STUDENT PERCEPTIONS ON GAME CONTENT CREATION IN AN IT CURRICULUM THAT INTRODUCED SERIOUS GAMES

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ABSTRACT
The aim of this study is to reflect on the perceptions of IT students on the inclusion of game content creation in an IT curriculum. Until recently, the undergraduate program for a Bachelor of Science degree in Information Technology at the North-West University, Vaal Triangle Campus (NWU VTC) purely consisted of theory and practical modules directly related to hard skills such as programming. There has not yet been a need to include any artistic skill training until now. Recently the university has started translating some of the IT modules into educational content for the creation of serious games. This study serves as the first report in an action research approach to determine the need for game content creation skills in the IT curriculum at NWU VTC due to the increased number of modules that now include serious games design.

KEYWORDS
Game content creation, serious games, artwork, IT curriculum, student perceptions

1. INTRODUCTION
The aim of the study is to determine the need to include modules in an IT curriculum that address game content creation. An increase in the number of modules containing serious games content have created awareness of the possible need for artistic skill training. A serious game can be defined as a game where entertainment, fun and enjoyment are not the main goals of its use but rather the educational value it provides (Michael & Chen, 2006:21). Game content can be defined as all graphic resources needed for a gaming environment such as the user interface, textures, models, animations and sprites.

Students exposed to serious games design were asked to share their perceptions and experiences with regards to the creation of serious games, game content and their need for content creation training. Section 2 provides a brief literature review on the key concepts of serious games and game content creation. Section 3 provides a history and discussion on the introduction of the Serious Games Institute of South Africa at the NWU VTC and the resulting interest in serious games concepts in the modules of the IT curriculum. Section 4 addresses the research methodology, procedures and data analysis used in this study. Results obtained from the feedback of the data collection are illustrated in Section 5. The findings discovered from the data analysis are discussed and recommendations are made in Section 6. Section 7 concludes the study and proposes possibilities for future research.

2. LITERATURE REVIEW ON SERIOUS GAMES AND GAME CONTENT CREATION
The aim of the brief literature review is to create a shared understanding on the concepts of serious games and game content creation.

2.1 Serious games
A serious game can be defined as a game where entertainment, fun and enjoyment are not the main goals of its use but rather the educational value it provides (Michael & Chen, 2006:21). The intention of a serious game is to educate the user about a serious topic. These can range from skill training, military training, medical training and all levels of education whether it be maths, science, biology and so on. Beggs et al. (2009:174) further support the definition of serious games by describing it as software or technology that is created according to game design rules for the purpose of training or educating users on a serious subject. The goal of a serious game is to inspire, motivate and improve the engagement of users by reinventing the learning process (Marcos & Zagalo, 2011:146). Serious games are an excellent source for teaching external abstractions such as science and mathematics but could possibly fall short when representing philosophy and introspection (Marcos & Zagalo, 2011:146).

An example of a medical serious game is JDoc which exposes junior doctors to the everyday stress experienced in busy hospitals (Sliney & Murphy, 2008:131). The serious game simulates patient scenarios using parameters set by senior doctors, it immerses the player in a hospital-like 3D setting and educates the player on diagnostic processes. The user’s actions are logged by the system and reviewed by senior experts. An example of a
serious game for skills training is Flame-Sim which provides fire training for firefighters (Flame-Sim: 2013). It provides high pressure 3D immersive scenarios for prompt decision making without the danger that a real–life situation holds.

In order to create these 3D environments and objects, the need for people who can do both content design and programming increases (Tsai et al., 2006:219). The creation of games is a multidisciplinary environment that includes technology, art, design etc. (Marcos & Järjalo, 2011:143). This statement is also supported by Tsai et al. (2006:220) who mentions that programmers and art designers need to work very closely together, especially in the gaming industry. Adams (2010:54) further supports the importance of a good working relationship between the lead artist and lead designer as they share the same project goals. Adams (2010:53) states that the artist is responsible for the visual assets such as sprites, animations, textures and models. These are commonly referred to as game content.

2.2 Game content creation
The creation of games is not merely a programming activity but also includes content design and creation. Game content, as previously mentioned, includes all graphic resources such as the user interface, textures, models, animations and sprites. Artists generate game content using a variety of software such as Adobe Photoshop, Adobe Illustrator, Adobe Flash and Blender for example. Without these software tools game creation would be very unlikely.

Software tools allow for different styles of game content design that can include the creation of 2D and 3D textures, objects and environments. When creating game content it is also important to take the point of perception into consideration i.e. the position from which the player perceives what’s happening in the game environment (Järvinen, 2002:115). Jenkins (2004:119) labels the design of a game as the sculpting of space seeing as they are fashioned to lead the player through detailed skill development. For a serious game to be engaging to the user, the visuals and graphics need to be as rich and as accurately depicted as possible to the real-life scenario.

In order to create rich game content, the artist needs to be exposed to a variety of visual art such as drawing, photography, painting, lighting, sculpture and technical illustration (Ahearn, 2009:4). These skills do not come naturally to all people and even the most creative artists need some form of formal training.

3. SERIOUS GAMES AND GAME CONTENT CREATION IN AN IT CURRICULUM
The Serious Games Institute of South Africa (SGI-SA) was established at the North-West University, Vaal Triangle Campus during November 2011. SGI-SA focusses on both commercial and academic applications within the environment of the university, more specifically in the department of Information Technology (IT). During 2012, one module in the BSc IT degree was adjusted to contain topics regarding serious games. Now, in 2015, team members of SGI-SA are responsible for 6 modules containing serious games concepts. There are also 5 other modules presented by lecturers not part of the SGI-SA team that refer to topics on serious games or use a serious game to educate their students. There has been a growing interest in serious games development since the establishment of SGI-SA, as they have taken part in both national and international projects.

Due to the shown interest, one of the long term goals of SGI-SA is to present a postgraduate diploma in serious games. However, in the immediate future, SGI-SA tries to incorporate serious games concepts in as many undergraduate modules as possible. SGI-SA has also taken into consideration the possibility of presenting an undergraduate degree completely dedicated to serious games design. Students that formed part of the evaluation of this study were asked whether the university should consider this possibility. Their responses are illustrated in Figure 1.

![Figure 1. The NWU VTC should or should not consider presenting a serious games degree.](image)

Even though 93% of the IT students indicated that the university should consider presenting a degree in serious games, only 4% of students indicated that they would change their degree from IT to serious games design (Figure 2). 53% indicated that they would still rather study the degree in IT which they are enrolled for and 43% indicated that they would consider a degree in serious games only after they completed their current IT degree. When asked why, students indicated that a degree in serious games would be a very specific skillset and that job opportunities in this regard could be very limited. The feedback also suggested that the
concept of serious games is very interesting and that some of them do enjoy the design of serious games more than system programming. The students also suggested to add more modules that address serious games to the current IT degree which is supported by the feedback illustrated in Figure 3.

![Figure 2. A degree in IT or a degree in serious games.](image)

Should more of the modules in the BSc IT degree contain serious games topics?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>61%</td>
</tr>
<tr>
<td>No</td>
<td>21%</td>
</tr>
<tr>
<td>Not sure</td>
<td>18%</td>
</tr>
</tbody>
</table>

![Figure 3. To add or not to add more modules containing serious games concepts in the IT degree.](image)

Given that 61% of students would like to have more serious games related modules and 21% can still be persuaded as they are unsure (Figure 3), the need for game content creation will also increase. Students now find themselves in an environment where the creation of serious games is mandatory, and as not all students are artistically inclined, we do need to determine whether there is a need to provide artistic skill training for game content creation.

At present, SGI-SA outsources a large part of their content creation as the NWU VTC does not train or deliver students that have graphic design experience. This further supports the issue at hand which is to consider including content creation training in the IT curriculum, as we do have a serious games department that will continue creating games and that doing content creation in-house would be financially beneficial. This also proposes additional job opportunities for the students as they not only complete pure IT modules but also have some form of graphic design skills as well. In turn, this could create positive word of mouth for the NWU VTC as employers will seek out graduates with a wider variety of skills.

For this study specifically, students were enrolled for an entry level module named ‘Human-Computer Interaction’. As part of the practical component of this module, students had to create a serious game in a 2D programming environment called ‘Scratch’. Scratch is a beginner-level programming environment with drag and drop stacks of code. It also contains existing sprites which are objects such as people, animals, backgrounds etc. which constitutes the game content. Students did not need to create their own game content but did have the option to. Seeing as these students will complete an exit level module where they will need to create 3D models and 3D textures in a 3D environment in the future, we wanted to determine how students felt about game content creation and whether they feel that they need specific training for this. Section 4 reports on the methods used to obtain data from the students in this study.

4. METHODOLOGY
This section reflects on the sample used and procedures followed in this study. There is also a discussion on the research methodology, the measuring instrument and the data analysis approach used for this study.

4.1 Sample and procedures
The participants for this study comprised of 28 students who were enrolled for an undergraduate module that contains elements of serious games design. The students that formed part of this group are the first group of 2nd year students who were exposed to the design of a serious game. As game content creation (the creation of the artwork used in games) is an integral part of serious games design, students were asked to reflect on their personal needs for skill training in this regard.

4.2 Research methodology
This section reflects on the research methodology followed in this study. The intention of the study is to possibly intervene where students may feel oppressed i.e. where the students may feel that they are exposed to many modules containing serious games design but do not have the necessary skill to create the game content. For this reason, the research approach appropriate for this study is that of action research. According to Baskerville (1999:6) action research seeks to better understand a given social situation, it aims at broadening scientific knowledge while trying to solve practical problems, it serves to improve the capabilities of the people involved and is of great value to understand the changes in behaviours of social situations. Action research has 5 phases that it iterates through namely diagnosing, action...
planning, action taking, evaluating and specifying learning (Figure 4).

**Diagnosing**
In the diagnosing phase, the researcher identifies the primary issues or problems that are causing the individuals who are involved to feel oppressed. In this study, the problem addressed is the possibility that students may feel that they do not have the necessary skill to create game content and for this reason they may find some of the modules that contain serious games design as a burden.

![Figure 4. The 5 phases that action research iterates through (Baskerville 1999:14)](image)

**Action planning**
In order to determine whether this might be the case, one needs to develop a plan to address the situation at hand. In this study, the researchers wanted to understand the students’ perceptions on game content creation and whether they feel that they need skill training in this regard.

**Action taking**
To complete the plan in the action planning phase, one needs to take action by means of intervention in order for change to occur. In this study, because we needed to understand the needs of the students first before assuming an outcome, we took action in the form of distributing an interpretive questionnaire to the students involved. This questionnaire contained questions relevant to the research question at hand.

**Evaluating**
In order to determine whether the result of the action taking phase was successful, one needs to evaluate the outcome of said phase. In this study, the feedback received from students are evaluated and the findings are presented in Section 5.

**Specifying learning**
Once the results obtained from the action taking phase have been evaluated, one can possibly make valuable conclusions that adds to the scientific body of knowledge. In this study, a summary of evidence will be presented to the NWU VTC, adding valuable information to their body of knowledge with regards to whether additional modules should be added in the IT curriculum to address game content creation skills.

**4.3 Measuring instrument**
As the aim of this study is to understand the artistic needs of the students, both quantitative and qualitative research was conducted from an interpretive perspective. During the course of this module students were asked to complete a questionnaire that was created in Google forms. The questionnaire consisted of quantitative and qualitative questions regarding their experiences and perceptions on the design of serious games in Scratch, the possibility of future game content creation and software tools used for drawing purposes.

**4.4 Data analysis**
Simple graph analysis and descriptive analysis are performed to illustrate the results obtained from the quantitative questions. Open coding by Straus & Corbin (1990) is used to analyse the qualitative feedback received pertaining to the experiences and perceptions of the students. The results of the methods used are presented in Section 5.

**5. STUDENT PERCEPTIONS ON THE NEED OF GAME CONTENT CREATION SKILLS**
This section reports on the feedback obtained from the interpretive questionnaires. As students had created serious games in Scratch (which contains its own graphic objects), they were asked to reflect on their experience with the environment and the possibility to personally create game content in the future. They were also asked to share their artistic experience, previous experience with software for content creation and the software tools they would like to learn how to use.

**5.1 Perceptions and experiences with the Scratch environment**
In question 1 of the questionnaire the students were asked to indicate whether they enjoyed creating games in the Scratch environment. Figure 5 depicts the results from their responses. 78% of students indicated that they enjoyed creating games, 18% of students were not sure how they felt about creating games and 4% indicated that they did not enjoy creating games in Scratch. Students were also asked to indicate whether they would like to be able to create the content art for games. As Scratch contains its own game content and objects, students do not need to create their own game art but the software does allow the user to draw objects within the environment. 75% of students indicated that they would like to be able to create their own game art, 21% of students were unsure whether they’d like to be able to create their own game art and 4%
indicated that they do not want to create game art themselves (Figure 6).

The larger part of the group indicated that they enjoy creating games in Scratch and that they would like to be able to create their own game art (78% and 75% respectively). Only 4% indicated that they do not enjoy creating games and do not want to create their own game art. It now needs to be determined why the remainder of the group are unsure of their feelings toward the creation of games and game art (18% and 21% respectively). A possible reason for this hesitance could be due to the fact that some students do not have any prior artwork creation experience.

The students were asked whether they had any previous artwork creation experience. 32% of students specified that they did have prior experience whilst 68% of students indicated that they had no prior art creation experience (Figure 7). The latter result could be a possible reason for the hesitance of students towards the creation of games and artwork. This argument is supported by the fact that 67% of the students who were unsure of whether they wanted to create their own game art also stated that they had no previous art creation experience. The students who indicated that they had prior art creation experience also briefly described the form of experience that they have. Their responses are recorded in Table 1.

In Table 1 students also indicated that some of them had interacted with software for content creation or a form of artistic software. Question 4 also addressed students’ previous experience with any content creation software. 43% of students indicated that they had been exposed to some form of content creation software whilst 57% indicated that they had no previous experience (Figure 8).
Table 2 depicts the 6 content creation software tools that students have previously been exposed to. The tool most often used by students is Microsoft paint (21%), followed by Adobe Photoshop (11%), Blender (11%), AutoCad (7%), Corel Draw (4%) and Photoscape (4%).

Even though 21% of students were unsure that they want to create game art, 68% of students had no prior art creation experience and 57% of students had no experience with software for content creation; 100% of students indicated that they would like to learn how to use software for game content creation (Figure 9). Table 3 holds record of their motives as to why they would like to learn how to use game content creation software. Table 4 indicates their interest to learn specific software tools for game and game content creation.

<table>
<thead>
<tr>
<th>Content creation software</th>
<th>N</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Microsoft Paint</td>
<td>28</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>2  Adobe Photoshop</td>
<td>28</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>3  Blender</td>
<td>28</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>4  AutoCad</td>
<td>28</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>5  Corel Draw</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6  Photoscape</td>
<td>28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Even though 21% of students were unsure that they want to create game art, 68% of students had no prior art creation experience and 57% of students had no experience with software for content creation; 100% of students indicated that they would like to learn how to use software for game content creation (Figure 9). Table 3 holds record of their motives as to why they would like to learn how to use game content creation software. Table 4 indicates their interest to learn specific software tools for game and game content creation.

Table 3. Student motives for learning how to use game content creation software

<table>
<thead>
<tr>
<th>Code assigned to data</th>
<th>Example answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broaden own body of knowledge (7 occurrences)</td>
<td>“For the benefit of my knowledge since I enjoy doing games and It’s fun learning new things as always I would love to get into more details.”</td>
</tr>
<tr>
<td></td>
<td>“just for the matter of knowing how to design games”</td>
</tr>
<tr>
<td></td>
<td>“Gain more knowledge”</td>
</tr>
<tr>
<td>Improving skill (7 occurrences)</td>
<td>“I really enjoy playing games and I am always amazed by how the way recent games are improving and I really wish to create my own games but I lack the skills and knowledge.”</td>
</tr>
<tr>
<td></td>
<td>“It would provide useful skills that can be advantageous in future art software.”</td>
</tr>
<tr>
<td>Game enjoyment and fascination (5 occurrences)</td>
<td>“It’s fun making games and I may get a chance to make a good educational game for those who need it.”</td>
</tr>
<tr>
<td></td>
<td>“I enjoy playing games and I love colour, creating games always involves using colour.”</td>
</tr>
<tr>
<td>Artistic interest (1 occurrence)</td>
<td>“so that I can get in touch with my artistic side”</td>
</tr>
</tbody>
</table>

Table 4. Students show interest in game content creation software they’d like to learn how to use.

<table>
<thead>
<tr>
<th>Game content creation software</th>
<th>N</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Adobe Photoshop</td>
<td>28</td>
<td>5</td>
<td>89</td>
</tr>
<tr>
<td>2  Blender</td>
<td>28</td>
<td>3</td>
<td>71</td>
</tr>
<tr>
<td>3  3DStudio Max</td>
<td>28</td>
<td>7</td>
<td>64</td>
</tr>
<tr>
<td>4  Adobe Illustrator</td>
<td>28</td>
<td>4</td>
<td>54</td>
</tr>
<tr>
<td>5  Adobe Flash</td>
<td>28</td>
<td>6</td>
<td>36</td>
</tr>
</tbody>
</table>

6. FINDINGS FROM STUDY

This section reports on the findings discovered in the results in Section 5. Students had to reflect on their experiences with game design and the future creation of their own game content. Recommendations are made regarding the need for training to prepare students for game content creation.

6.1 Recommendation for the inclusion of game content creation skills training

This section provides a recommendation on whether students in an IT curriculum who are enrolled for modules that contain serious games concepts may need additional game content creation training. Participants of this study completed a questionnaire regarding their experiences and perceptions of serious games and game content creation.

The larger part of the group indicated that they enjoyed creating games in Scratch (78%) and that they would like to be able to create their own game art (75%). 18% were unsure of their feelings toward the creation of games and 21% were unsure of their feelings toward the creation of game art. 32% of students specified that they did have prior
art creation experience whilst 68% of students indicated that they had no prior art creation experience. 67% of the students who were unsure of whether they wanted to create their own game art also stated that they had no previous art creation experience. Students who indicated that they did have previous art creation experience further said that they had fair experience with drawing and sketching (8 occurrences), painting (3 occurrences), artistic software (3 occurrences), hand created artwork (2 occurrences) and layout design (2 occurrences). Even though only 2 people indicated that they had fair experience with artistic software, 43% indicated that they had been exposed to some form of content creation software. Some of the tools they had been exposed to included Microsoft paint (21%), Adobe Photoshop (11%), Blender (11%), AutoCad (7%), Corel Draw (4%) and Photoscape (4%).

Even though 21% of students were unsure that they wanted to create game art, 68% of students had no prior art creation experience and 57% of students had no experience with software for content creation; 100% of students indicated that they would like to learn how to use software for game content creation. Their motives for wanting to learn how to use content creation software ranged from wanting to broaden their own body of knowledge (7 occurrences), to improve their skills (7 occurrences), because they enjoy playing games (6 occurrences) or because of artistic interest (1 occurrence). Students then indicated which software tools for content creation they would like to learn how to use from a list and their order of preference were Adobe Photoshop (89%), Blender (71%), 3D Studio Max (64%), Adobe Illustrator (61%), Adobe Flash (54%) and Unity (36%).

From this data it can clearly be seen that:

- 78% to 96% of students may enjoy the creation of serious games.
- 75% to 96% of students may enjoy creating game content.
- 43% of students have previously encountered content creation software.
- 7% have fair experience with content creation software.
- 100% of students would like to learn how to use content creation software for personal and professional reasons.

The IT students at the NWU VTC will be exposed to a number of modules that cover concepts on serious games design throughout their degree. 75% or more students do enjoy the creation of serious games and game content. However, less than 50% of students are familiar with content creation software but all of the students indicated that they would like to learn how to use software for content creation. It can then be recommended that the NWU VTC should consider adding or translating modules in the IT curriculum to facilitate skill training for game content creation.

7. CONCLUSION AND FUTURE RESEARCH

This study aimed to determine the need for game content creation skills training in an IT curriculum that includes modules that contain serious games design topics. Participants completed a questionnaire regarding their perceptions of and experiences with serious game creation, creating their own game content and their experience with software tools to create game content. Section 5 illustrates the results obtained from the questionnaire and Section 6 discusses the results. It is recommended that an IT curriculum that includes modules pertaining to serious games and game content creation should consider adding or translating modules to provide additional content creation skills training.

This study was conducted using entry level students (1st year students) who had just started a 3 year degree. As this study forms part of an action research project, future research constitutes repeating the study with exit level students (3rd year students) to compare whether the need for game content creation skills training were necessary to students who are on the verge of completing a degree.

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