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The creation of digital artefacts as a mechanism to engage students in studying literature

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Abstract

The aim of the project was to motivate school students to learn about the national literature of their own and others' countries. Engagement was fostered via the creation of digital artefacts (or "e-artefacts") such as online comic strips, live videos or animations. The pedagogical rationale was based on Papert's constructionism and Bloom's revised taxonomy formulated by Krathwohl (2002) expanded by Churches (2008).

Participatory action research (PAR) (Reason & Bradbury, 2011) put school teachers at the centre of the research process. School teachers from five schools (Croatia, Denmark, Poland, Sweden and the UK) chose their own pedagogical approaches for classroom activities. Data on how teachers viewed the use of e-artefacts in their classroom practice was gathered using focus groups. Teachers in all five schools identified the same process for relating texts to activities: involving a close reading of the text, collaborative formatting for the e-artefact, and points for reflection and discussion.

Students and staff were not only more excited with studying the literature, learners also showed improvement in language learning. Teachers also reported that specific students showed noticeable increases in self-efficacy and classroom participation.

By providing alternative means for students to excel and show competencies beyond academic capabilities, more students feel included and valued. Furthermore, the process of creating e-artefacts demanded greater reflection from students, which was a result of greater engagement with the materials. Finally, including the creation of e-artefacts in the curriculum, whilst maintaining more traditional approaches, offers a more inclusive and rewarding provision of learning for both students and staff.

Keywords

Digital artefacts, e-artefacts, technology enhanced learning, collaborative learning, constructionism, digital literacy, media literacy

Practitioner Notes

What is already known about this topic

Creating artefacts encourages, and in many cases, requires collaboration between students which results in greater student motivation.

Creating artefacts requires more resources and longer time to engage with the activities.

The act of reframing content in other forms than text demands reflection and abstraction, which develops deep literacy.

Learners can struggle with linking the process of creating the artefacts with the academic knowledge required by the curriculum.

What this paper adds

The longer length of time taken to create artefacts results in deeper engagement with and knowledge of the content and maintains motivation for longer.

A suggested approach for making explicit the links between the creation process and the academic content being engaged with.

An analysis of the specific ways in which creating digital artefacts have supported students' educational and personal development in the classroom.

An observation of the characteristics of those students who experience limited benefit from the creation of digital artefacts

Implications for practice and/or policy

Models for effective implementation of learning in the classroom through students creating digital artefacts.

Identifying constraints to the process

Identification of barriers to the creation of digital artefacts in the classroom.

Introduction

The aims of this study were to increase student motivation to read their national literature, to improve digital literacy and skills in English. This was to be achieved through a new three-step teaching process, the first being the creation of digital artefacts in the classroom, the second being through the sharing and co-creation of further e-artefacts through online social media, and the third being to collaborate through videoconferencing in sharing these e-artefacts and their experiences of the project.

This paper focuses on the first of these steps, analysing the impact on learning of collaborative creation e-artefacts in the classroom, teacher perceptions and the impact on self-efficacy and personal development of the children who took part.

Literature Review

McDonald, Miller, Cochrane and Linnane (2011) argue that a lack of reading experience in students hinders engagement with reading and writing at school which can be improved by ensuring early intervention, parental involvement, better resources and more time. The project reported on by McDonald et al (2011) linked together schools from 5 countries and used a range of different media to create digital artefacts on a range of different texts, including films, fiction, books, non-fiction books, games, TV programmes, DVDs, comics, and graphic novels. To do this they drew upon social media, websites, magazines, advertising, friends, books and music stores. The project concluded that Information & Communication Technology (ICT), not just hardware such as laptops but also software for example cartoon generators, enable creativity and could be used to improve the interest of students in learning and writing, as well as increase their confidence. Using digital media such as online graphic novels or YouTube made lessons more enjoyable and stimulating, not only by making them more interested in responding to the texts they had found, but also by giving them confidence to create texts of their own (McDonald et al, 2011, p.19). In addition, it was observed that "ICT and digital storytelling [offer] an opportunity to further develop and expand pedagogical practice" (McDonald et al, 2011, p.19).

The rationale is built on three educational principles. Firstly, the idea that by encouraging students to create digital artefacts their learning will be improved. This is known as learning through design (Kafai & Resnick, 2011, p.4). For the purposes of this project, we used terminology generally recognised in the educational community, "A digital artefact is any type of item produced and stored as digital/electronic version. Examples of digital artefacts include digital documents, presentations, programmes and codes, video and audio files, images and photographs and the like." (Wikieducator, 2007). These are also known as 'e-artefacts'. Secondly, technology is used to support learning (Walton & Hepworth, 2011, 2013). Thirdly, the act of storytelling is a useful learning tool in itself to encourage self-empowerment and communication (McDonald et al, 2011).

Learning through design is often described as an exemplar of constructivist theory where the creative act of designing provides a "rich context for learning" (Kafai & Resnick, 2011, p.4). Both Piaget's concept of constructivism and Papert's of Constructionism (Ackerman, 2001, p.87-88) look at learning as a development of an internal worldview from which to interpret the world, ie

constructivism. However, in our search for practical applications of theory in the classroom we identified Papert's constructionism as a model with which to understand the children's development as it proposes a mechanism whereby this development is "formed and transformed when expressed through different media, when actualized in particular contexts, when worked out by individual minds" (Ackerman, 2001; 88). In Papert's view, "self-directed learning is an iterative process by which learners invent for themselves the tools and mediations that best support the exploration of what they most care about" (Ackerman, 2001, p.88). Our proposal was that the opportunity to create using technologies, and to share these with their friends, is what children most care about. In short, e-artefacts can be a way to encourage children to learn and give them the tools to continue to learn.

Collaborative learning is described by social constructivism as a process by which meaning is constructed jointly by a community (Conole et al, 2005, p.11) and requiring social negotiation (Driscoll, 2005, p.397) where interaction promotes learning (Dillenbourg, 1999, p.5) and can have a positive impact on students' perceptions of their own learning (Lawlor, Marshall and Tangney, 2016). Lewis, Pea & Rosen (2010, p.7) summarise social constructivism as the process in which "By together questioning texts and situations, conceptualizing problems, designing solutions, building e-artefacts, redesigning, re-conceptualizing and reinterpreting, people generate forms of public knowledge that in turn provide conceptual and relational support for further interaction and learning".

Krathwohl, in his reworking of Bloom's taxonomy, places creativity as the highest order of learning, arguing that it is an activity that requires the learner to know, understand, apply, evaluate and synthesise in order to carry out effectively (2002, p.214). In essence, meaning is created by the learner, both by interacting with an e-artefact and with other learners. Furthermore, learning through constructionism enables learners to maximise the effectiveness of learning activities by sequencing them so that the act of creating an e-artefact is followed by feedback and then learning from this feedback in a recursive cycle (Kolb, 2009).

Locating this within a digital arena (Churches, 2008), "creating" activities become programming, filming, animating, blogging, video blogging, mixing, remixing, wiki-ing, publishing, videocasting, podcasting and directing/producing. These are the kinds of activities in which this project aimed to engage children. It is envisaged that these approaches will have a positive influence on learners' self-efficacy (defined by Bandura (1977, p.193) as 'the conviction that one can successfully execute the behaviour required to produce the outcomes'.

Despite the benefits that enabling learners to create their own learning can provide, and creativity within a 21st century context would evidently involve digital tools, there is still "no body of hard evidence that tells us with any precision when we should best use technology, or avoid it" (Davies, 2007; 50). In a survey of the use of ICT in teaching English, the predominant use of ICT is in re-presenting the texts for further text-based consumption, through annotations, blogs and forums, or even simply using e-books rather than print (Andrews, 2007, p.132).

There are examples of more transformative approaches to bringing technology into the classroom, for example students reframing texts using visualisation software. In these cases of active creativity using different media, learners not only engage more deeply with the text in terms of understanding its meaning ("deep literacy" as opposed to simple improvements in reading and spelling), but also are more motivated which improves students' ability to work with each other and with teachers

(Davies, 2007,p.60-61). There are shortcomings, too, for example, the tendency for these techniques to require more resources and time, and also observations have been made that focusing on the creation of the artefacts can distract from the longer term academic objectives (Sadik, 2008,p.501-502). Also, the improvements in engagement may be short lived, and the ICT literacy possessed by students and staff may not be sufficient to properly implement the activities (Andrews, 2007; 133).

In summary, this study builds on previous work by encouraging students to engage more deeply with the literature they are studying by requiring them to reframe those texts using digital tools, and so develop their knowledge and collaborative learning via a scaffolded process (Walton & Hepworth, 2011, 2013) where learners construct meaning through the act of co-operative design (Kafai & Resnick, 2011). The intention is not only that they learn the subject matter better through constructionist learning (designing and socialising); they will also become more reflective learners by embedding this constructionist learning in an experiential learning cycle. It also aims to determine practical steps that teachers can adopt to employ these strategies within their classrooms, and identify the benefits that may result.

Participants

To encourage the learning in a variety of contexts, and to provide a platform for the sharing of different nations' literature, the study involved school children and their teachers in Croatia, Denmark, Poland, Sweden and the UK. This partnership was facilitated via Erasmus and Comenius projects over a number of years. This foundation provides the basis for informal relationships which provided the levels of trust required for effective collaboration (Vangen & Huxham, 2003, p.11).

In total 400 school students participated. The age ranges from each school were as follows:

Croatia 10-11 years

Denmark 9-10 & 11-12 years

Poland 10-11 years

Sweden 12-13 and 14-15 years

UK 9-10 years

Details of the learning contexts in the five schools are provided in Appendix 4.

The project took place over two years, with six months preparation, during which the technologies were selected through consultation with the teachers involved, drawing upon technologies with which they were familiar, and consensus established about which all felt able to employ. As such the process emulates the five step process identified by Vanderlinde & van Braak (2013) which enabled:

'(1) gaining insight into teachers' vision of good education,

(2) making an inventory of the actual use of educational technology,

(3) setting priorities,

(4) considering new activities and

(5) drawing up an action plan. (Vanderlinde & van Braak, 2013, p.E16)'

This was followed by a single academic year in which the students were engaged with the activities approximately one day per week and data gathered. The project concluded with a six month period in which additional data were gathered and then evaluated.

Methods

Research methodology

The research methodology was designed using participatory action research (PAR) approaches, as these are not only ethical and democratic (Fetterman et al, 1996 and Reason & Bradbury, 2011), but also pragmatic. Engaging school teachers in the research process can be seen as “academics” placing an additional, and onerous, burden upon the “practitioners” who may feel themselves as being merely research subjects. This can result in an “us and them” power relation within the project team, and so constrain the teachers’ engagement with the research process, such as administering surveys to the students, and participating in reflective activities. A participatory action research approach can mitigate this barrier (Fetterman et al, 1996). In effect, followings the findings of Vrasidas (2015) who observes that to make change, pedagogical practice requires the participation of stakeholders in the design, implementation and evaluation of the introduction of new ICT within the classroom.

The methodology was therefore designed to engage school teachers by;

- encouraging them to co-design the research questions so they would be of value to their own practice, each teacher contributing their own interests, with the questions below synthesising these submissions,
- enabling them to choose the research tools they felt most appropriate to their students
- limiting the data gathered to the practitioners’ best estimate of what was appropriate to their students and thus ensure that the evaluation did not make excessive impact on students’ time.

The implementation of the project was therefore, by necessity opportunistic, providing a range of technologies from which the practitioners could select, and leaving it to them how to incorporate these into their own pedagogical practice and curriculum in order to address the project’s research questions:

RQ1 What activities effectively support the pedagogical approach?

RQ2 What support do students need to enact the pedagogical approach?

RQ3 What influences do individual differences of students have on the effectiveness of the approach?

RQ4 What constraints are there in deploying the approach?

RQ5 Were there any unforeseen benefits or hindrances with effecting the approach? This was a catch-all question enabling teachers to offer any observations that may have been outside the initial anticipated impact of the study.

Methods

Of the various methods that were offered to the teachers for gathering data from their students, including both quantitative methods in the form of surveys, and qualitative methods in the form of setting reflective tasks to students, none were deployed consistently across the different schools, due to differing constraints. The one data gathering method deployed consistently was the authors' use of semi-structured interviews with teacher practitioners and consequently this is used as the basis of the analysis presented here. To provide a student perspective, additional quotes are drawn from the additional (non-comparable) data sources, but are used for illustrative, not analytical, purposes.

Focus groups were effective in eliciting data from teacher practitioners because:

1) in-depth accounts of classroom experiences were required, with reports on the range of impact on different students, with varying abilities, motivations and skills, in order to ensure that the nature of the study was fully understood, drawing on the teachers' knowledge of their students and the contextual factors for the study. This could not have been achieved through a simple survey tool (Stewart & Shamdasani, 2015, p12).

2) the groups formed were close colleagues and the interviewers had worked with them throughout the project, and thus formed a "real group" in a "natural setting," highly conducive for effective data gathering (Stewart & Shamdasani, 2015, p11).

3) a group setting was more likely to elicit consistent engagement in the data-gathering process across the whole project team than remote, text-based correspondence.

It is recognised that focus groups have some limitations. The chief of which is the possibility that group members could be influenced by a single perspective for example, if the group contains a member with a dominant personality or an individual with higher socioeconomic status (Stewart & Shamdasani, 22).

Five focus groups were conducted, one in each of the five schools involved. The focus groups were semi-structured, in that a common set of questions were asked of teachers at all five focus groups, with follow-up questions for clarification or for more depth. A selection of verbatim transcripts are available in Appendix 1 and the questions are listed in Appendix 2. The total volume of all transcripts is 36000 words in total.

4) Categories were developed through a constant comparative method (Bryman, 2012) independently from other sections of the evaluation. These produced a series of common factors that were exhibited across all five focus groups, and are shown in figure 1. The findings below follow these categories, expanding upon the characteristics identified. Representative quotes have been added in order to illustrate these categories.

Figure 1. Factors influencing learning with e-artefacts

[Figure_1 place here]

Findings

Employing the creation of e-artefacts in the curriculum, while maintaining more traditional approaches, offers the most inclusive and rewarding provision of learning for both students and staff. How this was achieved is demonstrated in the findings. Although teachers were asked to employ technologies in the teaching of literature through the creation of digital artefacts, the specific steps taken to achieve this were not prescribed. Nevertheless, teachers all introduced this

concept to their students in a very similar process, determining independently that these stages would be most effective in working with their students. The steps in this process are outlined below and shown in figure 1.

The first step was to decide the literature to use for the project, which is similar to usual working practices. This step in itself can promote engagement with reading, in that, by interesting the students in part of a book, they will then choose to read the rest themselves (see Appendix 1, T1). Note that in the Swedish context their librarian is also involved (see Appendix 1, T2). This was found not to be the case in other countries. In tandem, teachers checked which software applications were available and ensured that the functionality of the software matched the planned activities. Teachers found that there was not one particular activity that worked, only that by selecting different types of activity, the novelty (and therefore high levels of engagement) were maintained. Choosing the right tools to support the chosen activities was important. Once the tools to be used were determined, the students were introduced to the tools (See Appendix 1, T3). Alternatively, some schools allowed the students to make their own choices about what e-artefacts to make (See Appendix 1, T4).

Once these were in place, a key part of the engagement was to conduct an analysis of the texts in the classroom, focusing attention on the key points needed for the children to draw upon for their e-artefacts. For some schools this was a new part of their process, others normally did this as part of their analysis. For example, Swedish schools have a reading strategy which involves analysing books through a particular lens, *'we have the detective, the reporter, the fortune teller, and the artist, and you're supposed to use these characters and then to have different discussions about what you have read'* (see Appendix 1, T5).

Although the e-artefacts to be created and tools were decided early on (videos, or "Top Trumps" cards for example – see fig. 2), teachers found that a key stage before commencing activities was to consider the ways in which the type of e-artefact requires a specific structure, for example, what content for the video would best suit the analysis. Activities were designed that combined type of analysis with specific tools the teachers wanted the children to use, taking into account students' abilities and the specific practicalities of the situation (see Appendix 1, T6).

To help students link the two processes of reading and interpreting the book on one hand, and creating the e-artefact on the other, some schools required the students to create a logbook, which recorded their thoughts about the book and gave the children a set of materials to draw upon when putting the e-artefacts together. This became the common record of their various practices throughout the project.

Figure 2. "Top Trumps" playing cards designed by Danish students

[Figure_2 Place here]

The selection process for bringing students to work together was a step that required teachers to balance many competing concerns. The motivation of students, the ability of students and, where students had the option, which sort of e-artefact they wanted to create all had a bearing (see Appendix 1, T7). Learning was consolidated by reflecting on the e-artefacts created by giving presentations to, *'explain the intentions behind the creation (e-artefact) and what they focused on the most'* (see Appendix 1, T8). This is a critical moment in the process for a number of reasons because it enables two processes to take place. It promotes reflection and allowing the process of creation to commence.

The act of having to retell the story required the students to investigate and think about the story in more depth. They had to understand it more fully in order to produce the e-artefacts, *'when you're making something, an e-artefact out of a story, they had to read the story very closely, much more closely than they used to because they're going to retell it'* (See Appendix 1, T9). This led them to remember more as well as understand it; with one UK student stating *"Doing the action and making up our own Mischevions has helped some of them [original characters] stick into my mind"*.

For other schools this was not such an integrated part of their approach to literature and so an important part of the teaching process was to prepare the students for the creation of the e-artefacts by exploring the books and helping them analyse the works. Extracting key elements of a storyline is a complex reflective task for children of the ages involved in the project, a factor pointed out by teachers in both Croatia and Denmark. The e-artefacts produced, therefore, are the result of a challenging interpretive process for the children, although they include no obvious personal reflection or perspective on the works, *'An important component of creating e-artefacts ... was analysing the literary work beforehand.'* (see Appendix 1, T10). This introductory session was seen by teachers as a fundamental part of the teaching process. The rationale for the approach described here is to encourage an understanding and love for reading. It was seen to be essential that any creation of e-artefacts had to be in the context of a full understanding of the book, *'because we prepared extensively beforehand and thoroughly analysed the literary works, the children were able to choose the part which they liked the most'* (See Appendix 1, T11).

The use of a logbook enabled students kept a record of their thoughts about the book while they were reading it. Not only did this mean that the students had an account that was in more depth than just a retelling of the narrative, it also worked as a record of the actual content of the book, which helped when constructing the e-artefacts, *'they kind of ... really knew the book. Later on. And they could discuss it, and they could say - well, this is it. No, that isn't what happened!'* (see Appendix 1, T12). The logbook, discussion and the filming further facilitated reflection. .

None of the students presented any problems with acquiring the skills to use the technologies. Most of the software used was already familiar to the students, particularly the older ages, for example one 15-year-old Danish student stating *"The School technologies we have to use, is amateur stuff. When i edit a video for fun, i use Sony Vegas Pro 12/13"*. One constraint of the process was some children required more individual attention; which presented resourcing problems. This may have been due to some students working too slowly or because they did not remain focused on the task. Although no single technology was particularly complicated, it was challenging to keep large group numbers simultaneously using the technology and on task.

School timetable constraints meant that students did not have time for this initial exploratory activity to acquire complete familiarity with the technology before moving onto using it for creativity. Some schools find the daily pressure of schedules and lack of time too limiting to add in extra activities, *"to actually find time because everything in school so manic, isn't it?"* (see Appendix 1, T13 and T14). One mitigating solution was to choose to make comic strips rather than videos since these take less time and enable the students to focus more on the analysis and interpretation of the text rather than the production of the e-artefact. However, although students did show some difficulties with requiring more support and time than anticipated, none of the respondents indicated that implementing the technology itself had been an issue. This indicates the effectiveness of a technology plan drawing closely on the competencies and interests already established within schools (Vanderlinde & van Braak, 2013, p. E16) and involving practitioners in the research design.

Comparing the experiences between countries showed few differences, with the exception of the UK. This school had particular problems because of less autonomy in choosing the degree to which non-written work can be substituted for written work, *“to do that every week [create e-artefacts] we would then feel that's too much because they wouldn't have enough in their books written down”* (see Appendix 1, T15). Another constraint on the new teaching process in the UK is in the dominant cultural normative practices that require classrooms to be organised and calm, and children to be orderly, *“I think sometimes we try and avoid that and it's easier when they've got a pen and pencil. But actually when they're engaged... it's noisy and a bit chaotic, but when you look around there's nobody misbehaving”* (Appendix 1, T16). These normative constraints were not evident in other European schools. It appears that, if this new approach were to be adopted more widely in the UK some re-imagining of how a school operates will be required, for example in terms of dealing with noise. Collaborative working, by its very nature requires that students talk to each other, teachers and their heads would need to recognise that noise demonstrates productive, creative and focussed activity rather than inattention. Another factor is that co-operation, a core part of the new teaching process, presented more of a challenge to introverted students. These students are typically more likely to be already engaged with traditional classroom approaches, and so the combination of less potential for development (because they are already realising their potential) and more challenging activities may lead to this not being a beneficial exercise for these students (see Appendix 1, T17).

The process may have had a differential impact on students. Being able to express themselves through another medium other than text helped these less academically-focused students to contribute (see Appendix 1, T19). It narrowed the attainment gap between those students and those who excel, *“it's a help that they can make it in a picture, or illustrate it in another way, and that's also an example of how the gap between the good students and the less able is getting smaller”* (see Appendix 1, T18). Teachers also observed differences in how their students responded to the task of creating e-artefacts. Some students saw the activities as an opportunity to explore and create the e-artefacts and have fun with the concepts. Others focused on producing the artefact as quickly as possible so they could move on to the next thing (see Appendix 1, T20).

Students and staff indicated more excitement in studying the literature; they reported that the use of technologies made the activities more interesting, but also commented that these had to be changed in order for the novelty not to wear off. Having a range of different tools available is therefore important (a list of the software tools used by students can be found in Appendix 3). Enthusiasm arising from the additional engagement factor of using technologies extends to creative writing as well as literature. Whereas before children did not like writing poetry, now they have the opportunity to do more technologically, the desire to write verse has increased. This applies to all abilities, not just the less-able students, *“before, if the children actually write poems – ‘oh, it's boring’, and now they like it!”*. Another common theme was that the value of the teaching process was not simply the introduction of technology, but that these technologies were varied. The process recommended a range of technologies and this constant novelty was also felt to be key to maintaining children's interest and sustaining it for longer. *“they would quickly get tired of using a particular tool, so we tried to use as many tools as possible”* (see also Appendix 1, T27). A student, when talking about videoconferencing between the UK and Croatia, made the following comment which echoed the previous view, *“Most of them [fellow students], at first thought of everything they would have been, ‘yeah, yeah, yeah’, but towards the end they would have been, ‘do we have to go for another VC [videoconference]?’”. “[...] Probably because it sort of turned into something, the usual routine, and not exactly very out of the ordinary.”*

Students could show and develop their digital competence, their communication skills and their language skills (see Appendix 1, T22). ~~One example was via the Edmodo secure social media tool. Although take-up was disappointing as a whole, during the most significant activity there were 102 posts where students shared their e-artefacts across borders. Those posts received 85 likes and 47 replies. UK students were not allowed to access Edmodo because teachers regarded the software as 'too risky', despite repeated reassurances that it was secure.~~ The benefit to the students generally in terms of engagement with classroom work, and the opportunity to develop new relationships resulting from different activities also had a beneficial impact. Teachers reported that providing students with a wider-range of activities in the classroom had positive benefits on their confidence and self-efficacy (see Appendix 1, T23). Other elements that teachers noted was how unpredictable the students' response to the opportunity was, in that some students that were not particularly self-efficacious normally, became much more forthcoming when given the opportunity to present themselves in video, *"they seemed a bit more outgoing and they delivered ... more confident ..."* (see Appendix 1, T24). This facilitated closer reading of the text and engaged a wider range of student abilities and interests. Including the creation of e-artefacts in the curriculum, while maintaining more traditional approaches brought about a inclusive and rewarding provision of learning for both students and staff (see Appendix 1, T25). Relationships between staff and students also improved, as both reported that being in the classroom was now 'more fun'. It would appear that by providing alternative means for students to excel and show competencies, more students, particularly those less able academically, feel more included and valued.

The overall impact of the new teaching process has been very important for building up skills, creativity and self-efficacy of these school students (see Appendix 1, T26). However, one of the goals of the project, that the teaching process created will produce a stronger love for reading, is not so evident. The teachers doubt that this has changed, but are confident that the process has improved the degree to which students enjoy learning about literature, *"they were more engaged in the texts"* but noted, *"I don't honestly think it's going to have... it would have necessarily a long-term impact (on students' desire to read)"*. Not only did the teachers think that students enjoyed sessions on reading more, they also thought the process improved the depth of engagement with the reading material. This is partly because creation of an e-artefact requires students to apply reflection and interpretation to their reading, *"they got more into the book. They picked up more details; they were more involved - immersed."*

One indirect aspect of the new teaching process was that, in order to create the e-artefacts, students had to focus on the book for longer. This longer time spent, plus the requirement to look at the book from a particular perspective, meant that students delved far deeper into the books they were studying. Also, it is because of the additional engagement and interest caused by the use of the technology that students are able to remain focused on a single book, enabling the book to be investigated in more depth (see Appendix 1, T28). It should be noted however, that not all countries allow schools the autonomy to make this change (see Appendix 1, T29). Another aspect of introducing the process was it presented something new for many of the students, not only with respect to the technology but also the opportunity to create and to interact with other students. This interaction also helped the students learn from each other, and motivate each other to produce material (see Appendix 1, T30). Sharing the e-artefacts within the class also was very engaging for the students, though some e-artefacts were more than others. Videos that depicted the other students were found to be generate the most interaction (for example, when compared to comic strips) (see Appendix 1, T31).

The benefit to the students generally in terms of engagement with classroom work, and the opportunity to develop new relationships as a result of different activities also had a beneficial impact. Teachers reported that providing students with a wider range of activities in the classroom had positive benefits on their self-efficacy, *“when they are set into a new surrounding and they have to react spontaneously, they discover different skills.”*

Discussion

Teacher observations throughout all of the five focus groups indicate that learning activities, which require the creation of digital artefacts, produce a greater engagement with learning literature supporting RQ1 and findings in previous work such as, McDonald et al (2011); Lawlor et al, (2016). In part this is simply because the students find the use of technology more interesting echoing Davies (2007). Their attention is promoted through the use of the digital environment, although this novelty soon wears off and the technology used needs to be varied, this short lived engagement is also noted by Andrews (2007) and Sadik (2008).

However, the aspects of the learning activities that relate to creativity, to collaboration and to the demonstration of skills outside of academic skills of writing, also contribute to engagement echoing Krathwohl (2002) and Churches (2008). Students and staff both reported on how the activities within the classroom fostered an environment of enjoyment. The inventiveness and movement required in creating the e-artefacts was a pleasurable experience for most of the participants. This mutual enjoyment was further enhanced by the technologies employed being ones that the teachers felt confident in using, as they drew on those with which they were already familiar, or had selected themselves. This observation supports the findings of Vrasidas (2015, p.379) that changing pedagogical practice requires the participation of stakeholders in the design, implementation and evaluation of the introduction of new ICT within the classroom.

Analyses of these texts were conducted in more depth for several mutually-supportive reasons.

- Creating an e-artefact requires a greater understanding of the text, as it needs to be re-presented to an audience, and this necessitates deconstructing, summarising, and applying a perspective on the narrative (Kafai & Resnick, 2011).
- Students remain engaged for a longer period on the text, because of their interest in the technological aspects, and so this enables a deeper understanding of the text, simply by having worked on it longer corroborating work by Davies (2007)..
- The process is even more supportive of less academically-focused students, as the multimodal aspect of the e-artefacts gives these students an opportunity for self-expression they do not find in text-based activities in line with work by McDonald et al (2011).

Although the concept of creating digital artefacts per se is found to be valid (in line with Kafai & Resnick, 2011), there are elements of the specific implementation found within the learning activities employed in the project which enhanced the effectiveness of the approach.

The specific steps of the new teaching process are covered in more depth in the AMORES project report (2015). In brief, the aspects reported by the teachers as contributing most effectively to the learning activities and supporting RQ1 were:

- Choosing appropriate technologies for the tasks that are planned, and providing variety of technologies, are key elements to a successful implementation. Appropriate here means both in terms of enabling the students to be creative within the resources and skills

available, but also in terms of supporting the type of analysis chosen (for example applications that include timelines).

- Introducing a reflection stage to consolidate learning, as this provides an opportunity for students to articulate their choices of text and technology echoing Kolb & Kolb (2009).
- Above all, it is important to analyse the texts with the students to provide the depth of interpretation and reflection that is required. Digital artefacts were also useful here because video, and to a lesser extent comic strips, were effective media for sharing and reviewing analyses between students.
- Useful tips, such as creating a logbook of analysis, helps with this interpretation process, and also acts as a basis for the creation of the e-artefact.

In relation to RQ2, students require support in interpreting the literary works, but also in developing the skills required in creating the digital artefacts. The level of media literacy of students can be over-estimated and so help in how to structure videos, comic strips etc, needs to be paid attention to.

Schools experienced some constraints when applying the process and this implies that perhaps some re-imagining of how a school operates is needed in order to alleviate these. Time was a particular issue for many schools, as finding the time to set up the activities, and finding the additional time that the creation of e-artefacts demands is also difficult. Teachers found that working with fewer books in more depth would actually benefit students' learning. However, not all school systems allow enough autonomy to enable this to be enacted which partially addresses RQ4.

In consideration of RQ3, the new teaching process has a differential impact on different students. Although creating e-artefacts has a beneficial impact on students' learning (as per Papert as cited in Ackerman, 2001; 87-88), the extent of this impact depends on a range of individual differences between students. A particular strength of the process is that it benefits most those students who normally do not succeed within an academically-orientated environment, as the creation of e-artefacts gives them a different forum to express their skills. Given this, however, students with strong language skills continue to perform particularly well and those who were averse to reading still tended to participate to a lesser extent.

The findings demonstrate that the collaborative aspects of the process also promote engagement and learning corroborating Lawlor et al (2016) and Kafai & Resnik (2011). However, this does not apply equally to all students. Students that are not collaborative may be disadvantaged by this new teaching process. Finding ways to support these students and encourage them to recognise the value of collaborative skills is an important adjunct to our approach. This approach may be an opportunity for them to form co-operative learning skills, if properly scaffolded (echoing Walton & Hepworth, 2011).

The new teaching process is successful in a far wider range of competencies than reading. Although the project promotes literature reading it is in its development of students' personal sense of self-efficacy and co-operation that it has its strongest transformative power. There were many stories of students that previously had not had opportunities to present their abilities finding a new presence within their classrooms. Creating e-artefacts had an additional benefit in that gives many students with low self-efficacy an opportunity to develop supporting McDonald et al (2011) and providing an answer to RQ5.

What is evident is that by placing different demands on students, a certain subset of students who did not normally do well in class were given an opportunity to develop. Others who would normally

perform well were not given as great an advantage. The implication is that an effective learning environment is one in which multiple teaching approaches are adopted, in order for each student to have their different abilities rewarded. For this reason, we would not suggest replacing all classroom activity with the new teaching process, but this form of activity should be one amongst many.

Conclusions

The participative research strategy put in place throughout the study had strengths and weaknesses. Its advantage was the additional motivation and engagement of the practitioners within the classroom, and the effective collaboration that took place. The limitation was that the evaluation of the students' learning was conducted inconsistently, resulting in a lack of comparable data from the schools. However, direct focus groups with the staff, conducted by the authors, generated a large amount of qualitative data, which although could not be triangulated with quantitative data and the students' perceptions, was reinforced by similar experiences from all five schools. The findings from the practitioners reports across the five schools were:

Creating e-artefacts appears to be a valuable mechanism for encouraging students' engagement with studying literature. The factors that contribute to this are partly that students find the inclusion of technology interesting (though the novelty quickly diminishes) but largely because the opportunity to collaborate and create is in itself rewarding for most students.

This builds on previous studies (eg. Davies, 2007) which observed that reframing texts using video and visualisation tools encouraged deep literacy, as this requires reflection and abstraction in order to create the artefacts. However, we have also observed that an issue with the longer times required (Sadik, 2008) also contributes to this effect as the length of time taken to create the e-artefacts requires longer engagement with the texts being studied, while also creating an environment which is stimulating enough to support longer engagement. For this reason, the longer times taken to implement technologies within the classroom is not a negative aspect of using ICT; it is beneficial.

Observations by Sadik (2008) that students can struggle to link the activities to the academic content were also observed, but the interviews with staff demonstrate that through interjecting moments of reflection in order to make these processes explicit to the students can support this aspect of learning. That the practitioners at the schools independently came up with very similar strategies, that worked within their separate contexts, indicates the generalisability of this method.

This expands upon previous work, by presenting evidence that, if effectively scaffolded, links between the process of producing artefacts and the unpicking of meaning from the texts, can be made clear for students. It also presents a replicable strategy for doing so.

The findings of the project also address some of the concerns of the literature, in that we observed no barriers due to ICT literacy across any of the five schools. The process of introducing technology to the classroom requires the initial input from staff to design and create a technology plan, which contributed to this removal of technological issues. As previous studies have noted (e.g. Davies, 2007), with effective and engaging technologies in place, learning is more fun for students and staff, resulting in a more enjoyable classroom dynamic – although some re-imagining of how the classroom is managed, particularly in allowing more noise for collaborative activities is essential.

The value of using data from in-depth focus group conversations with staff is that these are practitioners who have deep insights into the learning and development of their students. Although largely interpretive in nature, these insights enable individual differences in the personalities of students to be observed, and the differential impact of the approach on students to be analysed.

Creating e-artefacts engages a wider range of abilities and interests of students and so this approach enables students who are not academically oriented to demonstrate alternative skills, as for example, linguists, film-makers and actors . Teachers educators found this approach particularly rewarding professionally as it had the added impact of benefitting a subset of students by developing their self-efficacy. As a corollary, the limitations are that this approach has less impact on those students who self-identify as non-readers, and those who have less developed language skills. Students who are averse to collaboration, and those who have an advantage in a traditional academic approach to studying may struggle with the tasks. The approach is also demanding of both time and resources, and requires some flexibility in approach to curriculum and assessment, which in our experience may be more difficult in some countries than others. However, it is our view that including the creation of e-artefacts in the curriculum, in tandem with more traditional approaches, offers the most inclusive and rewarding provision of learning for both students and staff.

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Statements on open data, ethics and conflict of interest

Ethical approval was established through the lead UK partner Staffordshire University.

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No conflicts of interest have arisen or are likely to arise as a result of this project.

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