. XNA is very different. The completed game must be downloaded to play. While this is not a comparison to declare which package is best but merely a discussion of ease of use and affordance offered by the software packages. It is clear that the preference of the developer and type of output required would be more of a deciding factor as to whether a person would chose one software package over the other. Personally, I believe that had I known more about Unity

before initiating my project, I would have chosen Unity over XNA because of its interface and output options.



Scene [1]—where the game is constructed

Hierarchy [2]—a list of GameObjects in the scene

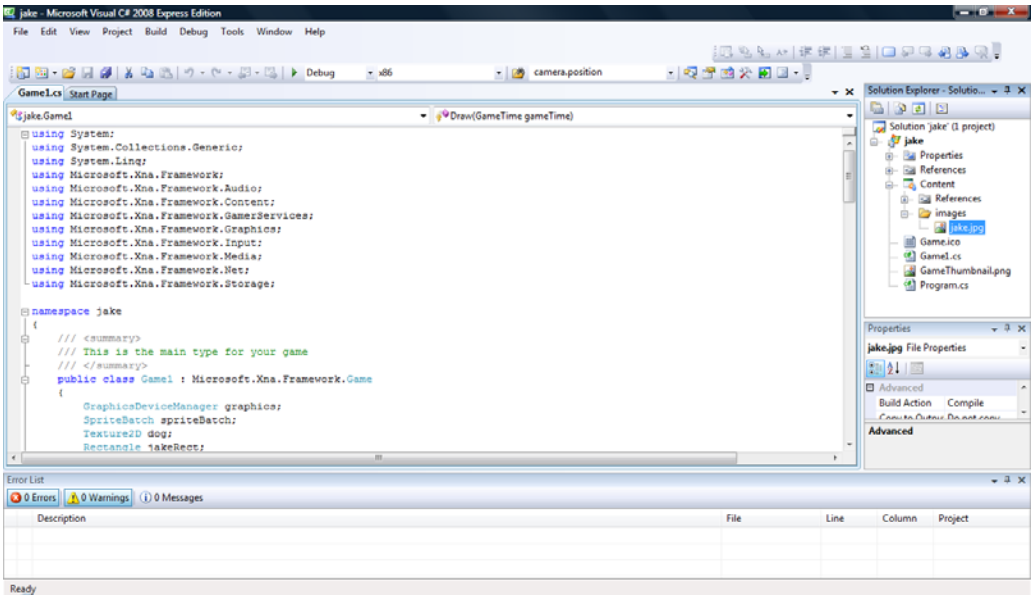
Inspector [3]—settings for currently selected asset/object

Game [4]—the preview window, active only in play mode

Project [5]—a list of your project's assets, acts as a library

http://www.packtpub.com/article/unity-game-development-welcome-to-3d-world

A screenshot of a typical Unity workspace



A screenshot of a typical XNA workspace

Conclusion

According to Calkins et Al (2007) “five percent or 5000 of America’s one hundred thousand public schools, representing more than 2.5 million students, are on track to fall into the most extreme federal designation for failure by 2009-2010”. This was a prediction that has come true. Can we afford to wait any longer? While learning through games may not have the supporting qualitative and quantitative data most educators and researchers want to see, it has been proven that people can and will learn through gameplay. The reality is that today’s school model is not preparing these students for 21st Century learning. With so many programs and school systems failing the underserved urban population across the country, I cannot understand how we as a research and learning community can afford not to put games to work. Time has run out while we have been waiting for the answer. The answer is here and it is recommended that learning through COTs as prescribed herein not only be researched, but developed as a supplemental and additional means of providing on demand anytime learning for all.

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