

# Towards Capturing and Storytelling of the Evolution of Thought in Knowledge Building Communities

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**Abstract:** Sustained creative work with ideas is a key concept within the pedagogy of Knowledge Building as it is a fundamental means in which a community advances and deepens their understanding of a set of problems. Although creative ideas can be classified after they have been contributed, it is difficult to determine how they arose. Without understanding the seed of a creative thought and the path that led to its contribution in a community it is also a challenge to teach how to think creatively as required by various 21<sup>st</sup> Century competencies initiatives set forth by education ministries, particularly in the Ontario context. This conceptual paper seeks to describe the necessity for the capture and analysis of thought evolution as well as a potential model in which this could be achieved.

## Introduction

A core ability essential to the 21<sup>st</sup> century is creativity or creative thinking, as determined by OECD (2001, 2018) and the Ontario Ministry of Education (2016). Creative thinking has several benefits at the personal, community and global levels. First, creativity allows individuals and groups to have a competitive edge over their peers due to the innovation that may arise (OECD, 2001). Second and more importantly, creativity is a social good (Banaji et al., 2010) that enhances a student's social and personal development.

Despite the obvious benefits and importance that creativity has for students, Lucas, Claxton and Spencer (2013) state the central challenge of creativity in education is that it does not *fit* in any subject, but spans across and can be cultivated, analyzed and assessed in a plethora of methods. This challenge is further exasperated by access to easy-to-use software, hardware and social platforms that allows students to creatively apply their knowledge in any number of methods for any number of reasons, with then has an influence on their education. A promising means of enabling the cultivation of creativity is the use of Knowledge Building as a principled-based pedagogical approach elicit and capture sustained creative work on ideas. This is in part due to how Knowledge Building requires students to authentically and constantly move deeper in their understanding of a subject-domain in order to solve genuine problems. When faced with *wicked problems* (Rittel & Webber, 1973) creative thinking is perhaps the only means of arriving at a meaningful solution. As such this paper seeks to accomplish two main objectives:

- 1) Describe the need for the capture, analysis, and storytelling of student creative thought evolution
- 2) Propose means in which the evolution of creative thought can be captured

## Background

To understand why we need to capture the evolution of creative thought it is essential we review the existing literature surrounding creativity, Knowledge Building as an enabler of 21<sup>st</sup> century competencies and digital stories as a vehicle for conveying thought. The following section will review these areas in some depth to provide context before proposing methods in which evolution of thought can be captured and analyzed.

### Creativity in Education

Creativity is a difficult term to define and even harder to analyze, perhaps for the same reason why it is challenging to cultivate as an essential competency for the 21<sup>st</sup> century. Scholars have defined creativity in several manners ranging from the Four-C model by Kaufman and Beghetto (2009), the application of all knowledge to solve a particular problem (Weisberg, 1999), must be original and effective (Runco and Jaegar, 2012) and creativity as craft (Glaveanu, 2018) to name a few. Each of these definitions tries to capture a different perspective of what creativity is or should be thought of as.

For example, Kaufman and Beghetto's (2009) *Four-C* model breaks creativity into four segments that begin internally (*mini-c*), then moves externally at a personal level (*little-c*), then professional (*pro-c*) and finally global scale (*Big-C*). As you move along the spectrum creativity becomes more meaningful and influential to a wider range of people and requires arguably more skill in developing these creative solutions. Students, although

unlikely to achieve the latter two stages of creativity still exhibit creative moments throughout their academic years before finally becoming a professional. As noted by Kaufman and Beghetto (2009), creativity is not always explicitly recognizable, and often occurs tacitly. When creative thinking is externalized it doesn't necessarily have a great impact, novelty or effectiveness as other scholars (Runco and Jaegar, 2012) describe creativity, but it still holds value for the individual and potentially their immediate community. This distinction is important as it opens up how we think about, analyze, and teach creativity. The personally meaningful creative thinking (*mini and little - c*) is a steppingstone for the development of the competency in students.

Whereas many scholars discuss creativity as an individual endeavour, Glaveanu (2018) argues for the notion of *creativity as craft*, in which creativity is likened to craftsmanship rather than innovation or artistic expression. This paradigm of creativity takes the middle road between creativity that novel and original and creativity as a means of problem-solving with the addition of *context*. He argues that creativity does not happen in a vacuum and is very much influenced by a community that surrounds an individual. Effectively building on Vygotsky's (1987) zone of proximal development by scaffolding the creative actions of each person through collaboration and the sharing of resources and experiences.

By combining the notion of *mini-c*, in which creativity starts from the "transformation or reorganization of incoming information and mental structures based on the individual's characteristics and existing knowledge" (Moran & John-Steiner, 2003, p. 63) and *creativity as craft*, we move closer to a means in which we can study creativity. Recognizing that all students can be creative, which is influenced by those around us, frees us to rethink how we could use pedagogy to aid students in developing necessary competencies essential for the 21<sup>st</sup> century. In particular, various studies (Astutik & Prahani, 2018; Lin, Chang, & Lin, 2016; Lin & Wu, 2016) have begun looking at the use of new media and technology to develop creativity in education. Astutik and Prahani (2018) studied collaborative creativity in physics simulations and recorded positive increases in student creativity. Lin, Chang and Lin (2016) found that the frequency of quality ideas rose dramatically. Finally, Lin and Wu (2016) found their students achieved higher levels of creative fluency, flexibility, uniqueness and elaboration. These studies further highlight the need to study creative thinking in manner that is community-based rather individualistic, and idea-centered instead of strictly an exercise in producing artifacts.

### Knowledge Building, an enabler for 21<sup>st</sup> Century competencies development

If creative thinking is focused on the development of ideas within a community than it would be necessary to consider pedagogies that are centered on working with ideas. Knowledge Building as defined by Scardamalia and Bereiter (2003) is the production and continual improvement of ideas of value to a community. This is achieved in part by applying the twelve principles of Knowledge Building such as: *increased epistemic agency, pervasive knowledge building, real problems; authentic solutions and community knowledge; collective responsibility*. Through the application of these principles' students can develop important 21<sup>st</sup> century competencies such as collaboration, creativity, self-directed learning and problem solving. This is achieved by first giving students more *epistemic agency*, specifically changing the social structure of a class so that students have greater responsibility as individuals and as community to drive their own learning in the pursuit of genuine solutions. When students have agency, they are more motivated and engaged as their contributions have a direct impact on the success of the community, in other words they build up a *collective responsibility* towards each other and their shared goals.

According to Zhang, Scardamalia, Reeve and Messina (2009) *collective responsibility* occurs when factors are present: awareness of the contributions of others, complementary contributions and distributed engagement amongst community members. To achieve this state of responsibility, students' work on the development of the competencies of communication and collaboration, allowing them to begin acquiring a deeper understanding of their peers, the goals of the community, the problems that need to be solved and how to work with each other. Alongside having greater agency and responsibility, students also need to form groups in an emergent and opportunistic manner (Chen & Hong, 2016). How groups are formed can enhance or detract from how successful students are at working with each other, especially when they are trying to become more self-directed in their critical thinking, problem solving and creativity. When ad hoc groups are formed based on how to best solve a problem rather than arbitrary conditions related to classroom management then "creativity emerges from an interactional process that involves a social group of individuals engaged in complex, unpredictable interactions" (Zhang, Scardamalia, Reeve & Messina, 2009, p. 13). After solving one problem, students can form other groups that build on previous ideas, generate new ideas, or solve additional problems as the need arises. With the freedom to adjust the very structure of their work and form new groups

surrounding a specific problem rather than conform to fixed rotations based on time and other-defined goals, students can take charge at increasingly high levels. They can work with a variety of students with different epistemologies, increasing both the collective knowledge of the group and their individual knowledge as well.

In closing, Knowledge Building when applied to classrooms increases the agency of students and fosters greater collective responsibility in iterative idea improvement of community knowledge. Increased responsibility leads to deeper learning for the individuals within a community who share a desire to solve real problems. In turn, creative capacity is also increased through the improvement of personal and public spheres of knowledge while contributing to the solution of a complex problem. Sustained creativity and its application in a variety of situations are constantly tested as new knowledge is built. Ad hoc group formation with like-minded students further breeds an environment that allows for creativity to emerge as students make their tacit knowledge explicit (Nonaka, 1991; Orthel, 2015). Knowledge Building becomes a framework that aligns and promotes many of the necessary ingredients required for creativity to flourish and for the development of key 21<sup>st</sup> century competencies.

### Digital Stories as vehicles to convey creative thought

Digital storytelling (DS) first grew out of a community arts movement during the 1980s in Berkeley, California (Lambert, 2013). DS typically are short narrative videos that combine images, audio, and text to create a video that has a personal significance. Since the introduction of DS, it has been steadily incorporated into the field of education and transformed into Educational Digital Storytelling (EDS). EDS has been applied in numerous ways and elicited a variety of benefits for students. Wu and Chen (2020) in reviewing EDS found five common methods for applying the practice across subject domains: *appropriate*, *agentive*, *reflective*, *reconstructive*, and *reflexive*.

Appropriate DS focuses on students gaining subject knowledge understanding through the construction of stories. Agentive applications look at providing students with greater levels of agency in their stories, such as choosing their own themes, topic of investigation, and so on. Reflective, provides students the space to contemplate new knowledge they have learned in relation to what they already know. Reconstructive DS requires students to breakdown and rebuild their understanding of a subject, engaging students in critical thinking and reconstruction of existing knowledge so they may build new knowledge. Lastly, there is reflexive DS which asks students to focus on themselves and develop a better understanding of their own identity, their worldview, and who they want to become.

Of the various EDS methods, *reconstructive* bears the closest resemblance to Knowledge Building as it asks students to critically question what they have learned and propose potential new breakthroughs to existing knowledge. When reconstructive EDS occurs as a community rather than individually there is potential for it to be a transformative practice that pushes the boundaries of a communities understanding of boundaries they may face and develop authentic solutions. EDS can be applied as a vehicle that aids students in Knowledge Building whilst producing digital artifacts that can be utilized as central points of discussion, markers of new inquiry directions, or higher-order summaries of community discussions. All of these can serve as a means of sustaining creative work with ideas as students enter a cycle of engaging, producing and sharing ideas.

Alongside the proper implementation of EDS to aid in building knowledge, digital stories have also been shown by scholars to motivate, engage and aid students in developing their creative thinking. While investigating how digital stories could enable collaborative creativity, Schmoelz (2018) found that the production of digital stories let students experience *co-creative flow*. When this flow is achieved students seek no specific reward or reason but to simply enjoy and immerse themselves in the action of being creative. Sadik (2008) found that when students presented their stories, they did not just report facts but actively engaged with the material and highlighted their own experience and perspectives in relation to what they learned. Van Gils (2005) noted that DS was motivational as it was easier for students to convey their exact thoughts regarding a specific topic as they had the affordance of multiple mediums of expression. In addition, they learned a new method of utilizing technology to tell personal stories that did not require specialized knowledge in production.

To conclude, EDS is a practical means of applying creativity thinking while enabling a range of other 21<sup>st</sup> century competency development. It also has the potential to elicit a state of flow for students that causes them to actively create and engage with the project without thinking about the goal but so they can create

something for their enjoyment. Finally, if shared digital stories become artifacts that can spark discussions, further investigations, and even act as markers of an individual's learning progress.

## Discussions

As described in detail, creativity is a difficult concept to define which makes it also a challenge to cultivate in students as there are a plethora of methods that could be used without any guarantee they would work. As such, it is crucial to capture evolution of thought with a specific focus on creative thinking so that researchers, teachers and even students themselves can gain an insight into how thinking changes overtime. An additional challenge of capturing the evolution of thought is if the thoughts occur in an ad hoc manner without a specific focus, such as when students are answering questions. What is required is a framework that elicits sustained effort by students to solve real problems that require authentic solutions. Knowledge Building pedagogy is a very promising means of achieving sustained work with ideas as it has repeatedly shown over the course of its history within education (Chen & Hong, 2016). In addition, Knowledge Forum, the companion web application, is often used as the primary means of applying the pedagogy. Being a digital platform, it inherently collects idea contributions which can be analyzed in the future, however there is potential to expand on the functionality or even norms of engagement related to use of Knowledge Forum so that a wider range of ideas can be captured and inputted.

First, as noted in the Huang's prior studies (2017, 2020) into the integration of mobile learning and digital storytelling into Knowledge Building, students are inclined and require the use of multiple mediums to contribute their ideas. Not only does it expand the range of ideas they could contribute, it also highlights the depth of their understanding that text-only would not be sufficient in conveying. Also, more prominent and easier to use means of contributing via multiple mediums increases the accessibility for students who may be struggling with one form of contributing or another. With multiple mediums, students have multiple points of entry into a discussion that ultimately can lead to them achieving *co-creative flow* which in turn enriches the community experience as a whole. One quick means of accomplishing this state would be to integrate digital storytelling practice into Knowledge Building so that it becomes a scaffold rather than an addition. In this way students are able to contribute a spectrum of media and ideas without hinderance, making building knowledge the most important goal. Furthermore, as students are drawn toward (Huang, 2020) personal stories it creates a natural hook that draws other students in to engage with the ideas contributed. In time, with shifts to both the norms of engagement in Knowledge Forum and the functionality, there is a hope that students will be highly engaged and motivated to spend time building knowledge well beyond the time set within class.

Second, if there is a wider range of media being contributed that enriches a community discussion, one can imagine a plethora of notes being generated that progresses steadily toward a verity of tangential solutions for community-specific problems. Although these are collected within Knowledge Forum, it does not make it easy to understand the evolution of creative thought or even analyze it for that matter, especially as sustained Knowledge Building spans months of work. A promising solution that can be applied, which is borrowed from filmmaking and photography, time-lapsing a community's work. A time-lapse in the traditional sense is a capturing the evolution of a lengthy process and shrinking the temporal plane so that the end result is a short form video. This is often used to denote the passing of time, or to study incremental yet minute changes in things. A common example is the use of time-lapses to film the blooming of flowers or a day-to-night transition. By time-lapsing a communities work we are now able to both view the entire transformation of solutions and ideas from start to finish, but also pick out particular points in time in which there was a significant shift in focus or even points in which a community began to diverge. This would be highly beneficial in getting to the root of creative thought evolution as one is able to both see the end result and the catalyst that started everything.

Lastly, introducing digital storytelling practice and capturing of thought evolution into Knowledge Building does not automatically result in understanding how individuals and community ideas evolve overtime. At this point these two concepts are separate, the former being used to potentially stimulate and sustain creative work with ideas, while the second just captures and plays back all the work done. A missing piece is the narrative of the community's evolution as told by individuals within the community. As an addition, it would be crucial and valuable to allow community members access to their time-lapses so they can use it tell a personal story about their Knowledge Building journey. This of course can be done in a digital storytelling manner, which in turn can be re-contributed into the community for further discussions. To further explain how these concepts could work together to allow us to capture and tell the story of the evolution of thought, I have included a conceptual model (see Figure 1).

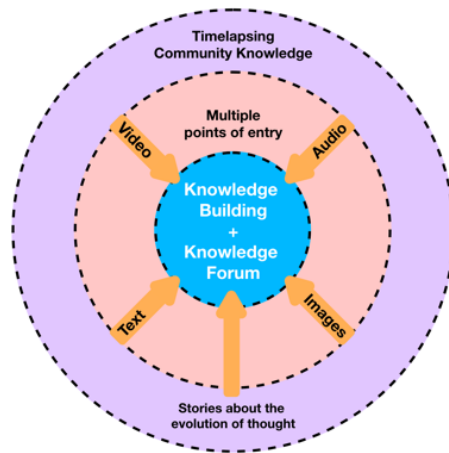


Figure 1: Conceptual Model for Capturing the Evolution of Thought

A potential method of capturing the evolution of thought as proposed by Figure 1 is to situate Knowledge Building and Knowledge Forum at the center. Students contribute via multimedia based on their preference or what makes the most sense in a given learning situation, allowing them various avenues of expression that more closely aligns with their understanding. In this way, the hope is that authenticity of their ideas is maintained with minimal friction caused by forced translation from thought to a medium that does not connect with them. Lastly the outer circle is a constant capture of their ideas, which builds on the *Timemachine* functionality in Knowledge Forum, with the addition of allowing the students to annotate and generate stories of both community and individual evolution of thought. These stories provide an additional layer of context, guidance for others new to the community and most importantly are artifacts that can lead to even deeper levels of idea improvement.

## Conclusion

Creative thinking is a necessary and crucial ability that needs to be developed by students as it is highly beneficial for their future careers within a knowledge society. The challenge lies within both describing what creativity is, how to cultivate it, how to study it and how to evaluate it. This paper is proposing a new conceptual model in which digital storytelling practices are used to elicit dynamic content creation by students that can be inputted into a shared Knowledge Building community space for further development into genuine solutions. In doing so, students are given a high degree of agency to contribute in multiple ways so that their authenticity is maintained. Furthermore, by capturing inputted ideas through a time-lapse manner, one is better able to analyze the progression of change made by a community, which can lead to a deeper and clearer understanding of how individual and community thought evolves. As this is only a conceptual paper, the logical next step is to apply it in practice with a smaller community that is inclined to explore the uses of digital storytelling within education. In this manner potential benefits and drawbacks to the model can be iterated on and refined for application with the same or larger community.

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