
Learning, Technology and School Success

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ABSTRACT Based on research conducted as part of the project Learning by Design: creating pedagogical frameworks for knowledge building in the 21st century, funded by the Australian Research Council, the article explores the learning experiences of two students in a primary school in the Australian Capital Territory. In communities where ordinary citizens, including children, have ready access to contemporary technologies, the potential causes of underperformance are critically examined in the light of the cases of two students in their final year of primary/elementary school, for whom school success had proved elusive in the past. The article describes the learning journey of the students and their teacher as they begin working on a Learning Element designed using the Learning by Design planning framework with its eight knowledge processes. A brief outline of the Learning Element provides a context for the students' experiences, highlighting some of the factors which influenced the teacher's design. The children are given a voice as they explain their experiences of learning designed using this approach. Their improved performance is analysed in the light of the learning design to extract the features of the Learning Element which impacted most significantly on the performance of these students.

Introduction

Today, expanding arrays of information and communication technologies (ICTs) are increasingly available to ordinary citizens as they pursue their everyday lives. For many children, these technologies have become a taken-for-granted part of their lifeworlds. In communities where access to technologies is no longer a significant issue, it is becoming apparent that access to technologies alone does not ensure school success. For some students, school success in an age of expanding ICTs is as elusive as in the traditional schools of the past century.

Initially, with the advent of the digital age, observing the confidence and enthusiasm of children engaging with these technologies, it is not surprising that Tapscott (1999, p. 8) declared: 'Digital kids are learning precisely the social skills required for effective interaction in the digital economy. They are learning about peer relationships, team work, critical thinking, fun, friendships across geographies, self-expression, and self-confidence.' However, quickly more cautionary notes were also sounded by others, including Yon (2000) and Jenkins et al (2006), who have recognised the potential for new forms of exclusion to emerge in what appear to be inclusive, participatory environments. Perhaps a part of this concern may be attributed to an awareness of the complexity of these environments and the literacy demands they impose, as highlighted by Anstey:

Being multiliterate requires not only the mastery of communication, but an ability to critically analyse, deconstruct, and reconstruct a range of texts and other representational forms. It also requires the ability to engage in the social responsibilities and interactions associated with these texts. (Anstey, 2002, p. 446)

This recognises that learning to become multiliterate involves more than just access to new media; it requires an effective learning design that provides opportunities for exploring these new literacies and accompanying social skills. Similarly, Luke (2003, p. 399) contends that the pedagogical emphasis should not be on the technology but rather on knowledge and learning: 'Computers and

connectivity are but one resource among a platform of knowledge and communication sources that support, rather than drive, a critical, learner-centred constructivist pedagogy, and teachers remain an indispensable component in this mix.' From these arguments, it would seem that even in an increasingly technologically mediated world, teachers and effective learning designs hold the key to student success.

The veracity of these arguments became evident in the real-world context of an Australian classroom. On entering a socioculturally diverse classroom at the beginning of a school year, in a school where students enjoy ready access to ICTs, both in the home and at school, it soon became apparent that even within this classroom, for some students school success had proved elusive. Following the stories of Marie and Rob (the names are pseudonyms) as they embarked on a learning journey with their teacher using a new pedagogical framework – the Learning by Design framework – the importance of an effective learning design to student success was revealed through these students' improved performance and engagement with learning.

Elusive School Success

Initially, Marie and Rob's lack of school success posed a conundrum. Despite their best efforts, school success appeared to elude them. Various reasons are cited as to why school success eludes some students. Kenway & Bullen (2005, p. 31) contend that many students today are 'dissatisfied, disengaged, disaffected, disrespectful, and disruptive'. Adding weight to this argument are the findings of the Australian Capital Territory's (ACT's) 2000 Programme for International Student Assessment (PISA) results, which drew a link between student engagement and literacy performance with the research finding that in the ACT, student engagement levels impacted more on students' performance than gender or socio-educational status (Frydenberg et al, 2005). However, Marie and Rob showed no signs of disengagement and were in no way disruptive or disrespectful. On the contrary, Marie and Rob were generally compliant and accepting of the adult-imposed rules and codes of conduct evident in schools (Schilling, 1993; Valentine, 2001). Furthermore, they were generally observed to be diligent in completing classroom tasks and homework assignments.

Perhaps Marie and Rob's lack of school success was the result of limited access to or interest in ICTs. Like Tapscott (1999), Gee (2006) has highlighted the enormous learning potential of engagement with digital media and, in particular, computer games. For Gee (2006, pp. 10-11), one of the most powerful features of computer games is their interactivity as 'all deep learning involves learners feeling a strong sense of ownership and agency, as well as the ability to produce and not just passively consume knowledge'. Further exploration revealed that Marie and Rob did, indeed, have easy access to ICTs both in the home and at school. In fact, Rob's parents revealed that he spent significant amounts of his leisure time engaged in playing computer games with his friends. Both Marie and Rob, in addition to using these technologies in their leisure time, also used them in completing school assignments. However, any learning that was occurring in their use of these technologies was not translating into school success. There still appeared to be something yet to be identified in the differentiation of Marie and Rob's experiences from those of their peers.

In the cases of Marie and Rob, an alternate explanation may also have been sought in adopting what Cummins (2001) contends is the approach of current educational reforms, which is to place the problem of underperformance with individual student characteristics. While discussing the performance of students from linguistically and culturally diverse backgrounds in America, like Cummins (2001), Gallego et al (2005) have expressed concern about these deficit interpretations of student underperformance with their tendency to attribute underperformance to individual characteristics of the child, their family or community. Characteristics used to explain student underperformance include low intelligence and lack of motivation, as well as poor linguistic and high-order thinking ability. Although it may have been easy to resort to these deficit interpretations of Marie and Rob's underperformance, there was a sense that their underperformance was not the result of low ability, lack of effort or sociocultural background.

Cummins (2001) provides another possibility in the nature of classroom interactions with their unequal power relations and the messages they convey to students about the worth of their language, culture and perspectives. Perhaps, in this latter explanation, there was a clue, as both

Marie and Rob, despite their engagement with the learning, did not appear to fully belong in the learning. Delving further, it became apparent that the answer may lie in Kalantzis & Cope's description of progressive curriculum, where they note a subtle form of exclusion may occur in what, on the surface, appears to be an inclusive environment where difference and diversity are valued:

Ostensibly, this is a classroom of open engagement, but if the rules of engagement don't click, you won't do well here. To succeed you need to get with the epistemological strength of the lifeworlds closest to the culture of curriculum, to think in a particular way, act in a particular way, communicate in a particular way and ultimately know in a particular way. (Kalantzis & Cope et al, 2005, p. 60)

Although Marie and Rob were from significantly different sociocultural backgrounds, their lifeworld experiences and family values had instilled in them a set of expectations and understandings about schooling that closely mirrored the traditional schooling of the past century, which emphasised singular, authoritative notions of knowledge rather than the more questioning and open-ended exploration of knowledge such as in contemporary classrooms, where personal perspectives are canvassed. The difficulty for Marie and Rob was the mismatch between their expectations and those of their teachers. Perhaps this subtle form of exclusion also operates in digital environments, as feared by Yon (2000) and Jenkins et al (2006), among others. The concern is that for some students, school success will continue to elude them, despite investments in improving student access to new technologies, unless investments are also made in effective learning design.

Designed Learning

At a crucial point in their schooling in the year before entering high school, something changed for Marie and Rob. Their new teacher was an experienced user of the Learning by Design planning framework, although she still considered herself a learner, like her students, experimenting with the potential of the framework. Marie and Rob were now in a learning environment where their learning was meticulously planned around the eight knowledge processes of the framework.

The Learning by Design approach is underpinned by a recognition of the increasing diversification of society and an expanded definition of literacies as one of multiliteracies, including different social languages and multimodal forms of expression. The emphasis in this approach is on students not just as consumers of knowledge, but also as producers of knowledge to be shared with diverse audiences.

The Learning by Design planning framework is divided into four broad knowledge processes of experiencing, conceptualising, analysing and applying. These broad knowledge processes have been further refined and subdivided to produce the following eight knowledge processes:

Experiencing

- ... The Known: personal knowledge, evidence from learners' everyday lives.
- ... The New: immersion in new information and experiences.

Conceptualising

- ... By Naming: defining and applying concepts.
- ... With Theory: by putting the concepts together that make discipline knowledge.

Analysing

- ... Functionally: cause and effect, what things are for.
- ... Critically: people's purposes, motives, intentions, points of view.

Applying

- ... Appropriately: 'correct' application of knowledge in a typical situation.
- ... Creatively: innovative application of knowledge, or transfer to a different situation. (Kalantzis & Cope et al, 2005, pp. 73-74)

Rob and Marie's teacher used the Learning by Design framework with these eight knowledge processes to design a complex Learning Element incorporating studies of society and environment, values (responsibility), literacy and science. The scope of the learning was defined as 'the

importance of water and the impacts of human use on the environment, catchment areas and the water system, and accountability for their own actions, in relation to the environment and in cooperative groups' (Learning Element A, 2007, p. 6). The Learning Element also incorporated a Web-based resource that involved students nationwide in a competition to solve a scientific mystery in a water catchment. The following extract provides a sample of the learning objectives of the Learning Element characterised under the four broad knowledge processes of *experiencing*, *conceptualising*, *analysing* and *applying*:

Experiential objectives

... exploring the water cycle and the way we effect our catchments through experiments.

Conceptual objectives

... identifying and collecting data relating to environmental impacts.

... hypothesising about the distribution of the world's water; defining a catchment.

Analytical objectives

... comparing and contrasting uses for water.

... interpreting data to support or refute a particular prediction.

Applied objectives

... developing a catchment management plan relating to a local issue. (Learning Element A, 2007, pp. 7-8)

Embedded within the Learning Element was a strong values component aligned with the national values education framework, with students encouraged to reflect on and take responsibility for their own actions both with regard to the environment as well as their work behaviour in the classroom. The following learning activity entitled 'Round and Round – What Can I Do?' illustrates how the learning design supports students to personalise the learning:

Using the Kidspiration program on the computer, create a concept map answering the question: 'How can I be more responsible with water use?'

In your Values Journal write a reflection about how you will be more responsible with water.

Homework task – identify a goal to improve your water usage habits at home. Write a personal response to your actions. (Learning Element A, 2007, p. 12)

In designing the Learning Element, the teacher carefully considered the individual needs of her students, including the scaffolding they would need to successfully complete set learning activities. Despite the supportive nature of the design, the activities are still intellectually challenging, inviting participation and deep thinking from all the students in the class. For Marie and Rob, this learning design provided them with the keys to school success.

Finding the Keys to School Success

In analysing this Learning Element, it appeared that the use of the eight knowledge processes had prompted the incorporation of some significant features that ultimately resulted in improved school performance for Marie and Rob. These features included personal connection, explicitness, intellectual challenge, interactivity, shared language, knowledge sharing and collaboration. While all these features enhanced Marie and Rob's learning experiences, explicitness and shared language were particularly important in improving their performance.

In referring back to the initial investigation of Marie and Rob's underperformance and the realisation that there was a mismatch between their expectations of schooling and those of their teachers, the importance of explicitness in the learning design becomes self-evident. In talking to the students, it was apparent that the explicitness in the learning design was also reflected in the delivery of the learning, with the students demonstrating a clearer understanding of the teacher's vision and expectations. The students alluded to a thread running through the learning design that provided a central purpose for their learning activities. In percentage terms, it was found that 85% of the learning activities in this Learning Element featured explicit instruction and articulation of learning goals and expectations.

The importance of explicitness is revealed in Rob's learning journal entries, where he describes his learning:

I learned how to set out your page when you're writing. And you stay on one subject in a paragraph. I learned how to make an argument and stay with it ... It taught me how to argue and I wanted to argue myself ... It helped me by how you stay on a subject and don't come off it. It helped me by the way you do it in real life and how to set it out.

This learning was achieved through participation in a series of learning activities involving the knowledge processes of *conceptualising by naming* and *conceptualising by theorising*, designed by his teacher to develop the students' exposition-writing skills. Through role playing a debate, the students were taught how to maintain a coherent argument. They were then taken through the steps of writing an exposition, from setting out to paragraphing. This sequence of activities provided Rob with valuable understandings of the genre of exposition writing, giving him the confidence and skills to present his own ideas in a coherent argument. Rob's learning experiences add weight to Kalantzis & Cope's argument that:

ironically, in some respects outsiders to the mainstream literacy game may find the traditional formal literacy curriculum preferable because it is explicit about rules – what a particular unfamiliar but powerful form of language does, and the generic devices it uses to achieve its ends. (Kalantzis & Cope et al, 2005, p. 60)

In the early years of schooling, Rob was given explicit instruction in language and literacy; however, he needed continued explicit instruction to tackle the more complex language and literacy demands of academic discourse as he progressed through his schooling. In this Learning Element, through the conceptualising knowledge processes, the teacher effectively scaffolded Rob's exposition-writing efforts, systematically guiding him through the process and enabling Rob to achieve success in the completion of the assigned tasks.

Marie's learning experiences further highlight the importance of explicitness to both participation as well as performance. The design of this *analysing critically* debate activity in the Learning Element guided the students' focus, setting clear parameters for the exploration of the issues while providing opportunities for the students to reflect on and express their own perspectives:

The debate will have two teams and each team has to defend its plans for the land. One team is the Farmers – the other team is the Developers. Think about how you would respond to these questions:

Why do you need the land? What will the other team do to the land and surrounding areas?
What will affect you, your lifestyle, job, or home?

Write your own ideas down and Rally Robin to share ideas with your small group. Be prepared to think on your feet as well. Come together as a class and start the debate. (Learning Element A, 2007, p. 15)

The initial perception of many of the students was that it would be much easier to support the farmers' perspective. However, through this guided exploration of the issues, the students discovered the complexity of the problem, prompting them to think more deeply about the issues and enabling them to appreciate both sides of the argument. For Marie, it provided an opportunity to fully engage in the learning activity, as she had a clear understanding of the issues to consider, later commenting:

I think the Round Robin was a fun discussion because we all shared ideas with each other and defended each other. We were all encouraging each other. I learned and got the idea of a clear argument.

By being explicitly guided through the process of thinking about issues and expressing her ideas to an audience, Marie was building the confidence to independently engage more deeply and critically with knowledge. This is illustrated in Marie's learning journal reflection:

I thought it was Hexham Swamp because we had all these reasons. I found different information in my homework research. I found information on fertiliser and I thought it matched but then we got more clues and found it wasn't fertiliser.

Marie had moved beyond reporting researched facts to using knowledge to solve a problem and she began to receive teacher comments on her assignments such as 'excellent thinking', reflecting her deeper engagement with the subject matter. Marie was now a more critical user of online information sources as well, with a clear purpose evident in her selection and use of content.

Marie's ability to engage fully with the content of the subject area and, consequently, her improved performance can also be attributed to another key feature of the Learning Element's design and delivery: the building of a shared language for communication about the subject area. In Marie's learning journal entries, it is almost possible to sense her feelings of empowerment as she describes her understanding of the language of the subject area:

I learned about silt and sediment. Well, sediment is the matter that settles to the bottom of a liquid. Silt is earthly matter, fine sand or the like, carried by moving or running water and deposits as sediment. That is something I learned in one day.

Gee (2006) has argued that the comprehension of academic language is pivotal to school success. Further, he contends that it should be learned in a meaningful context, otherwise students

may be able to pass paper and pencil tests, but they often can't use the complex language of the text to facilitate real problem solving, because they don't actually understand how the language applies to the world in specific cases for solving problems. (Gee, 2006, p. 7)

Through the collaborative activities in the Learning Element, Marie was able to engage with her peers in learning the language of the subject area in a meaningful context. As Marie explains:

I feel like I have gone into a scientist's head and have learned how to use water samples. I am like Mrs Joy because I stayed up all night and got clues and put them together as a plan.

Brown (2006), in examining how learning could be better designed for the needs of twenty-first-century learners, determined that students should be enculturated into knowledge communities, learning to think and operate as members of these communities. He argues that learners should directly engage with members of these knowledge communities, such as scientists and authors, so that the learning will become more connected to the 'real world'. As advocated by Brown (2006), Marie was becoming a scientist, using the language, concepts and tools of a scientist, rather than just learning about science. The learning in the Learning Element was designed in such a way as to provide opportunities for the students to directly investigate water quality issues in their own local area, as well as to engage with environmental workers in the field.

Initially, Marie's teacher had been concerned about Marie's language skills; however, at the end of the Learning Element, she recorded above the cohort median for the appropriate use of subject-specific language. She was consistently using the language in discussing and writing about the subject area. This was also the case for Rob, with Rob indicating that the building of a shared language for communication helped him to better understand group and class discussions. Reflecting on the 'Round Robin' activity, he wrote: 'it was very clear to me. I understood everything and it was fun as well'. Tracking back to the learning activities in this sequence, it became apparent that a quarter of the activities in this sequence involved developing subject-specific language. Further, many of the activities involved practical experiential activities such as experiments, so that the language was being learned and reinforced in meaningful contexts, as advocated by Gee (2006).

The following descriptions of a slice of the Learning Element provide an insight into how the building of this shared language was achieved through the learning design. Through jigsaw activities, the students were divided into expert groups to build an in-depth understanding of a specific environmental issue, which they then needed to explain to their home group in their own class, as described in the students' own words:

In the jigsaw activity, we learned about things and then shared them with the class. I learned that man-made things like fertilisers are bad for environments. Each learns a bit then we could come together to understand what it is and write it down, so we could understand it for the mystery, so the jigsaw helped me.

I liked the jigsaw activity – each group learns about a different activity and I was learning about sediment and silt, and then you go back to your table and you share your ideas. You mainly learn about one thing, but then you go off and you can learn more, more quickly.

The students were engaged in using the language of the subject area to explain the issue and associated concepts to their peers. They then worked collaboratively to develop shared definitions of the new terms introduced. This was followed by the whole class coming together to share, discuss and refine their definitions, in the process building a glossary of terms. The language of the subject area was reinforced during subsequent learning activities, such as the water review and effects wheel, with students using the language and concepts learned during the jigsaw activities to complete these new activities.

Within this Learning Element, the process of building a shared language involved collaboration, dialogue and learning about real environmental issues through experiments, field trips, videos and websites. In effect, the students were engaged in a process of enculturation into the knowledge community, developing situated meanings through dialogue or substantive conversation (Education Queensland, 2001; Morrow & Torres, 2002; Brown, 2006; Gee, 2006). These embedded understandings of the language and concepts enabled the students to participate in complex problem-solving processes, and to produce effective oral and written reports and expositions on the relevant environmental issues. The students themselves felt more confident in discussing issues with experts in the field because they now shared the language of the knowledge community. For Marie and Rob, there was a greater sense of truly belonging in the learning as participants in the knowledge-creation process, rather than as recipients of other people's knowledge.

An Incomplete Tale

Much changed for Marie and Rob during their final year of primary school before entering high school. They finally achieved the school success that had eluded them in the past. Marie made significant progress in the knowledge processes of *conceptualising by naming* and *analysing critically*, indicating significant improvement in her use of academic discourse as well as high-order thinking skills, while Rob moved from performing largely at an assisted competence level to autonomous competence, which was particularly important in the light of his transition to high school, where greater learner autonomy is expected.

There was also a significant shift in their perception of themselves as learners, with a demonstration of greater confidence and improved participation in learning activities. The mismatch with the expectations of schooling had diminished, with both Marie and Rob making greater contributions during collaborative activities. They now demonstrated a more critical stance on knowledge and a willingness to take a personal stance on issues. Marie commented on how she learned from the ideas of others:

I like working with groups – if you only have pairs you don't get so many ideas, but with other people you learn lots of things. And they don't always have to be friends because other people have different ideas and you can put your ideas together and you learn lots of things.

For Rob, the shift in perception of himself as a learner was also evident in his leisure pursuits. His parents noted that although he still enjoyed playing computer games with his friends during the holidays, they had also been spotted voluntarily conducting research and writing a report for school on the heavy-metal band Metallica. This was in preparation for an upcoming Arts Learning Element, after learning that their teacher had little knowledge of this type of music. The students' research made a valuable contribution to the class work the following term as they compared and contrasted different styles of music. Working with knowledge had become engaging and rewarding.

Unfortunately, the stories of Marie and Rob remain incomplete as the parameters of the research did not allow for longer-term observation of their progress. Their stories are ones of success. However, it is not possible to be sure whether these academic gains were consolidated in their future learning or whether this taste of success was perhaps enough to help them maintain their own learning momentum. There is a sense that Marie had truly latched onto the keys to schooling success and would be able to transfer this knowledge to new learning contexts. Greater concern is felt for Rob, who had experienced some literacy difficulties in the past. There is a sense that, for Rob, this was just the beginning of a significant learning curve and that he could be supported to make even greater gains through engagement with well-structured learning designs.

For both Marie and Rob, the ideal learning setting in the future would be one that is well resourced not only in terms of access to new technologies but also, perhaps even more importantly, access to excellent teachers highly skilled in learning design.

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