

## DIGITAL MAKING WITH “AT-RISK” YOUTH

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### Abstract

This paper explores how a small group of adolescents in an alternative care and treatment program develop digital literacy skills over time while immersed in a rich media setting. It also explores how the students use new media tools and affordances to “perform” their identities and to present themselves within their classroom community. The author shares how these students used inquiry-based learning and multiple modes of expression, facilitated by the multimodal, multimedia nature of digital media, including both screen-based and tangibles as essential components of knowing and communicating.

### Introduction

#### At-Risk or At-Promise?

To be literate in the 21st century, students need to both read critically and to write functionally across a range of media forms and formats. Literacy in the digital age has developed into a “repertoire of changing practices for communicating purposely in multiple social and cultural contexts” (Mills, 2010, p. 247). It does not only involve reading and writing anymore but also meaning-making with images, sound and movement. This is an important development for “at-risk” youth and struggling learners, as now more than ever, there exists an opportunity to engage and include these students who may have previously remained on the periphery of the classroom learning community, due to a deficit in traditional reading and writing skills. If we want to engage and support struggling learners, we need to: (a) reframe our thinking about what it means to be “at risk” and (b) provide them with equal opportunities to learn, to develop positive literacy identities and skills; thus, we need to draw heavily on digital and multimodal tools.

Following Swadener (2010), we agree that the term *at-risk* has been overused and tends to suggest a deficit model, positioning these youths as *other* in “dominant education and policy discourses” (p. 8). While we recognize that the students we worked with in our study do, by the nature of their unfortunate circumstances, “inhabit the ‘margins’ of contemporary society and are systematically excluded from many of its benefits” (p. 8), we choose to think of them as *at promise* for success, rather than at risk of failure (p. 9). Rather than focusing on the abilities of the students, we have directed our attention to assuring access to opportunities to promote digital literacy across the digital divide.

Uses of digital technologies—mobile devices, social media, apps and games, 3D printing, and robotics—are ubiquitous; in order to benefit from, integrate, and adapt to these technologies effectively, new approaches are required to meet the challenge of educating a growing young population with the knowledge and skills essential to a democratic knowledge economy. It is particularly important to foster digital literacy to help mitigate the digital divide in Canada and the world.

### **Makerspaces in Education**

One of the primary objectives of this research is to explore whether and how constructionist *production pedagogies* work to build students' *performative* competencies in digital literacies (where students demonstrate understanding and represent learning through a multimodal digital performance that is shared with a wider audience) and whether and how they promote personal and community identity awareness and development. Community makerspaces are becoming a widespread phenomenon; however, these do-it-yourself (DIY) models for encouraging teachers and students to become designers and producers of the materials and resources upon which they depend (de Castell, Droumeva, & Jenson, 2014) have not yet moved into the realm of formal education. Makerspaces are creative, educational, collaborative spaces that capitalize on current technology and help prepare students with the kinds of skills required for active participation in modern society – politically, socially and economically. The 2015 Horizon report indicates that “Makerspaces are places where anyone, regardless of age or experience, can exercise their ingenuity to construct tangible products. For this reason, many schools are seeing their potential to engage learners in hands-on learning activities” (Johnson, Adams-Becker, Estrada, & Freeman, p. 38). Makerspaces tend to include tools such as Arduinos, soft circuits, wearable tech, 3D printers, programmable robotics and more. These technologies position the users as creators and require participants to draw on a variety of skills including interpersonal skills, coding skills, troubleshooting skills and more. The educational benefits of makerspaces reflect a pressing need to incorporate makerspaces into schools to keep pace with society and students' out-of-school literacy practices. To avoid the “dangers of trivialization” or *keychain syndrome* of making “stuff” that will end up in landfill sites, Blikstein (2013, p. 8) cautions educators to shy away from the kind of quick demonstration projects typically associated with makerspaces and move toward learning that is more meaningful and contextualized.

### **Critical Making**

The research activities undertaken here draw on the concept of digital making as a vehicle for deep learning through technology and community interaction. Situated within a constructionist approach to education, critical making assumes that learning is most effective when learners are actively *making* in the real world and drawing their own conclusions through experimentation across multiple media, where learners construct new relationships with knowledge in the process (Kafai, 2006; Ratto, 2011). Unlike more traditional instructionist approaches to learning (where the knowledge to be received by students is already embedded in objects delivered by teachers), constructionist learning encourages learners to learn from their own active engagement with raw materials. In this project, *raw materials* include both tangible and virtual materials. Creating interactive stories, simulations, games, and both physical and wearable technologies entails using digital tools to identify, access, manage, integrate, evaluate, critically analyze, synthesize, create, communicate and collaborate.

Beyond simply creating objects for the sake of creating objects (e.g., creating 3D keychains), critical making concerns itself with the relationship between technologies and social life, with emphasis on their liberatory and emancipatory potential. Thus, it connects two practices that are often considered separate: critical thinking and creative expression (Ratto, 2011). The term *critical making*, associated with the DIY movement, emphasizes critique and expression over technical sophistication: shared acts of making are more important than the resultant object. In the context of this research, students

worked in our university based makerspace, which was established to promote, observe and evaluate the impact of this kind of critical making using a variety of digital tools. For the past three years, we have been working with students enrolled in a Canadian alternative school that provides educational programming for students from government approved Care, Treatment, Custody and Correctional facilities. The primary purpose of this alternative program is to provide students with effective instruction that leads to the re-integration of students into community schools, post-secondary institutions or employment. For the purposes of this paper, we focus on a specific program intervention that took place over the course of five months, in which grade six to eight students (aged 11-14) engaged in a variety of digital making activities. We refer to the coupling of digital making with curricular goals as *serious digital making*, in the same way *serious games* refers to games whose main purpose is to train or educate. We are especially interested in serious digital making as a form of *computational participation* (Kafai & Burke, 2014), whereby students create digital artefacts to transport and perform their learning beyond the classroom, and in the case of these students, to explore individual and community identity. A focus on production or *maker* pedagogies can give students voice and agency in the context of their learning communities, and thus provide opportunities for them not only to learn subject matter, but also to explore issues of identity and their places in the world around them. This research investigates the relationship between production pedagogies and the development of adolescent digital literacy and identity. More specifically, it explores (a) how adolescents' digital literacy skills develop over time while immersed in a rich media setting and (b) how adolescents' identities are shaped and performed, as they use new media tools and affordances to present themselves to the world. In this paper, we will share how these students used inquiry-based learning and multiple modes of expression, facilitated by the multimodal, multimedia nature of digital media, including both screen-based and tangibles (Kafai & Burke, 2014), as essential components of knowing and communicating.

### Methodology

Since this research focused on the transformation in teaching practices and student learning, an ethnographic case study approach was suitable. The researchers were immersed in the case, leading classroom activities and discussions, and thereby accumulated local knowledge. The case study method is also appropriate for studying a 'bounded system' (that is, the thoughts and actions of participating students or the learning-community connection of a particular education setting) so as to understand it as it functions under natural conditions (Stake, 2000).

This study involved seven students (3 female, 4 male) from a Canadian alternative school that provides educational programming for students from government approved Care, Treatment, Custody and Correctional facilities. The students were identified with a variety of cognitive, behavioural, emotional and developmental exceptionalities, which included fetal alcohol syndrome, oppositional defiant disorder, various learning disabilities, anxiety, and post-traumatic stress disorder. The students had a range of experience with, and access to, technology and different digital tools both at home and in school from previous grades. The students' digital literacy skills also ranged significantly. None of them had worked in a makerspace prior to this project.

Through an integrated arts-based curriculum, with a thematic focus on community and identity, the students used a variety of digital tools and media to create an "All About Me" book. The classroom teacher collaborated on lesson plans with members of the

research team. Each week for twelve weeks, the students came to the university's makerspace, for two hours each session.

### **Data Sources and Analysis**

At the start of the project, the students, classroom teacher and child and youth care worker in the classroom completed a questionnaire about their experiences *making* and their expertise with digital tools and media in general. Throughout the project, the researchers recorded detailed field notes, collected students' planning notes and rough work, the digital texts they produced, still images/video recordings of the students' authoring/making activities and classroom conversations. The researchers also engaged in informal discussions with the students and teacher, of which noteworthy points, themes, ideas or feedback were recorded through text or voice recorder. We also conducted a set of open-ended interviews asking questions related to the texts and tangibles they were making. Analysis of the data took place over the duration of the study and attempted to capture the multiple layers of production practices and where and how those change over time. Thematic coding (Miles, 1994) and cross-case analysis were used when examining the data sources.

### **Digital Making Activities**

The idea behind the "All About Me" book was to provide students with the opportunity to make discoveries about themselves, their likes and dislikes, and to uncover who they are, explore how they feel, what they think, and to express these answers through a variety of activities and technologies. Students were given a weekly question, and, during the course of the assigned activities and learning new technologies (using the Evernote app), students would spend time reflecting on what they had created, what they had learned about themselves, and their experiences with the technologies they were learning about and using. Over the course of three months, the students designed and created a series of 8 pages, with their reflections based on the following questions:

1. What is your favourite season? Why? (PicCollage)
2. What is your favourite sport to play/watch? (Lino)
3. What is your favourite colour? How does it make you feel? (Chibitronics)
4. If you could go anywhere, where would you go? Why and with whom? (WordSwag)
5. If you could have dinner with a famous person, who would it be? What would you talk about? (Popplet/Piktochart)
6. Ask someone to define your greatest strength. What is it? Do you agree? Why or why not? (MangaMaker)
7. What advice would you give to your future self? (Tool of their own choice)

For each of these pages, students used a different digital tool (noted in parentheses above) to represent their responses to the question. Each question required students to justify their choices and explain their reasoning (i.e., why is green your favourite colour?). The reflection process afforded students the opportunity to delve deeper into why and how they felt about something (e.g., like or dislike) and to practice their communication skills. It is beyond the scope of this paper to discuss all seven of the activities. The questions became gradually more complex, and we focus our discussion on the final three questions, which elicited the most interesting, introspective responses from the students.

### Sample Questions and Student Responses.

In this section, we share activities and student responses to Questions 5, 6 and 7.

**Question 5:** “If you could have dinner with a famous person, who would it be; what would you talk about?”

Students were advised that they had won a contest and that the prize was for them to take a famous person of their choice to dinner. So as not to waste their time on asking trivial questions (i.e., where were you born?), students were required to complete a short biography, to ensure the questions asked were more meaningful. Students then chose a restaurant, anywhere in the world. Students’ choices were varied – one student chose Cleopatra as she already had some knowledge from previous research completed at school, but was surprised at all the information she didn’t know (i.e., that Cleopatra had married her brother). This generated a lot of

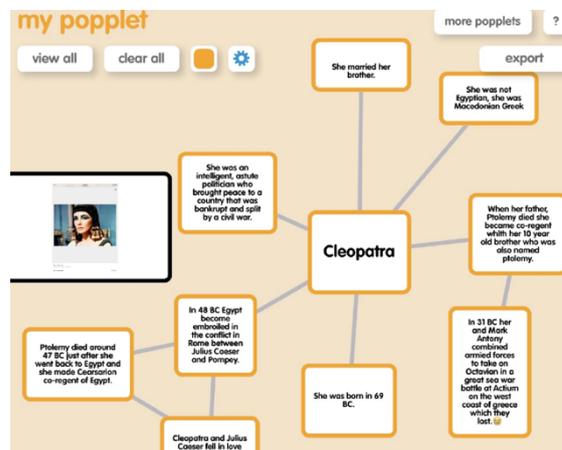


Figure 1. Cleopatra Popplet.

conversation about how what was acceptable historically would no longer be tolerated. Students used Popplet to organize the information collected so it was easily accessible and visually appealing – students used text and pictures, and retrieved pictures of their restaurant and copies of menus (see Figure 1). They also used PicktoChart to create an infographic based on the person they chose.

**Question 6:** “Ask someone to define your greatest strength; what is it; do you agree; why or why not?”

This prompt provided the students the opportunity to see how others view them. A list of personal strengths was handed out to each student, and individually they chose a strength that best represented each classmate. Then in pairs, they chose a strength that best described their partner. A discussion followed to determine if the strength really exemplified the students themselves. Using this strength, students then wrote a story in which they were a hero, and then using a storyboard template, they outlined the story in rough format. At the end of the activity, using MangaMaker, students would write their story using text and pictures available with that program (see Figure 2). Most students had a clear vision of how they wanted their story to appear – the backgrounds, and the appearance of the characters. The MangaMaker program has set character choices that did not jive with the students’ vision. Some students found it difficult to adapt and change their stories or characters within their stories, and as a result rewrote the original version. This particular session generated a lot of frustration for the students, and it afforded the facilitator and teacher an opportunity to reflect that giving students an opportunity to familiarize themselves and play with technology



Figure 2. Manga Maker autobiography.

prior to planning their stories was extremely important.

**Question 7:** “If you could give future-self one important message, what would that be?”

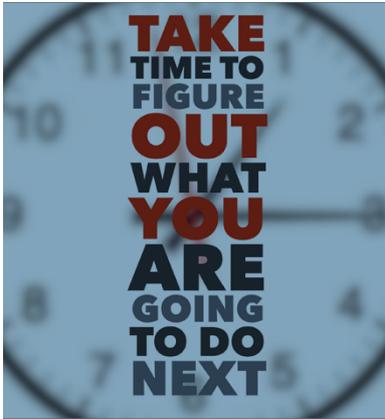


Figure 2. WordSwag advice.

This question provoked important discussion for this particular group of students. They talked about the fact that the future is not written; every new day is unwritten. There are times when as individuals we look at our past and think if we could only change something that has occurred, perhaps send a message back in time that would prevent something from happening. We cannot change the past, and everything that has occurred has contributed in some way to who we are today. However, what if we could send a message to our future selves? This is what the students did and messages included: don't let people's words change who you are inside; if you don't make it the first time, don't give up – keep persevering; don't let the words of others stop you from doing what you love;

choose your friends wisely. Students wanted to ensure that their future selves would direct their own path, and not allow others to deter them from achieving their goals. Students were encouraged to represent this message using the technology of their choice – all of them chose WordSwag, and all of them indicated that this app allowed them to choose both the message and a picture that best represented the feeling behind the message. Students' reflections on their WordSwags demonstrated an ability to articulate their thoughts visually and in words. The student who wrote the message depicted in Figure 3 stated, “I chose this message because once I start learning more about myself in life, I have to take time to think about what I'm going to do – stuff like a job, where I am going to live, am I going to have a family, how long do I want to work before I retire, etc. In my final design I chose red because it means stop before you do anything stupid.” Given the need to address both the educational and emotional needs of students in this program, an emphasis was placed on discussion and debriefing in all of the sessions and students wrote reflections on their learning each week.

In the final week of the project, students received the printed documents and the hard copy pieces that they worked on over the semester and organized them as per a table of contents that they created. They were given creative license in the way the documents were organized and whether they wanted to include their reflections in their books. When they had completed their organization, they used a template to mark holes on every page of their book, which they then used as guides when creating holes with a needle or an awl. Lastly, they used the holes to sew the books together using ribbon or embroidery thread. They returned to the school with their finished books. The students were incredibly and understandably proud of their books. We had hoped to keep the best examples to use as exemplars in the next iteration of the research; however, none of the students was willing to part with their book so we had to scan all of their work to keep in digital form only.

## Discussion

### Directing Their Own Learning

In addition to contemplating important topics related to their future goals and developing intrapersonal skills, the students also developed in other ways. The inquiry-

based approach, set in a makerspace environment where many materials were available to them, helped the students to direct their own learning.

Throughout the creation of their book, students were encouraged to take increased responsibility for their learning with each successive question, and to explore their learning process through reflection questions. Students who struggle in traditional learning environments often find expressing themselves easier when they use multimodal tools and technologies (Hughes, 2009). The students in this program had ubiquitous access to iPads, which they used to research information and create digital texts through apps like WordSwag, Popplet, Picktochart, PicCollage, and Evernote. Combining text, recording, and picture options conveys student meaning more effectively, and in turn provides opportunities for academic successes previously not experienced. One of the strategies we used to help them develop autonomy was creating and providing them with visual “walk-through guides” that they could access on the iPads when they weren’t sure what to do next. The guides were consistently written in a way that facilitated the transfer of skills from one tool to the next. Indeed, we found that the guides (and the tools as a result) became much easier to use as they progressed through the weekly activities (see Figure 4). We also directed students to online tutorials for each of the tools and insisted that they access and view these prior to asking the teacher(s) for assistance.

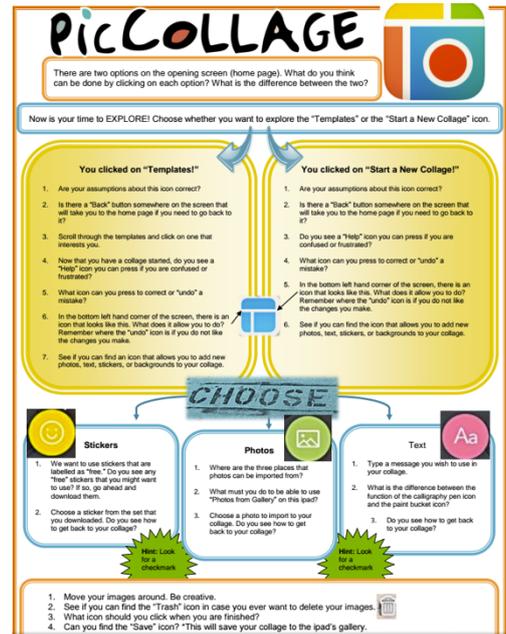


Figure 4: Walk-through guide for PicCollage.

### Developing Perseverance

Assessment of the students changed significantly as the emphasis shifted from creating an “end product” to focusing on the process of learning. Students are not just producing a conventional assignment, but also are learning specific and significant skills as they acquire knowledge through the process of creating their digital texts. This allows the teacher to observe in greater depth the growth a student undergoes while exploring the technology. Students also spent much more time throughout the process reflecting on their learning than previously. They learned to trouble-shoot and problem solve, as well as to determine what they could do to improve their work. Previously, when the students struggled with something they found difficult, they would give up and refuse to keep trying. At the beginning, we needed to constantly reassure the students that making mistakes was an opportunity to learn. When they felt frustrated and exhibited negative behaviours as a result (tossing the work aside, crumpling it up, saying ‘this is too hard’), we challenged them to rethink their responses with more positive questions, such as “how can I deal with this setback?” Encouraging this kind of growth mindset that praises effort rather than results (Dweck, 2007) has helped the students develop perseverance.

### Developing Confidence

As the students became more comfortable with the concept that making mistakes and learning from them or *failing forward* (Maxwell, 2014) is an important part of the design/creation process, they became more flexible and relaxed about the modifications

they had to make from the planning stage of their activities to the execution, adapting to constraints of the soft/hardware.

Using iPad apps removed a great deal of pressure from the students, allowing them to develop their abilities to interact to:

- build trust, commitment, self-confidence;
- develop a feeling of self-worth;
- develop an ability to effectively communicate thoughts and feelings;
- develop listening and cooperation skills and, the ability to compromise; and
- participate in a safe, secure, comfortable, non-judgemental learning environment.

Students spend a great deal of their day in the school environment, and in the 21<sup>st</sup> century it seems to be that a blurring of the lines between work and play would be a positive thing. As technology is such an integral part of our culture, the distinction between work and play has not remained defined, and in fact the lines are blurred. Allowing students the opportunity to explore a technology, to play and become adept at the capabilities of a given technology, only serves to increase both their comfort level and ability to apply their knowledge to a given task. In many work environments individuals are required to have knowledge of emerging technologies, and to employ this expertise in their work. Teaching students how to navigate their way through unfamiliar technology, to reflect on the process, and to communicate effectively, are important in both academics and future work environments. We continue to work with this group of students in our STEAM-3D Maker Lab and emphasize learning through discovery, design and the development of important skills such as perseverance, trouble-shooting, resilience, and collaboration. All of the students are making gains in their academic work, and, perhaps even more importantly, in the development of some of the so-called “soft skills,” such as perseverance and collaboration. Although the scope of this paper does not facilitate detailed elaboration regarding these gains for each student, one case in particular stands out. One of the grade eight boys identified with a learning disability in the group was reading at a grade one level at the outset of this program. He would not participate in any class discussions, and, when academic work was assigned, he characteristically put his head on his desk. His teacher commented that the “transformation that this student underwent was so amazing. Providing him with alternative way of expressing himself, lots of support and encouragement, served to increase his confidence. He went from never raising his hand, to being one of the first to having a contribution.” We are expanding this program to work with students in other contexts, including at a high-needs, underachieving group of 21 grade six students in a local school.

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