A Game Creation Tool which Supports the Development of Writing Skills: Interface Design Considerations

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Abstract

Improving children's writing skills is a significant concern in schools. A key problem identified is a lack of engagement and motivation with writing tasks, something which can be particularly pronounced with boys. Computer game creation has potential as an activity for improving writing skills. It can be very motivating, especially for boys, and offers an excellent opportunity for developing writing skills within a media-rich context. We argue that whilst existing game creation tools make the activity possible for school-aged children, they fall short of supporting writing skills development because the interfaces focus attention on non-literary aspects of game creation. This paper describes an approach to designing an interface which will provide targeted support for the development of writing skills through game creation. We propose design considerations drawn up through consultation with teachers, and with reference to curriculum documents and external representations literature. These guidelines will be used to inform design-based research which will take a learner-centred design approach to building the interface, allowing a number of key issues to be investigated.

1. Introduction

Concerns about the need to improve school children's writing skills have grown in recent years (Fisher, Brooks et al. 2002; Goodwyn 2002), especially with regard to boys (Barrs and Pidgeon 2002). One problem that has been identified is children's lack of motivation for tackling writing tasks (Younger, Warrington et al. 2005), as well as feelings of apprehension about writing (Mulholland and Robertson 2001). Computer game creation can be a very motivating activity, for boys as well as girls, and it is notable for being motivating whilst also involving a high level of challenge and hard work (Good and Robertson 2006). Game creation has potential as a new way of developing writing skills which can excite and engage both boys and girls and recognise and support the changing nature of literacy.

Existing work has investigated game creation as an activity which can help develop narrative and storytelling skills (Carbonaro, Cutumisu et al. 2005; Robertson and Good 2005; Good and Robertson 2006; Robertson and Good 2006). These investigations have used game creation tools which are revolutionary in allowing children to create simple 3D games without the need for specialist technical skills. A key focus in studies using existing tools has been the potential for game creation to allow young people to create complex narratives without needing to be proficient in more traditional literacy skills (Robertson and Good 2005; Szafron, Carbonaro et al. 2005; Robertson and Good 2006). This opportunity for young people to engage with a new form of digital literacy without being held back by literary problems is invaluable, but there is also potential for more general and transferable writing skills to be developed. We believe that with an appropriately designed interface, the activity could support the development of these more

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traditional and often lower-level skills such as using descriptive language effectively, in addition to higher-level writing skills such as creating complex narrative structures.

The target group identified as an initial focus for this undertaking is 11-14 year olds; Key Stage 3 (KS3) in England, Wales and Northern Ireland and Primary 7 (P7) to Secondary 2 (S2) in Scotland. These pupils will be old enough to benefit most from game creation, and a drop in motivation levels in English has been observed at KS3 (Goodwyn 2002) so there is a lot to gain. There are a number of tools available which allow children of this age to create games and other types of digital stories (Maloney, Burd et al. 2004; Robertson and Good 2005; Szafron, Carbonaro et al. 2005; Kelleher and Pausch 2006; Begel and Klopfer 2007), but at present these interfaces tend to focus attention on non-literary aspects of games such as level design, character appearance and combat related settings. Also, these tools often require the use of programming and scripting languages which can distract focus from a writing task.

The following section explains how game creation has the potential to encourage the development of writing skills, and argues that existing tools do not currently provide enough support to fully achieve this potential. We then outline an initial set of skills which have been identified in consultation with teachers as being appropriate for development through game creation. A number of design considerations are then proposed, with reference to skills identified, teacher input and external representations literature. Finally we describe how these considerations will contribute to the overall design process of a new interface.

2. Developing Writing Skills through Game Creation

Commercial video and computer games are often written by large teams and will customarily employ at least one dedicated writer for the project. Although some games succeed without particularly compelling narratives, the plot is generally considered to be an important part of most games. Some believe that games are an important new medium for storytelling (Laurel 2001; Atkins 2003), but it's not necessary to agree with this to recognise that writing skills are involved in creating most games. Game design handbooks indicate that creating an engaging interactive story within a game environment involves creating realistic characters, developing interesting plotlines and writing compelling dialogues (Handler Miller 2004; Bateman 2007; Ince 2007). These are skills that are also used in a wide range of creative writing activities.

Robertson and Good have been investigating the potential for game creation to support interactive storytelling, among other learning activities, for a number of years (see for example (Good and Robertson 2003; Robertson and Good 2004; Robertson and Good 2005; Good and Robertson 2006)). They have carried out an extensive series of studies using a game creation toolset distributed with Neverwinter Nights (NWN) (Bioware 2002), a 3D role-playing game. This tool was chosen because it allows young people without specialist technical skills to create games with commercial quality 3D graphics. Children can use the toolset's Graphical User Interface (GUI) to quickly create areas, objects and characters by dragging and dropping GUI elements. Wizards and menus allow the user to set up events to take place within the game, including interactive conversations between the player and a non-player character (NPC). Using these tools, children are able to create simple stories quickly and easily. Results from studies have indicated that it is possible for children to use these tools to create games with elaborate plots, interesting characters, compelling narratives, and sophisticated themes, with many participants writing extensive dialogue for their characters.

Game creation can provide a creative outlet for young people who have difficulty expressing themselves in more traditional creative writing tasks (Robertson and Good 2005). Strong motivation for children to create an interesting and enjoyable interactive story comes with the knowledge that their game may be played by their peers. Additionally, receiving and taking into

account feedback from peers can help children to develop audience awareness skills (Good and Robertson 2006). The NWN toolset has also been used by a team at University of Alberta in storytelling workshops with high-school students. They noted that students found it very motivating to create interactive stories with the toolset, and observed high levels of collaboration and spontaneous peer evaluation occurring (Carbonaro, Cutumisu et al. 2005).

However, there are a number of problems with using commercial toolsets such as the NWN toolset for story writing. Firstly, whilst the toolset provides GUI support for a range of game creation tasks, creating complex narratives requires the use of the inbuilt scripting language NWScript. This requires programming skills which most children do not have, and low-level tasks such as this distract attention from the higher-level story writing task. There have been a number of attempts to provide an alternative to using this scripting language (Szafron, Carbonaro et al. 2005; Howland, Good et al. 2006). However, there is a more serious problem with repurposing a commercial tool such as the NWN toolset, which underlies the scripting issue. The tool was created for a specific purpose. It allows gamers who have played and enjoyed the original NWN game to build their own adventures of the same ilk. It provides excellent support for building attractive 3D areas, quickly adding multiple generic characters to the environment, and creating basic (mostly combat or quest-related) storylines through wizards. However, using the tool for interactive story writing involves a different type of target user and the task requires different interface support.

Work has begun on a purpose-built game creation tool for young people, Adventure Author (Robertson and Nicholson 2007), which looks to support game creation as an interactive storytelling activity. An early prototype of the tool was built through a learner-centred design process (Good and Robertson 2003). The complete tool is now being built as a plug-in to the Neverwinter Nights 2 (NWN2) toolset (Obsidian Entertainment 2006). This allows the commercial quality NWN2 graphics and game engine to be used in conjunction with an interface specifically designed for supporting school-aged children in building interactive stories. So far attention on the design has focussed on supporting the creative process of interactive storytelling, with interface support for ideas generation and sharing (Robertson and Nicholson 2007; Robertson and Howells In press).

If the activity of game creation is able to support the development of writing skills attention needs to be given to interface support for specific writing tasks.

3. Teacher Consultation on Writing Skills

Our aim is to provide targeted interface support for the development of key writing skills. A specific skill set will be drawn up in consultation with teachers and literacy experts with reference to the National Curriculum for England, Wales and Northern Ireland, and the Scottish Curriculum. We have begun identifying a potential skill set through consultation with two Key Stage 3 English teachers. The teachers were interviewed about their opinions on game creation as a potential activity for developing writing skills. After being introduced to and experimenting with the NWN toolset they suggested skills which they believed could be developed through game creation. They were also asked to identify additional skills which could be developed if the tool was improved in specific ways. The National Curriculum Programme of Study for Key Stage 3 English was used as a reference tool in this discussion, and concepts which are outlined in this document are italicised.

Composition Skills Both teachers felt that a variety of composition skills could be developed through the activity of game creation. In the context of writing to imagine, explore and entertain they mentioned *drawing on experience of different fictional forms* in composition, *using*

imaginative vocabulary and varied linguistic and literary techniques and *exploiting choice of language and structure to achieve particular effects and appeal to the reader*. The programme of study notes that the variety of narrative structures can include sound and images as well as words.

The teachers stated that the potential for developing use of imaginative vocabulary and choice of language could be increased by including opportunities for using text to a greater extent in creating a game in addition to creating dialogues for the characters. Suggestions for this included activities which are already possible using the toolset such as adding text-based introductions to scenes and creating diaries for the player to read. One teacher was also able to suggest how the method of interaction with the game creation tool could be altered to better support development of skills in this area. It was suggested that actions such as creating a new character or a scene background could be carried out through typing in text-based descriptions rather than selecting from a visual library of potential characters or backgrounds.

In the context of writing to inform, explain and describe, areas highlighted included the *ability to form sentences and paragraphs that express connections between information and ideas precisely*, *using formal and impersonal language and concise expression* and *considering what the reader (player) needs to know*. In addition to the suggestions above one teacher suggested that pupils could develop their use of formal and impersonal language if they wrote in the 'voice of the game to give instructions and information to the player.

It was also observed that skills in the area of writing to persuade, argue and advise such as *anticipating reader (player) reaction* and *using persuasive techniques and rhetorical devices* could be developed through creating games.

Planning and Drafting *Planning, drafting, redrafting and proofreading* were also highlighted by one teacher as skills which could be supported, as it was noted that the tool gave potential for changes to be made easily allowing aspects of the game to be refined regularly. A further key skill suggested was *the ability to analyse critically their own and others' writing*; something which is supported and encouraged by the peer play-testing which occurs naturally in game creation settings.

Other Writing Skills *Presentation skills*, and *using ICT* were also raised as clearly relevant by both teachers and audience awareness skills, including *being sensitive to an unknown audience* were also highlighted as having potential.

Other English Language Skills The teachers were also asked about any other areas of the curriculum, closely related to writing skills, which could be developed. Both cited the *drama and speaking and listening* strands of the curriculum as being relevant. They also felt that *language variation skills* were an area that could be developed through writing interactive conversations in different styles according to the characters in question.

One teacher also suggested that the reading attainment target of *understanding the author's craft* could be developed by looking at other games and conventions in the planning stage, stating that children could 'read' other computer games. Both teachers highlighted the media and moving image area of the curriculum as very relevant and felt that lots of attainment targets in this area could be addressed through computer game creation. Understanding of *how meanings are changed when texts are adapted to different media* was also highlighted as an area which game creation could help develop.

4. Interface Design Considerations
Whilst a number of the skills highlighted by teachers are already well supported in game creation there are also a number of areas in which support for other skills could be added or improved in a

new interface. There follows some key interface design considerations drawn up following the teacher consultations, with reference to from related work and external representations literature.

Explicit Representation of Writing Components It is generally accepted that a single representation is not sufficient to represent all aspects of any complex entity (Schwarz and Dreyfus 1993), and a 3D computer game is certainly such an entity. It is clear then, that any given representation of a computer game will highlight certain aspects over others. In the NWN toolsets information about the 3D area in which the game takes place is given this privileged position at the expense of information about the interactive plot or character traits. Since the representation used in a tool influences the way a task is carried out we might hypothesise that children using a tool which represents the game primarily in terms of spatial aspects would be drawn to focus on working on these aspects of the game. This is backed up by self-assessment of time spent on different aspects of game creation by a group of children who used the tool over a week long workshop (Robertson and Good 2004).

Trying to hold a mental representation in working memory over a period of time can lead to cognitive overload, something which is to be avoided in learning environments (Mayer and Moreno 2003). At present, when trying to write an interactive story, users of the NWN and NWN2 toolsets have to keep an internal representation of the (often very complex) branching plot in their minds. This can place a huge load on the user and may understandably lead them to focus on other aspects of game creation which are better supported. If the aim is to develop composition skills such as structuring narrative to achieve particular effects and appeal to the audience, then it will be necessary to support users in building complex plots by providing a representation of narrative structure to support cognitive off-loading. This will need to be in addition to rather than instead of the existing representation, and it will be important to provide adequate support for working with the consequent multiple coordinated representations (Ainsworth 1999).

Similarly, whilst it is possible for users to hold in their minds a representation of multiple characters' traits, there is no support offered by the interface for this. A concrete representation of characters in the interface could support the building of more complex and interesting characters whose personalities are portrayed in the things they do and say. Relating dialogues more closely to characters would open the way for development of skills such as choosing language to achieve particular effects and using imaginative vocabulary. At present the interface doesn't support users in creating consistent and realistic characters whose traits are carried through in their dialogue and actions. The instantaneous nature of some of the processes in the toolset contributes to this problem, as discussed below.

Easier is Not Always Better There are a number of tasks which the current NWN toolset interfaces make very quick and easy, including the creation of an area, and adding new characters, objects and scenery to the area. Additionally, whilst creating interactive conversations is slightly more complicated it is still fairly quick and easy to add a number of branches to a conversation. Whilst it may seem beneficial for composition related tasks such as these to be easy to carry out, easier is not always better when it comes to educational tools. When the aim is to help students to learn, having an interface which make certain tasks too easy can work against this aim (Brna, Cox et al. 2001). For example, in the NWN toolsets the user can 'create' a character simply by dragging a character model title from a list into the 3D area. A new character now exists in the game world, but it is a generic character with default options chosen without any input from the user. Creating a character is an important skill in creative writing, but the toolset makes this an insignificant process. The user has no opportunity to practice developing a well-rounded character, or to reflect on the character's motivations or back story.

Norman distinguishes between experiential and reflective cognition (Norman 1993), and expresses concern that using multimedia learning environments can encourage experiencing when one should be reflecting. Experiential or 'reactive' cognition does not require deep thought and is event driven with automatic reactions following from input. Reflective cognition requires much deeper thought and tends to be slower and more laborious, it requires the ability to store temporary results and use those results in further thought processes. For this reason external representations facilitate reflective cognition by allowing more complex chains of reasoning to be built up, providing further evidence that representational support should be given for complex composition tasks such as structuring a narrative.

Choice of representation can completely alter the mode of cognition used in a task. Being able to drag in a generic character to the game world turns a task which should require considerable reflection into a purely experiential task. This fits with findings about using direct manipulation interfaces in problem solving tools. Svendsen (1991) concluded that whilst direct manipulation interfaces can be very user-friendly they can actually hinder problem solving if they are supportive of thoughtless action. The important distinction is between selection, which is quick and easy and can be done without deep thought, and composition, which requires considerable thought and effort. Direct manipulation interfaces can be limited to selection rather than composition, as in Svendsen's study, but this is not necessarily the case and depends entirely on the level of granularity.

The key consideration for educational tools is that extensive thought should be applied to the right activities. A game creation interface which made the task of saving the game into a reflective activity which required deep thought would be unsuccessful (unless the aim was to teach about the underlying process of writing a game file to disk). Similarly a complex scripting language is an undesirable way of creating complex in-game events (unless the aim is to teach coding skills). As our aim is to develop specific writing skills the interface should encourage deep reflective thought when it involves the practice and development of those skills, which are naturally composition-based tasks. Other aspects of game creation should be carried out easily through selection to avoid distraction and unnecessary cognitive effort (Howland, Good et al. 2007).

The Importance of Text A significant piece of feedback from the initial teacher consultation suggested that writing in text should play a greater part in the game creation process. It was recognised that writing skills in the broad sense are not limited to text-based composition, but noted that being able to express ideas through text is an important skill. Writing through text is a very reflective process, which involves formulating thoughts fully, so it is certainly a good candidate for interaction which encourages reflective cognition. It would also open up a much wider range of skills which could potentially be developed through the activity.

It is absolutely crucial however, that the key benefits of game creation are not lost; the motivating nature of the activity, and the opportunity it provides for children with poor literacy skills to express themselves creatively and engage in creating complex narratives. It would be beneficial to exemplify a parallel relationship between text and audio and visual representations of writing components. There is a potential to bring out a key skill here; understanding how meanings are changed when texts are adapted to different media.

Narrative Chunks It will be necessary for users to undertake some detailed and low-level composition work, to enable them to develop specific skills, but there are also a number of other skills identified which involve composition at a higher level such as structuring a piece of narrative. To avoid frustration from users at always having to build up games from a low level the tool could allow narrative chunks to be built up and manipulated at a higher level. Examples of such narrative chunks could include characters, conversations and scenes. The narrative chunks

could be reified through representation, for example characters could be represented by a card which showed their image, and information about their traits and temperament. So whilst the process of creating a character could be quite lengthy, requiring a user to answer questions such as 'what's the worse thing your character has ever done?' and 'what was their proudest moment?', it would culminate in the creation of an entity which could be used in different scenes or even in different stories. A key benefit of this building of narrative chunks would be the potential for collaboration and sharing of resources between users, for example a user could pass on a character, conversation or scene they'd created to a friend. This would be supportive of naturally occurring sharing of ideas already observed (Good and Robertson 2006).

This would also give the potential for different types of skills to be targeted more specifically through alternate ways of using the system. Instead of starting from scratch users could be given example narrative chunks by the system, and work on higher level structuring tasks such as choosing the order that scenes occur in. They could then choose at a later stage to customise and personalise the entities by going through the lower-level creation tasks.

Supporting Reflection It may also be useful to provide a summary of the experiences someone else has had when play-testing the game. This is something which is already planned for the Adventure Author tool (Robertson and Nicholson 2007) and would be supportive of developing skills around critically analysing their work based on feedback.

5. Future Work

The next step for this work is requirements gathering with stakeholders including teachers, target users and an English language specialist. This will involve finalising the skill focus and deciding additional requirements for the system through observing children working with current tools. A learner-centred design process will then begin; including design activities and low-fidelity prototyping with target users. A high-fidelity prototype will also be built and tested with users. The final tool will function as a complementary add-on to the Adventure Author tool, and will be evaluated over a six month period of use in a school. It is hoped that the evaluation will help determine whether game creation activities can support the development of Key Stage 3 pupils' writing skills, and whether any specific pupil groups such as boys or lower achievers can benefit more. The research should also allow us to investigate how interface representations of a game under creation can affect the skills which can be developed whilst creating games, potentially contributing to the wider question of how representations in educational applications influence the development of skills. Finally, we hope to be able to determine whether the activity of game creation game be geared towards specific skills development without losing the motivational affordances of the task.

6. Acknowledgements

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