

PROGRAMMING LANGUAGE: A STORYTELLING TOOL THAT CAN IMPACT THE  
DEVELOPMENT OF SOCIAL RESPONSIBILITY IN GRADE 10 BOYS

Denise Vythilingam

St. Stithians' Boys College, Sandton, South Africa

**Abstract**

In September 2018, a Grade 10 Information Technology (IT) class participated in a six-week action research project to promote interest in the need for social responsibility and to help develop social responsibility in Grade 10 boys. The project action coupled programming, a part of the curriculum that students typically enjoy and excel in, with storytelling in order to engage the boys with a section of work in which they had historically not shown much interest. The aim was to get the boys to engage and think critically about the content. The project required students to use technology to create and share the story of their thinking process and their personal development in social responsibility. By the end of the research, the boys realised the impact their actions have on the lives of other people and the environment. They showed a developing empathy for others, a willingness to change their actions, and the potential to influence the actions of their family and or school community. The first cycle of this action research also increased participation and engagement of the boys in this section of work in comparison to previous years.

**Introduction**

Environmental education falls within a theoretical component of the Information Technology (IT) syllabus and over the years I have observed that some boys have difficulty relating to the social implications and responsibilities of computing. They see a disjointedness between the programming and humanitarian perspective in this curriculum unit and historically have seen these environmental issues as something that affects people other than themselves. Since they can easily distance themselves from the content, they can be disengaged during these lessons. Throughout the years, I have adjusted my methods for teaching social responsibility in relation to technological waste many times over.

The research project aimed to change the way the boys looked at their social responsibility and the impact they had on the environment. Even the boys who realised the impact their actions had on the lives of other people and the environment were eager to change their behaviours and the behaviours of family and friends. I hoped that by changing the approach to teaching

this topic, there would be more interaction and participation from the boys and a lasting impact on the changes they need to start making.

I knew that the programming part of the curriculum typically served the boys' interest and most of them excel in it. Because there is some level of abstract thinking needed for Java programming, typically boys who are academically strong in mathematics and science take IT as an optional subject. When these boys are programming in Java, they are meaningfully engaged with the skills needed to achieve a specific goal. Programming provides an opportunity for immediate gratification if their program runs and a particular result is achieved and shown. Additionally, a problem-solving component comes in to play if the boys do not get the desired result. Since they appreciated these components of our coursework, I wondered if the boys might better connect with our environmental content if they used programming to tell a digital story. Consequently, I developed the following research question: *How does using a programming language as a tool for storytelling impact the development of social responsibility in Grade 10 boys?*

The cyclical approach of action research as described by Mertler (2016) allows for a systematic collaborative approach to improve teaching and learning practices. Using a wide variety of instruments and data ensured that a "polyangulated" (Mertler, p.11) approach to the research could be implemented and that improved practice could take place with each cycle in the research.

### **Literature Review**

The impact of storytelling in education is highlighted in a study conducted by Lederman, Gnanakkan, Bartels and Lederman (2015). The factual nature of teaching and learning science in their study relates directly to IT; however, Lederman et. al indicate that stories are beneficial even if they are not directly related to the subject content. They emphasise that stories can be used to create learner interest and confidence. They further state that, "knowledge is open to revision" (p. 61), a key factor for both science and IT.

For effective learning, educators must encourage learners to challenge the information that is presented as factual in stories. The learners must be allowed the space and opportunities to make connections between concepts and the story (Lederman et al., 2015). The process of creating personal narratives can open spaces for students to re-create their identities, enabling the construction and re-construction of themselves as capable actors in creating alternative realities (Hull & Katz, 2006.) The idea of reflection on our realities is key when teaching programming, as this reflection is what leads to an individualised optimal solution.

The enhanced benefit of using digital tools to tell stories is highlighted by Ahmed Alismail (2015) who suggests that the greatest benefit of digital storytelling comes from having the learners develop their own digital stories either individually or in small groups. This encourages learners to express their interpretation of the content in a meaningful way. Robin (2008) supports this finding by indicating that digital stories encourage learning by forcing learners to organise and express their ideas and knowledge. According to Robin, the participation in the creation of digital stories can contribute to developing enhanced communications skills. Robin further indicates that if learners can incorporate personal stories or experiences into the digital story they relate better to the content and “can draw connections with the content” (pp. 225-226).

Hansen, Iveland, Dwyer, Harlow, and Franklin (2015) looked at a novice programming interface as a digital storytelling tool. They used stories to engage children in science and engineering design, and highlight the importance of developing alternative solutions as well as “optimising a solution” for a task (p. 63). Once the stories about the thinking process are shared, the optimal solution is easier to develop. To obtain an optimal programmed solution in IT, it is important to integrate the process, the thinking around the problem, and its constraints. Hansen et al. elaborate that if learners are allowed flexibility in their creativity, they will be motivated to achieve in a task. This motivation enables them to use and share their prior knowledge in relation to the problem. It is very important for students to reflect on their own work, as well as other examples of programming code, that is logically sound yet different from their own. Many learners change their own programmed solution when confronted with the story behind the thinking. Learners who have not been able to get their code to work will often rethink their way of thinking based on the story behind the process.

Truong-White and McLean (2015) investigated the extent to which the process of digital storytelling supports changing views of global citizenship within the context of climate change analysis, and found that “digital storytelling is evolving as a potentially powerful innovation to support the aims of global citizenship education” (p. 6). They further elaborate that “the multimodal affordances of digital storytelling can allow students to express lived experiences in poignant and dynamic ways” (p. 7). Kordaki and Agelidou (2010) also share how digital storytelling can support environmental education. As digital storytelling continues to grow in popularity, it has a positive impact on global citizenship education (Robin, 2008).

Dhamborvorn (1996) explains that learning from someone else’s story makes a person continually reflect on their own story. Each of us has a unique way of interpreting things around us, and so we “construct knowledge from our past experiences and from our

interactions with the world” (Dhamborvorn, 1996, p. 294). This interaction allows us the time to reflect on our stories on a regular basis and this reflection influences the way in which we interact with our surroundings. This links directly to the theme of social responsibility for our environment. Stories can help clarify the problem, expand on the problem, and find possible solutions, thus helping to confirm our thinking and enabling us to reflect on our realities within our own context (Dhamborvorn, 2016).

Within the context of teaching boys, Reichert and Hawley (2010) indicate that “successful adjustments” (p. 229) in methods involve setting physically active tasks for boys. In accordance with the action research approach, Reichert and Hawley emphasise that teachers need to continually adjust their approaches if they want any success in teaching boys. IT is a subject that fortunately allows the story to dictate some of the continued adjustments that need to happen in the class to keep the boys meaningfully engaged.

### **Research Context**

At St Stithians Boys’ College, we have approximately 760 boys in the school. IT is only offered as an elective subject in Grade 10 and a maximum of 30 boys can choose this subject. IT is an optional subject for Grades, 10, 11 and 12. The action research was conducted with Grade 10 learners in the last term of the academic year. These 23 Grade 10 boys had been in the IT class for 8 months prior to the beginning of the task. I had developed a relationship with the boys, and they felt comfortable and confident to express their thoughts on the topic and the action research process. This was an advantage as not all the boys enjoyed the research task, and they were able to express this openly and explain why they felt this way.

Before we commenced with the research task, the boys took home a consent form, which the boy and the parent signed. This form indicated to parents and the boys that their identity would remain anonymous in the final report. The parents and boys also consented to the use of photos and video for the research and the report on the action research project. As per the agreement on the consent form, all information and discussions with boys were confidential and when parts of conversations were quoted, the identity of the boy making the comment was kept confidential.

### **The Action**

In the course of the action research, the boys had to research different aspects of social and environmental impacts of computing. These thematic stories were broken up into six-weekly tasks that were completed by the boys. Some tasks were completed individually and others required boys to work in groups. The groups were used to reflect and gain focus points, while

the individual tasks were focused on the boys thinking about their thinking and then sharing this process through Java code. The results were presented to the class in the form of a self-reflection story.

The six-week cycle of research was scaffolded as follows:

- Week 1: The boys completed a baseline questionnaire and we discussed the baseline knowledge. The discussion lead to the research goals for the individuals and groups. The groups were used to foster discussions and the share the experiences while the boys figured out what the focus of their stories would be and how they would present it.
- Week 2: Boys began preliminary research and participated in group discussion. They completed exit tickets after this process to give me insight as to how they were experiencing the process. This also ensured that all the boys were participating in the process and to to ensure that they focused on the storytelling.
- Weeks 3: Boys learned Java skills, the tools they would use to develop their story.
- Week 4 and 5: The boys used the Java skills to develop their storylines into a visual representation of their thinking. An exit ticket was completed when the boys were about 50% through this process, once again to gain insight into the learning and the process.
- Week 6: Boys participated in teacher and peer interviews to reflect on the story and the storytelling tools. They then presented their stories.

### **Data Collection**

The data collection methods in the action research were largely qualitative in nature. The project allowed the boys to tell their stories and have their voices heard through the mechanism of a programming language. Throughout the research, several methods of data collection were used. Using triangulation of data ensured trustworthiness and consistency of my findings. Mertler (2016) enforces this by suggesting that “rigor can be enhanced” through the “cross-checking” of data by the action researcher (p. 27). The intention was to ensure that the boys had enough time to reflect on the significance of the task and to honestly express their thoughts and opinions. This approach aimed at gaining credible, reliable and trustworthy data.

I conducted a baseline survey to determine the boys’ understanding of the social responsibility that comes into play in relation to computer use and the discarding of electronic goods. This Google Forms survey included both direct and open-ended questions. After reviewing the

survey responses, questions for peer discussion groups were setup for the boys. Video-recordings of these peer discussions took place and the boys made notes based on their observations. I took field notes during the entire process. Interviews were also conducted on a regular basis to monitor the progression of the boys' stories. This was done in the hope of gaining insight into how the boys were reacting and responding to this method of developing social responsibility around technology. In addition, at various stages of the process, the boys completed exit tickets, which allowed for reflection.

After the boys presented their projects and told their stories, the class had time to reflect on the process and their engagement with the content. This gave them time to gather their thoughts and feelings about the role they play in social and environmental responsibility. This cycle of action research was concluded with a follow-up survey, interviews, and whole class discussion.

### **Data Analysis**

The data collection process provided multiple sources from which data could be analysed. This gave insight as to whether this was an effective approach and if the stories behind the learning had an impact on their learning.

I reviewed and analysed all the qualitative data, including survey results, interview notes, and personal observations. During this process, common themes were identified and data were categorised accordingly. The videos were transcribed and data relating to common themes were extracted and captured. I attempted to use a database administrative application, *Microsoft Access*, to help with the process of sorting, categorising, and capturing of data, but this proved to be problematic. Many of the questions were open ended and it was difficult to extract results unless the entire response was put into context. The application would have worked if I could have programmed specific responses, without contextualisation, spelling or grammatical error, for analysis. This resulted in the manual classifying and categorisation the data.

Mertler's (2016) approach to the analysis of the data was used. This began with analysing specific observations and notes to look for emerging patterns and themes. Coding and categorising schemes were used, and connections were established between the data and the research question, including conflicting or contradictory data. This process enabled the development of general conclusions and observations to answer the research question.

## **Discussion of Results**

After analysing the data, four general themes emerged related to how creating a story with programming a language impacted the development of social responsibility. These included challenges related to balancing programming with storytelling content, an increased understanding of social responsibility, a pattern of social responsibility extending beyond the programming task, and an increased level of engagement and resilience in the programming task.

A baseline survey provided initial data regarding the boys' awareness of what social responsibility entails. Most of the boys thought they had sufficient knowledge and practised positive behaviours to regard themselves as socially and environmentally aware and responsible. After the baseline activity and discussions around their responses, my observation notes indicated that they soon realised that the knowledge they had was lacking and that they had no idea of what social and environmental responsibility entailed. This sparked interest and enthusiasm in the research activities that followed. After each of the activities, the boys had to find a way to relate their experience of the information into story form. It was quickly established that the boys were too eager to translate their findings into a programmed story and consequently their stories had no depth. Incentives had to be used to ensure that the boys first explored their thinking and feelings before they started the programming task. Observation notes indicated that many of the boys could take the facts that they found and easily add them to their story, but they had difficulty relating their feelings about their findings. It was found that peer discussions helped the boys put their feelings into words. These words were then transformed into a storyline told through a programming interface.

### **The Challenges of Balancing Programming with Storytelling Content**

Some boys were so keen to impress with their programming skills that they often placed more emphasis on the new tricks they had learnt in the programming than on the topic. Keeping the focus on the storytelling was sometimes challenging. However, transferring feelings and thoughts into programming code meant that the boys had to pause and reflect on the type of language they used and the way in which they elected to tell that part of their story.

There were two boys in the group who found the activities of self-reflection very exposing and decided that it would be easier to just learn the content and not engage in it through storytelling. Once they made this decision, these boys proved to be very difficult and criticised many of the tasks. They did, however, still enjoy the Java programming component of the task and continued to participate. Using a programming language for storytelling seemed to be

their incentive to continue to engage with the content. This being said, these boys did not relate to the idea of developing a story but rather on developing the programmed code.

Using computer programming encouraged the boys to look at developing an interface that could be used as an app to disseminate information. Unfortunately, most of the boys were not skilled enough at coding to do this yet, but they asked interesting questions about what they would need to incorporate into the code to accomplish these goals. While not actually programming, the boys verbally planned what the result of the programmed task could look like. Talking about the code and what their potential apps would do, indicated that the boys were thinking about the social issues that needed to be addressed. This part of the research was not part of my original plan but proved to be useful in relation to getting the boys to think about their thinking and translate it into a storyline. While the classroom discussion was very fruitful, it was unfortunately not incorporated into any of the boys' stories.

One of the tasks was to look at the laws that were being violated with irresponsible social and environmental behaviours. Through research, the boys discovered that while laws were in place, in many instances these laws were not being enforced. They also found that when the laws were enforced, based on the information they found, the punishment was not always appropriate. The interviews indicate that relating this part of the research into a story that could be told using programmed code was difficult for some boys. Once again, the idea of programming an app for education purposes was discussed, but since the boys already established that they were lacking in programming skill, they did not engage in or explore this option as much as we did earlier in the research. My observation notes indicated that the boys had to adjust their approach to the task and resort to getting the programming code to load and play a video. With Grade 10 programming skills this was acceptable.

The majority of the boys (21 of the 23) identified that not all communities and countries are equal when it comes to access to information. Exit forms indicated that some boys realised that this digital divide has an impact not just on a social level but also on the environment and the economy. During one of the peer interviews, one of the boys shared the realisation that when people are not aware of their rights and the rights of others, it is very difficult to hold people accountable for infringement of rights and laws. This knowledge created very interesting debates amongst the boys on how "copywrite laws need to change with the improved digital era." Once again, the boys struggled with converting this data and discussion into programmed code, and it was observed that some of the boys found this frustrating. Mostly factual information came through in their code for this section. The final program result indicates that most of the boys could not integrate this finding into a storyline.

The level of programming at this stage of the school curriculum was one of the limiting factors in the storytelling. The boys did, however, show a level of resilience and found ways around their lack of programming ability to produce pleasing results. The task did ensure that the boys explored their thinking and feelings even though they could not always translate this into their code. The two boys who did not engage much in the stories felt that we could have completed this task in much less time if we used a more traditional approach to learn the content or if we used a more traditional storytelling tool.

### **Increased Understanding of Social Responsibility**

My observation notes indicated that at first, the boys found it very easy to pass judgement on other people's lack of social awareness. They even criticised and bantered about each other's lack of socially responsible behaviour until they conducted a self-audit of their own behaviours and attitudes. Observations of the discussions indicated that the majority of the boys found this newfound knowledge humbling. Two comments made by boys in the class were, "I felt guilt because I may be causing the problem" and, "The emotions that are invoked are anger but also guilt." The interviews indicated that this type of realisation made the boys aware that they can and must do more to become socially and environmentally responsible, even if it means taking just a few small steps on a regular basis.

Through the course of the project, the boys began to realise that programming language could be used to spread important messages. One of the key issues revealed through the process of the research was that most boys thought that people did not understand what role they could play in being socially and environmentally responsible. In the words of one of the boys during an interview, "lack of information leads to lack of responsibility."

### **Social Responsibility Extended Beyond the Programming Task**

Part of the action research was to determine if the boys were prepared to get involved in environmental and social projects and not just say the right things in their programmed story. This was perhaps the most exciting result for me from the action research project. According to Mertler (2016), within an education context, an action plan can occur at several different levels. It was pleasing to note that many different levels of action were identified by the boys as a collective. On an exit form, the boys expressed excitement about making changes in their own lives, their family habits, and the school culture. One boy proposed encouraging change with the use of incentives. St. Stithians College has a house system, where competition in various components of school life contributes towards house points. This boy proposed including an environmental responsibility project in the house points system, to "gamify" this

process. Two boys suggested getting the local government council to run competitions as incentives in local communities to improve environmental and social responsibility. Three boys who are part of the boarding houses proposed a plan of action to get the other boys in their houses involved in this process. One boy suggested that social and environmental responsibility become incorporated as themes in all learning areas in the school. Two more boys were determined to join the school environmental committee and try to be more influential in improving the socially and environmentally responsible behaviour in school.

### **Programming Kept Boys Engaged and Resilient**

Using a programmed language to tell and share stories proved to keep the boys engaged for the duration of this task as reported by some of the boys in the video interviews. One of the boys stated that, “you have to plan... and make sure it all fits together even when it was not working to plan.” This statement reflects how the boys had to allow for a continual adjustment to the approach of the various tasks, which Reichert and Hawley (2010) emphasise, is needed if you want any success in teaching boys. One of the boys indicated in the interview that programming, “kept it interesting” and “it allowed everyone to do things differently.” When the boys were unable to get the programmed code to work, it was noted that they had to adjust their approach and relook at their story.

The video interviews, as well as the exit forms, showed that most of the boys felt that using a programming language kept the content interesting and gave them insight into what programming languages can do, whilst still engaging with the content and the personal stories of social awareness.

### **Conclusions**

The use of various tools to collect data in conjunction with the common themes discovered through data analysis resulted in the impression that using the programmed story approach has been my most successful instructional method for this section of the curriculum thus far. The most exciting and important change that could be seen through the entire process was that the boys realised that they were not as socially and environmentally aware as they thought they were, and they realised that they needed to change some of their habits and influence change in others. This was partly because they did not realise the different dimensions of social awareness. This made them interested and curious about changes that they could make.

After this first cycle of action research, I realised there are some adjustments that need to be made before starting a second cycle. The adjustments that will follow are a result of the feedback and discussions with the boys. One of the feedback sessions yielded that the boys

may have had to report too much on their findings. Since the action research was based on one section of syllabus, the boys spent quite a bit of time researching specific components of the topic in order to ensure that the outcomes of the syllabus were adequately covered. There may have been too much emphasis placed on this curriculum unit. I discovered that the boys' reporting on their interpretation of the research and discussions of how the boys interacted with the content were more beneficial than the factual information that they had found. It turned out that the boys were learning all the time and the interpretation of the content was where the story and the learning took place. Learning about the content happened in an almost natural way as the process unfolded and the boys' interest in their findings and their thinking increased.

Completing at least two more action research cycles is necessary before exploring how this investigation could be expanded to complete more theoretical sections of the syllabus using a programmed storytelling approach. This approach will allow boys to personalise the information and relate to its content in a more meaningful way.

### **Reflection Statement**

Dealing with difficult participants who tried to railroad the process through negative comments was particularly difficult. Being enthused by this action research task made it difficult to accept that not everyone felt the same way or shared in the enthusiasm and interest in this task. Fortunately, the tasks had most boys intrigued and the negativity often went unnoticed by the other participants. This was very encouraging because it indicated that most of the boys were enjoying the process and they had immersed themselves in the tasks and they were engaging with the content in a meaningful way. Observing the boys deal with the negativity in this way was one of the highlights.

Having completed the first cycle of the action research has been a fulfilling experience. It ignited an excitement for learning and teaching. Recording the process was very beneficial and it is a practice that needs to continue. In the past, whenever adjustments or changing of teaching methods and approaches to a topic were made, the experience and findings were never documented. As this has happened many times in my twenty years of teaching, recollection of the process and experiences has been difficult to keep track of. Documenting these actions should have been part of my process from the inception of my teaching career to ensure that a more meaningful reflection of practice could have been achieved.

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