

2017-05

Selected Proceedings of the IDEAS Conference 2017: Leading Educational Change

Preciado Babb, Armando Paulino

University of Calgary

Preciado Babb, A. P., Yeworiew, L., & Sabbaghan, S. (Eds.) (2017). Selected Proceedings of the IDEAS Conference 2017: Leading Educational Change. Calgary, Canada: Werklund School of Education, University of Calgary.

<http://hdl.handle.net/1880/52096>

Downloaded from PRISM Repository, University of Calgary



Selected proceedings of the IDEAS Conference 2017 Leading Educational Change

*May 4 - 5, 2017
Calgary, Alberta*



UNIVERSITY OF CALGARY
WERKLUND SCHOOL OF EDUCATION



Selected proceedings of the IDEAS Conference compiles double blind peer review manuscripts from the presentations of the annual IDEAS Conference.

Copyrights © 2017 left to the authors.

All rights reserved.

Conference website:

<https://werklund.ucalgary.ca/ideas/>

This document is publicly available through the University of Calgary Digital Repository:

<http://prism.ucalgary.ca/>

ISSN 2371-9265

May 2017. University of Calgary, Calgary, Canada

Editors:

Armando Paulino Preciado Babb, Lake Yeworiew, and Soroush Sabbaghan, Werklund School of Education, University of Calgary

Calgary, Canada

Cite as:

Preciado Babb, A. P., Yeworiew, L., & Sabbaghan, S. (Eds.) (2017). *Selected Proceedings of the IDEAS Conference 2017: Leading Educational Change*. Calgary, Canada: Werklund School of Education, University of Calgary.

Acknowledgment

This refereed proceeding was made possible by generous support from the following reviewers.

We truly appreciate their support and expertise.

Reviewers:

Nancy Arthur (University of Calgary)

Kathlyn Bradshaw (Algonquin College)

Jim Brandon (University of Calgary)

Barb Brown (University of Calgary)

Eva Brown (University of Calgary)

Patti Djyur (University of Calgary)

Sarah Eaton (University of Calgary)

Manuel Goizueta (Universitat Autònoma de Barcelona)

Michele Jacobsen (University of Calgary)

Peter Liljedahl (Simon Fraser University)

Srabani Maitra (University of Calgary)

Mairi McDermott (University of Calgary)

Martina Metz (University of Calgary)

Petrea Redmond (University of Southern Queensland)

Soroush Sabbaghan (University of Calgary)

David Scott (University of Calgary)

Marlon Simmons (University of Calgary)

Armando Solares Rojas (Universidad Pedagógica Nacional, Mexico)

Miwa Takeuchi (University of Calgary)

Christy Thomas (University of Calgary)

Gregory Tweedie (University of Calgary)

TABLE OF CONTENT

FOREWORD: LEADING EDUCATIONAL CHANGE

Armando Paulino Preciado-Babb, Soroush Sabbaghan and Lake Yeworiew	1
--	---

SECTION ONE: Design Thinking

AFFORDANCES OF LEARNERS' GAME DESIGN PRACTICES

Beaumie Kim, Reyhaneh Bastani, and Farzan Baradaran	7
---	---

DESIGNING SHIFTS TO POSITION TEACHER AS DESIGNER OF LEARNING

Stephanie Bartlett, Erin Quinn, Tracy Dalton, and Steve Clark	17
---	----

SECTION TWO: Higher Education Teaching and Learning

PLAGIARISM: MOVING FROM PUNITIVE TO PROACTIVE APPROACHES

Sarah Elaine Eaton, Melanie Guglielmin and Benedict Kojo Otoo.....	28
--	----

STRATEGIES FOR SUCCESSFUL GROUP WORK

Barb Brown and Christy Thomas.....	37
------------------------------------	----

A DISCUSSION OF STUDENT ENGAGEMENT INDICATORS AND STRATEGIES IN HIGHER EDUCATION

Nahum Arguera and Patti Dyjur	47
-------------------------------------	----

MAKING EVIDENCE INFORMED DECISIONS ABOUT FORMATIVE WRITTEN FEEDBACK

Lorelei Anselmo and Sarah Elaine Eaton	57
--	----

SIGNATURE PEDAGOGIES IN ONLINE CLASSES

Barbara Brown, Sarah Elaine Eaton, and Meadow Schroeder	66
---	----

HOW CAN GRADUATE STUDENTS CONTRIBUTE? REFLECTIONS ON CREATING A JOURNAL FOR AND BY GRADUATE STUDENTS

Jon Woodend, Maisha M. Syeda, Britney M. Paris, Gina Ko, and Konstantinos Chondros, Brianna Hilman, and Teresa Fowler	75
---	----

INTERPRETING 21ST CENTURY EDUCATIONAL REFORM IN ALBERTA: A PILOT STUDY

Amy Burns and Dianne Gereluk	84
------------------------------------	----

ENHANCING STUDENT ASSESSMENT THROUGH VEEDBACK	
Soroush Sabbaghan	93

SECTION THREE: Indigenous Education

RESPONDING TO THE CALLS TO ACTION: Indigenizing a graduate program	
Yvonne Poitras Pratt, Solange Lalonde, Aubrey Hanson, and Patricia Danyluk	103

SECTION FOUR: Leadership

SCHOOL WORK, ADOLESCENT DEPRESSION AND THE CLASSROOM	
Nahum Arguera.....	112

PROFESSIONAL DEVELOPMENT PARTNERS	
Christy Thomas	121

INSTRUCTIONAL LEADERSHIP: THE ART OF ASKING QUESTIONS TO PROMOTE TEACHING EFFECTIVENESS	
Kenzie Rushton	131

BETTER TOGETHER: FOSTERING EFFECTIVE RELATIONSHIPS FOR AUTHENTIC LEARNING PARTNERSHIPS	
Jennifer Meredith, Travis Robertson, Ita Kistorma, Sanghamitra Dhar McKenty, and Frank McClernon	140

SECTION FIVE: Literacies for Today’s Learners

AN INTERPRETIVE EXERCISE IN MOVING FROM RESEARCH TO ASSESSMENT IN LANGUAGE ARTS	
Galia Blackman	150

SECTION SIX: Mathematics & Numeracy

MAKING MEANING OF PERIODIC FUNCTIONS THROUGH BODY MOVEMENTS	
Minerva Martínez Ortega, Armando Preciado Babb, and Hugo Rogelio Mejía Velasco.....	159

USING VARIATION TO CRITIQUE AND ADAPT MATHEMATICAL TASKS	
Martina Metz, Paulino Preciado-Babb, Soroush Sabbaghan, Brent Davis, and Alemu Ashebir.....	169

ATTENDING AND RESPONDING TO WHAT MATTERS: A PROTOCOL TO ENHANCE
MATHEMATICS PEDAGOGY

Martina Metz, Paulino Preciado-Babb, Soroush Sabbaghan, Brent Davis, and Alemu Ashebir..... 179

SECTION SEVEN: Science, Technology, Engineering and Mathematics (STEM)

IT'S NOT ABOUT IDEAS, IT'S ABOUT CONCEPTS: TEACHERS' EXPERIENCES DESIGNING
ROBOTICS TASKS

Gabriela Alonso-Yanez, Kaitlin Duong, Caytlin Edge, Andrew MacLellan, Dominika Polakovic, and
Paola San Juan 191

FOREWORD: LEADING EDUCATIONAL CHANGE

Armando Paulino Preciado-Babb, Soroush Sabbaghan and Lake Yeworiew

University of Calgary

Innovators, Designers, Educators, Academics and Students (IDEAS) 2017, Leading Educational Change is the fifth annual conference co-hosted by the Werklund School of Education and the Galileo Educational Network Association at the University of Calgary. The mandate of the conference is to improve education through research, evidence-informed decisions across teaching, learning and leadership. The conference brings together innovators, designers, educators, academics and students from K-12, post-secondary and government to rise to the challenge of designing for today's new learning landscape.

Presenters in this conference are invited each year to submit papers for the Proceedings of the IDEAS Conference. The papers undergo a double-blind peer-review process that involves a minimum of two people reviewing each proposal. The reviewers' feedback helps to inform the acceptance of the paper. This process comprises up to two rounds of reviews and corrections. The acceptance policy is summarized as follows.

- 1) In accordance to the mandate of the conference regarding innovation and evidence-informed decisions, proposals are required to address the following questions: What does the research say about your particular innovative practice? How does this innovative practice live in the teaching and learning in your context? When studying this practice, what has been discovered through the research that is informing next steps?
- 2) Proposals need to be accepted by at least one reviewer in order to be accepted for the proceedings.

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 1-6. Calgary, Canada: Werklund School of Education, University of Calgary.

- 3) In case of discrepancy between two reviewers regarding the acceptance of a proposal, a third reviewer will be consulted and the editorial committee will make a final decision.

Authors are required to address reviewers' comments for the final version of the paper. The Selected Proceedings of the IDEAS 2017 Conference includes 20 papers from presentations in the following streams: Design Thinking; Higher Education Teaching and Learning; Indigenous Education; Literacies for Today's Learners; Mathematics & Numeracy; Leadership; and Science, Technology, Engineering and Mathematics (STEM).

LEADING EDUCATIONAL CHANGE

The challenge of designing for today's new learning landscape entails an innovative approach to education that involves both education for innovation and innovation in education. This is evident, for instance, in Alberta with the focus on *entrepreneurial spirit* and the emphasis on specific competencies in K to 12 education (Alberta Government, 2016). These competencies go well beyond knowledge or skills taught in courses. A similar tendency can be identified in some courses in higher education based on *signature pedagogies* (Shulman, 2005) that underscore the importance of learning how to act in a particular profession—as opposed to just learn content and develop skills. This approach to innovation also includes consideration to social issues, such as the focus on reconciliation (Alberta Government, 2014) that particularly addresses the history and legacy of residential schools and First Nations, Metis and Inuit peoples. The seven streams of the IDEAS 2017 Conference address, in one way or other, this innovative approach to education.

Innovators, designers, educators, academics and students are all essential to lead educational change. Educators' contribution could range from individual efforts to groups or communities engaged in expanding possibilities in education. Academics, who are often educators themselves, take the lead in research and collaborate with other partners in education. Leading educational change not only involves

educators and administrators, but also students. The Framework for Teaching Effectiveness (Friesen, 2009) suggests that students should engage in real issues at school, thinking as professionals do in each subject. Students can engage in design processes to address some of the real challenges, becoming contributors in their communities. The IDEAS Conference has been a venue for innovators, designers, educators, academics and students to present research that informs practice and practice that informs research. The Proceedings compiles and showcases the nature of the work presented at the conference and makes it available for a larger audience.

SECTION ONE: Design Thinking

The stream, Design Thinking, contains two papers. Beaumie Kim, Reyhaneh Bastani and Farzan Baradaran explore the affordances of game design practices for learners' experience in two junior high schools. They stress the importance of allowing learners to make their own design decisions. Erin Quinn, Stephanie Bartlett, Tracy Dalton and Steve Clark report on an intervention involving 120 educators from K to 12. They contrast differences between design thinking from business and from education, prompting a responsive combination rooted in creativity and the personalization of learning.

SECTION TWO: Higher Education Teaching and Learning

Higher Education Teaching and Learning has been this year's most popular category with eight articles. First, Sarah Elaine Eaton, Guglielmin Melanie and Benedict Otoo propose practices and strategies to proactively prevent plagiarism and help students understand its importance as well as how it is developed. Second, Christy Thomas and Barb Brown review three scenarios and the strategies instructors used to face the challenges of group work. Third, Nahum Arguera and Patti Dyjur offer a framework that may increase student engagement at the University of Calgary. Fourth, Lorelei Anselmo and Sarah Elaine Eaton discuss how formative written feedback that is clear, goal-oriented, and reflective of the learners' preferences act can help improve academic writing skills. Fifth, Barbara Brown, Sarah Elaine Eaton and

Meadow Schroeder highlight successful signature pedagogies provided learning during online synchronous sessions. Sixth, Jon Woodend, Maisha Syeda, Brit Paris, Gina Ko, Konstantinos Chondros, Brianna Hilman and Teresa Fowler describe the experience after one year of launching the *Emerging Perspectives: Interdisciplinary Graduate Research in Education and Psychology* journal: A journal for and by graduate students. Seventh, Amy Burns and Dianne Gereluk draw from their pilot study and outline how teachers and school-based leaders are interpreting 21st century education in very different ways. Eighth, Soroush Sabbaghan suggests how practitioners could enhance the student learning experience by providing annotated video feedback.

SECTION THREE: Indigenous Education

The stream of Indigenous Education had one submission. Yvonne Poitras Pratt, Solange Lalonde, Aubrey Hanson and Patricia Danyluk present their work on Indigenizing Pedagogy finding that the inclusion of knowledge keepers, a respectful learning environment, and creative pedagogical approaches, fostered transformative learning.

SECTION FOUR: Leadership

The Leadership stream comprises four papers. First, Nahum Arguera presents a study concluding that schoolwork pressure is associated with depressive symptoms in a negative way. The author also discusses stress-reduction strategies in the classroom. Second, Christy Thomas highlights a research study that investigated the potential impact of partnerships providing teacher professional development at one school, elaborating on scheduled time for PD, culture of pressure and support, and changes in teaching practices. Third, Kenzie Rushton draws from a pilot study to outline how instructional leaders could support the common good of promoting effective teaching practices by asking carefully selected questions as part of professional conversations. Fourth, Jennifer Meredith, Travis Robertson, Ita Kistorma, Sanghamitra Dhar McKenty and Frank McClernon describe the Campus Calgary/Open Minds

model that supports students through relationships between educational districts within Calgary, community learning sites, funders, and educational supports.

SECTION FIVE: Literacies for Today's Learners

In the stream, Literacies for Today's Learners, Galicia Blackman draws from her qualitative research project on dialogic practices in language classes. From the study, she discusses strengths and challenges of using audio-journals in research.

SECTION SIX: Mathematics & Numeracy

The stream of Mathematics & Numeracy includes three papers. Minerva Martínez Ortega, Armando Paulino Preciado-Babb and Hugo Mejía present a study on the experiences and learning of high school students engaged creating graphs of sinusoidal functions through body movements and a motion sensor. The last two papers in this section correspond to the Math Minds Initiative. In the first paper, Martina Metz, Armando Paulino Preciado-Babb, Soroush Sabbaghan, Alemu Ashebir and Brent Davis show examples of the use of variation theory to create and adapt tasks for supporting all learners in the classroom. In the last paper, the same authors describe a protocol used to structure feedback for teachers in the Initiative. The protocol, developed from four years of research, comprises: 1) effective variation, 2) continuous assessment, 3) responsive teaching, and 4) engagement.

SECTION SEVEN: Science, Technology, Engineering and Mathematics (STEM)

In the paper submitted for this STEM stream, Gabriela Alonso-Yanez, Kaitlin Duong, Caytlin Edge, Maclellan Andrew, Dominika Polakovic and Paola San Juan address the question of how do teachers design robotics tasks that facilitate learners' understanding of STEM concepts? Four of the authors are pre-service teachers and answer this question describing their experiences designing, programming, and operating a robot.

References

- Alberta Government (2014). Expression of reconciliation for the legacy of the Indian Residential School System. Retrieved from <https://www.education.alberta.ca/media/563919/albertas-expression-of-reconciliation.pdf>
- Alberta Government (2016). Competencies: Descriptor, indicators and examples. Retrieved from <https://www.education.alberta.ca/media/3272998/competency-indicators-september-30-2016.pdf>
- Friesen, S. (2009). What did you do in school today? Teaching effectiveness: A framework and rubric. Toronto: Canadian Education Association.
- Shulman, L. (2005). Signature Pedagogies in the Professions. *Daedalus*, 134(3), 52-59.

AFFORDANCES OF LEARNERS' GAME DESIGN PRACTICES

Beaumie Kim, Reyhaneh Bastani, and Farzan Baradaran

University of Calgary

Game play and game design require learners to think critically about contents within the game and to solve problems. We suggest that engaging learners in game design projects helps them understand school subjects deeply and develop important skills that individuals need in all situations in life (e.g., creative designs, strategic thinking). In this paper, we discuss what game design practices can afford for learners' experience and development based on the recent game design projects that took place in two junior high schools in Western Canada.

Keywords: Game design; interdisciplinary learning; interest-driven learning

INTRODUCTION

Playing and creating digital games have gained attentions for their learning potential to foster critical thinking and deep understanding of contents in a game (Gee, 2008). For example, games depicting complex social-historical phenomena (e.g., Civilization) could support a rich learning experience and outcomes (e.g., DeVane, Durga, & Squire, 2010; Salen, 2007). Designing games, on the other hand, provides the opportunity for students to create their own sharable artifacts and “to construct new relationships with knowledge in the process” (Kafai, 2006, p. 36). It requires students to develop and integrate their own ideas and to engage in an ongoing knowledge synthesis and reflection to create a complex set of meanings (e.g., background, knowledge, aesthetics, rules) and anticipate how the meanings transform in a social play setting (Salen, 2007; Vos, van der Meijden & Denessen, 2011). Students learn to acquire and appreciate a rich set of skills such as

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 7-16. Calgary, Canada: Werklund School of Education, University of Calgary.

systems thinking, problem-solving, art and aesthetics, storytelling, and game logic and rules when designing games (Peppler, Warschauer, & Diazgranados, 2010). Ke (2014) emphasizes the storytelling and identity expression in the process of students' game design, and how this encourages students to persist in "design and development-oriented problem solving" (p. 37). Designing games to learn curricular topics, students could construct their understanding and engage in disciplinary and cross-disciplinary reasoning. Students' personal preferences, their past gaming experience, or their competencies in coding and making digital or non-digital media would become important resources for their game design (Kafai, 1995; Ke, 2014). Students may come up with unique approaches to integrating the content, aesthetics, game mechanics and a complex set of game dynamics based on their own experiences. In this paper, we describe various learning opportunities that we observed in two schools' game design projects.

STUDY CONTEXT

Research on designing digital games for learning showed that students often created games to test players with knowledge (Kafai, 2006). With limited skills and their perception of "learning", students may not engage in creating the complex systems depicted in their school subjects. We support that teachers can engage learners in various types of game designs to support their deep learning. We worked with two Western Canadian junior high schools with different curricular goals. Lake View School (pseudonym) explored learner-centered interdisciplinary learning of Science, Math, Humanities, and English in two 8th grade classrooms. This project accompanied teacher-led lessons of going over the subject contents. Students were assigned to groups and created card or board games for the Renaissance period. They went through the process of playing and analyzing games to learn game mechanics, becoming experts in subtopics, creating and testing their prototypes, and inviting other classes to play their games. Teachers assessed students'

understanding of the topics through student-teacher conferences, their daily online reflections, and observing their presentations and game playtesting using rubrics throughout the project.

In Western Prairie Junior High School (pseudonym), a 9th grade Career and Technology Studies class supported students' interest-driven skill-development and an exploration of careers that use these skills. Game design was an overarching theme to achieve these goals. Students formed their own groups, and came up with ideas for digital games based on their interests. They negotiated ways to test out feasibility of their ideas considering their skills and timeline by creating diverse types of games (e.g., digital, card, board, Minecraft-based). We collected ethnographic data of lesson planning documents, classroom videos, game design artifacts and reflections, informal conversations with teachers, and interviews. We looked for patterns of students' decision-making and design process, which show their problem-solving and development of knowledge and skills.

GAME DESIGN PRACTICES IN LAKE VIEW SCHOOL (LVS)

In LVS, we observed that students engaged more deeply in their board/card game design practices when their game ideas depicted more dynamic systems for play. In other words, students who heavily incorporated knowledge-testing elements in their games found this project less engaging and redundant to their content-focused reading and practice school learning. We illustrate four examples of learning and development opportunities for more complex game designs.

Students' initiative to learn beyond the required subject content

Some students searched for more background information to incorporate into their games, and identified this activity as a significant part of the project. Hans described his experience of creating their game, Race of Renaissance, using the word "researcher" and stated that "*sometimes when we were doing our game, I was like feeling to [find out] some stuff, so when I go home, I research*

about it to make sure I understand it.” Such notable student-initiated work was not limited to the assigned topics. To create richer characters in their role-playing card game, the group sought to develop a thorough understanding of the lives and context of the historical figures (e.g., Galileo) beyond what was in the textbook. Markus explained, *“To create a game or a research paper or anything on one topic, you really need to understand that topic very well, even the information that you might not need to know, because once you know all the information you can decide what's good to add and what's not good to add... We did a lot of in-depth researching, we learned a lot about things that are not in the game, but we had to research like a lot.”*

Students’ deeper understanding of complex context and relationships

We observed that some students could contextualize their design ideas for others’ learning of math, science and humanities within the game. Students applied mathematics in the game rules for using resources and players’ interactions. One group’s game (Renaissance: Rebirth) used the concept of ratios for players’ in-game trading, which involved comparing and managing different resources based on their values. Race of Renaissance role-playing card game (Figure 1) required players to consider the historical context of the inventors’ endeavors in the Renaissance, and the inventions’ contribution to different fields. The students’ desire to create the settings for complex dynamics motivated them to incorporate a complex understanding of the overall impacts of inventions, which showed itself in their game rules. Markus explained how introducing an invention in the game could benefit everyone: *“They mostly make sense with the invention. [For example, the Vitruvian man], the action it unlocks gets everyone a point. That is because everybody gets a better understanding of perspective and math and the relationships in the human body, so that could help them with scientific invention like medicine or even just help them paint.”*



Figure 1: Race of renaissance card game

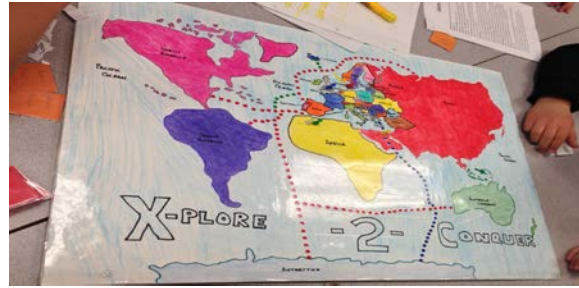


Figure 2: X-PLORE-2-CONQUER board game

Students connecting with their real-life context and skills

Another group pursued reenacting exploration and trade in the Renaissance (Figure 2). They incorporated the trade route of the Renaissance and created rules considering locations and positions of countries. To simulate real-life situations, they considered costs and benefits of taking each path to different countries, such as resources and accessibility: *“[our game theme is] exploring... to different continents, and just getting different resources, and seeing how they were worth different amounts, and the risks and pros and cons that could happen to you while you were going to those continents, stuff like that”* said Julio, one of the group members. He asserted that risk cards *“were like the pros and cons. Some things go good for you on the voyages, and then some turn bad, which is like real life.”* Noah explained managing resources in this game: *“you would just strategize and save some of the money that you had so that you didn’t run out.”* After testing with another group, they adopted a “loan” option for the problem of running out of money.

Students creating a context for problem-solving and decision-making

Designing games engage students in creating a game context that required players to compare their options and make decisions. Julio explained that *“sometimes people would say maybe buying countries close to the ocean could be bad for you because of all the storms that could happen with the oceans... [but it could be] really good for you because then they were really close to the ports and people kept paying you.”* Noah affirmed, *“The bigger countries not necessarily mean they*

were the best countries.” Put it differently, multiple cycles of design and testing were involved in this process to create a balanced game system. This entailed deciding on rules for buying resources and trading, and incorporating chances with risk cards that represented probable consequences of travelling to different countries.

GAME DESIGN PRACTICES IN WESTERN PRAIRIE JUNIOR HIGH (WPJH)

In WPJH, the work of some students clearly expressed their developing identities (e.g., aspiring programmers). Game design practices afforded various teaching and learning purposes, and we recognized that students relied heavily on their gaming experiences and preferences while engaging in this practice. In WPJH’s context of Career and Technology Studies classroom, we observed the following learning and development opportunities, especially in two groups of male students who claimed their affection for video games but took different routes to their final games.

Students using their experiences and preferences as resources

Z-Days, a group of three boys who desired to create a zombie game, had doubts about their idea at the beginning. Their game had a violent content that involved dealing with zombies and odd creatures, and they were not sure if the teacher (Megan) would endorse their idea. Megan remembered that they became interested in the project when she told them they could create a zombie game. Terry, one of the Z-Days members, mentioned *“I love video games, especially zombie games, and I think it's really cool that we are creating one ourselves.”* He explained, *“We took a bunch of ideas from games and shows [...] and put them into one, so it was a mixture of all the different games and shows.”* As soon as they found out that they could make such a game in the class, Z-Days, who did not show much engagement in class, became excited about designing the game of their desire. Bob, another Z-Days member, pointed out, *“We got more freedom to say what we wanted and make up our own ideas. I find with every other class you’re just using*

everybody else's way, you can't use your own, but with this you can make your own ideas, choose what ideas you want to use."

Students making their own decisions

Voxel War, a group of five avid gamers, wanted to create a video game that involved fighting to conquer more territories. The members of this group described making their own decisions as an engaging aspect of the project. Zoey explained *"I was able to be creative and say, I want to do this and then make something out of that."* Graham added, *"Rather than being handed an assignment [...] to do this, this, and this and it has to be specifically done in this one way."* Diego, the programmer of the group expressed that *"the experience of learning by designing a game is a lot more intuitive."* The iterative process of decision making was one of those aspects of the project. Zoey mentioned that the project had *"been making decisions, going back on those decisions, going back on those decisions, and making different ones."* Graham confirmed, *"While making decisions for the game, it is like you're considering a lot of different things."*

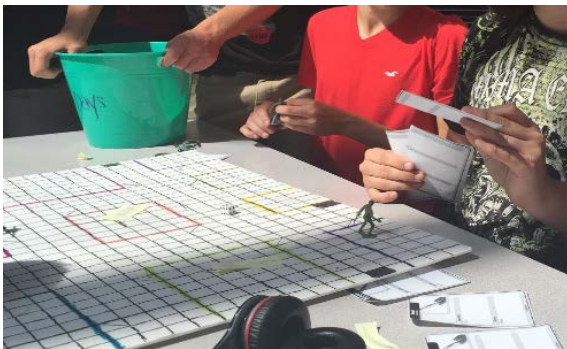


Figure 3: Z-Days' final game being played

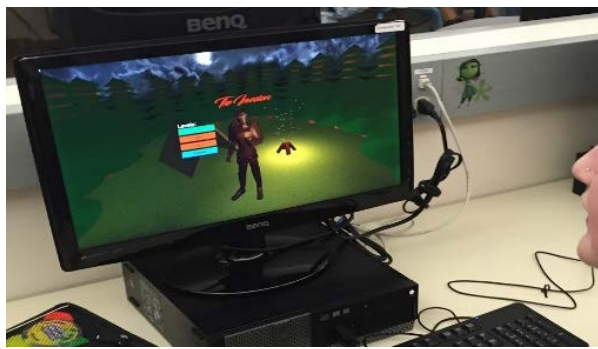


Figure 4: Voxel War game being played

Students developing skills based on their interest

Students were also able to find their own interest and develop skills in creating and designing unique game elements. For example, Zoey mentioned, *"I enjoy writing the stories for each*

character and the lore of the world.” Zoey, in fact, could tell us elaborate stories about the world and characters, even though Voxel War was not able to design a game at such scale. Through the iterations of testing, evaluation and modification of design elements, different members developed different skills, such as photo editing, sound editing, 3D graphics, programming, and animation. Terry was working on game sound effects: he developed his sound editing skills while designing for the game. Zoey mentioned, “*We learned the skills necessary, such as design, code, even 2-D design.*” Diego expressed, “*I enjoy modelling and learning how to use Unity and the programming language C++.*” Zoey added, “*I enjoy the development of character models, and how we started thinking that we would make it a 2D game but now we are doing 3D voxels, and now thinking of converting to polygons.*”

Students determining the final game format based on their interest

In the process of understanding, modifying, and transforming systems (digital game concept to playable game), students came to understand the complexity of doing multidisciplinary work involved in game design and development. Zoey found “*the scale of the game idea needing to be done in a realistic timeframe*” challenging. Voxel War members, who were interested in design and development skills, decided to create a final product that was a short demo of the game that the team members intended to design. The playable version included one of the main characters and a group of enemies to fight with using the keyboard and mouse (Figure 4). Z-Days members were more interested in their game design ideas with Zombie characters, and their prototype was focused on using the full backstory in a board game (Figure 3). The game included cards that were designed to make a balance between chance and strategy in the game.

DISCUSSIONS AND CONCLUSION

We described some aspects of what game design practices could afford for students' learning and development. Even though the curricular goals of the two schools were very different, students were positioned as problem-solvers and decision-makers in all aspects of their game design. In LVS, students were not only developing a deep understanding of complex context and relationships, but also creating an interesting context for other learners to play and learn through their games. In WPJH, students were deeply engaged in understanding their own interests, preferences and experiences, and pursuing them within the context of school. For some students, this was their first time in junior high to be excited about coming to the classroom and to be thinking about their future careers.

Our research indicates that turning the design decisions to the hand of the learners is important for bringing their own experience and expertise to their learning. We advocate for adopting game design practices not only to engage learners in deep learning of content but also to develop skills that all students need to thrive in their lives. We acknowledge that we could only demonstrate a part of our findings with a limited number of students in this paper. There was a range of guidance that came from teachers and researchers. In addition, students and teachers mentioned other aspects of learning, including how students could evaluate their own development, to learn from each other, and learn to work together. We are further exploring ways to better support students in thinking about complex systems that they represent in the game, and to employ the existing gaming expertise of students more productively in this process.

Acknowledgements: We thank the teachers and students for welcoming us in their spaces, Matt Tolman, for the offering of his time and expertise, and MindFuel for their collaboration.

References

- DeVane, B., Durga, S., & Squire, K. (2010). "Economists who think like ecologists": Reframing systems thinking in games for learning. *E-Learning and Digital Media*, 7(1), 3–20. <http://doi.org/10.2304/elea.2010.7.1.3>.
- Gee, J. P. (2008). Learning and games. *The ecology of games: Connecting youth, games, and learning*, 3, 21-40.
- Kafai, Y. B. (1995). *Minds in play: Computer game design as a context for children's learning*. Routledge.
- Kafai, Y. B. (2006). Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games and Culture*, 1(1), 34–40.
- Ke, F. (2014). An implementation of design-based learning through creating educational computer games: A case study on mathematics learning during design and computing. *Computers & Education*, 73(1), 26-39.
- Peppler, K., Warschauer, M., & Diazgranados, A. (2010). Game critics: Exploring the role of critique in game-design literacies. *E-learning and Digital Media*, 7(1), 35-48.
- Salen, K. (2007). Gaming literacies: A game design study in action. *Journal of Educational Multimedia and Hypermedia*, 16(3), 301.
- Vos, N., Van Der Meijden, H., & Denessen, E. (2011). Effects of constructing versus playing an educational game on student motivation and deep learning strategy use. *Computers & Education*, 56(1), 127-137.

DESIGNING SHIFTS TO POSITION TEACHER AS DESIGNER OF LEARNING

Stephanie Bartlett, Erin Quinn, Tracy Dalton, and Steve Clark

Calgary Board of Education

Design the Shift (DTS) is an iterative professional learning series for educators, immersing them as learners with an emphasis on design thinking mindsets. Using DTS as the context, we juxtapose field notes, observations, participant data, and reflection with the Teaching Effectiveness Framework (Friesen, 2009) to understand the impact of design thinking on teacher practice. Implications point towards the complexities in defining our methodology as uniquely design thinking; rather it is a responsive combination of design thinking rooted in creativity and the personalization of learning.

Keywords: design thinking; personalization of learning; Teaching Effectiveness Framework; professional learning; teacher as designer

As learning specialists with the Calgary Board of Education (CBE), we noticed a growing trend in requests for professional learning from teachers about design thinking and how it fits in a classroom or school ecosystem. While curious, teachers were often unable to articulate the connection of design thinking to curricular outcomes, revealing that system professional learning was needed to make theoretical connections to the work of teaching and learning. In our work supporting innovative practice, and in an effort to respond to this gap, our team began a critical, systematic reflection exploring the human-centred component of the design process. The result was a responsive professional learning series connecting design thinking to the Teaching Effectiveness

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 17-27. Calgary, Canada: Werklund School of Education, University of Calgary.

Framework (TEF) (Friesen, 2009) and a system focus on creating authentic learning experiences for students.

As part of a larger study, we critically analysed and responded to the needs of our teachers. Voluntary participants included twenty DTS educators who provided data through surveys. Participants responded to the questions: How has this experience impacted you as a learner? How has DTS impacted your teaching practice? How is your work in DTS impacting student learning? This paper is organized in three parts: Context, Response, and Reflection and Findings. The conclusion points to the realization that design thinking in our educational context is complex in nature, and not the same process associated with business; it is rooted in creativity and curriculum, with an emphasis on human-centred design.

THE CONTEXT

Design thinking is a term that appears frequently in popular teacher websites associated with education (For example, Edutopia (n.d.) and MindShift (n.d.)). Though popular content abounds, the context of peer-reviewed research associated with design thinking in education presents a challenge. Much of the peer-reviewed literature presents a design-thinking model that has been borrowed from the fields of business and design. Literature associated with the fields of business and design (see, for example, Martin, 2009; Dalton & Kahute, 2016) and that of education present an iterative creative problem-solving approach with several phases: discover, define, ideate, prototype, and test (Kelly, 2016, p. 8). This approach to design-thinking emerged in Stanford's *d.school* and international firm *IDEO* as an approach for creative yet capitalist purposes (Camacho, 2016). Peer-reviewed research has just begun to explore design- thinking's application in teaching and learning and has yet to explore how an economically driven approach applies in teaching and learning. Some early studies point to design-thinking empowering students to solve authentic

problems (see, for example, Watson (2015); Noweski et al. (2012); Cassim (2013)). What has not yet been explored in scholarly research is the connection between design-thinking and teachers as designers of learning. The design of our professional learning series aimed to understand this connection, and aimed to craft a version of design-thinking that applies in the field of education. This definition uses design-thinking as an analogy to teaching and learning, incorporating research of effective teaching and learning.

In planning DTS, we began by asking questions such as: how might we encourage teachers to embrace the mindsets of design-thinking to push them beyond design-thinking as a linear process? How might the design-thinking methodology empower teachers to consider themselves designers of learning so as to design work worthy of students' time and attention (Friesen, 2009)? To connect to the current work of teachers, we looked for alignment with our system priorities. Making Teaching and Learning Visible (2016a) defines the CBE's vision of personalization as learning that is "built upon a comprehensive understanding of each child;" teachers need to "know what students know, how they know it, how they show it, and what they need to learn next" (p. 2). The TEF (Friesen, 2009) has been used to inform the teaching practices necessary in designing personalized learning experiences. Together with the CBE's definition of personalized learning, the TEF (Friesen, 2009) helps teachers articulate their role as architects of learning.

While the TEF (Friesen, 2009) provides teachers with the theory *behind* teaching as designing, design-thinking gives them a methodology to *enact* this approach. Compared with other creative processes, design-thinking uses empathy as a key mindset. Design-thinking as an approach to instructional design recognizes "students as unique learners and as members of their learning communities" (Calgary Board of Education, 2016b, p. 2). The empathy in design-thinking holds

the student at the centre of the process, while the teacher sheds assumptions and considers the needs of the learner throughout.

THE RESPONSE

We created DTS, which was composed of three immersive learning days during the summer, and four communities of practice throughout the school year (see Appendix A). 120 educators from schools ranging from Kindergarten through grade 12 participated. In order to ground teachers in the role of designer, the summer intensive immersed teachers in empathy experiences as learners in the world, one of the foundations of human-centred design (d.school, 2016). Inherent in the representation of the design-thinking process as distinct phases, is the risk in using design thinking as a procedural approach to problem solving. Wanting to safeguard against teachers adopting a rigid process, we decided to focus instead on the human-centred mindsets associated with designing, such as embracing ambiguity, learning from failure, and coming from an empathetic stance. Reflection about the connection between design and effective teaching and learning, as well as the needs of teachers, informed the design of the professional learning series, outlined in the three following sections.

Empathy Gathering

Effective teaching asks educators to design learning tasks so students can “make connections to the disciplines, students’ lives and the world” (Friesen, 2009, p. 4). Teaching with empathy at the heart of planning naturally embeds personalization, where teachers deeply consider their students. Our participants needed experiences that would demand them to walk in the shoes of the learner, so they could better gain empathy for how students connect with the disciplines, their own lives, and the world around them. We designed the river walk with empathy in mind to position teachers in the role of the learner. They met people along the walk who represented a wide variety of

perspectives, such as a water engineer, a client from the local homeless shelter, and a member of a nearby First Nation. Another experience designed to elicit empathy was the Interview for Empathy with community partners (d.school, n.d., p.10). Participant G noted the importance of finding problems in the context of community: “I have always known the impact and value, however the experience of interviewing community partners ... truly illustrated this experience for me and made these connections non-negotiable.” Reflection questions throughout asked teachers to consider how thinking of themselves as learners might help them better understand their students.

The Topic in the World

When teachers consider how to bring topics alive, they become attuned to noticing authentic opportunities for learning. Design thinking demands its practitioner to deeply consider both the user and the topic. We deliberately designed the river walk to slow us down into a reflective state, inviting teachers to see how curriculum is “deeply connected to the world in which they live” outside the school walls (Friesen, 2009, p. 4). Participants observed through their own lenses, some noticing the history of the land from its place as a traditional trading spot to its present as a space of commerce and recreation, others noticing the multiplicity of voices that make up a community. They gathered “around real problems, issues, questions or ideas that are of real concern and central to the discipline” (Friesen, 2009, p. 5). Teachers were then able to see that our topics and disciplines exist in the world, not in our textbooks, and if we are open enough, we can find them simply by looking around.

Everything Designed can be Redesigned

Based on past experiences, our team knew that barriers inherent in the school system, such as disciplinary silos, bells, standardized tests, and specific curricular outcomes, can sometimes inhibit personalized learning. DTS needed to provide space for teachers to critically examine their beliefs

about teaching and learning, and their juxtaposition against traditional systems of schooling. Our teachers connected to the idea that “anything designed can be redesigned” (S. Speicher, personal communication, October 21, 2016). Design-thinking helped teachers understand that they can redesign their response to these and other barriers, as Participant F noted: “The program structure that we developed last year posed some challenges for my students this year, so my teaching partner and I had to “redesign” our weekly schedule to accommodate their needs.” Teachers began to understand how design-thinking could disrupt old patterns. To illustrate a disruption in the summer intensive and ask teachers to react to unknown stimuli, we offered a session on improvisational theatre. In an improvisational creative space, the “deepening of trust, commitment, and shared understanding” is necessary in order to create the conditions for educators to take risks, see failure as a mechanism for learning, and be open to new experiences and ideas (Gagnon, Vough, & Nickerson, 2012, p. 302). Participant F remarked, “Improv sessions, even though I was totally dreading them at first, took me out of my comfort zone and encouraged me to trust the people I was learning with.” Improvisation emphasized an openness in thinking, which let teachers consider different possibilities in instructional design.

REFLECTIONS AND FINDINGS

The data our team collected throughout the year indicated several key findings. Firstly, the summer intensive was successful in engaging teachers as learners. Teachers expressed gratitude in having time to dwell in the role of the learner, as Participant F noted: “It was interesting to discover things about myself and how I learn best. It has also helped me empathize with my students.” The river walk, in particular, stands out as an experience where participants were so engrossed in their learning that “time itself [seemed] to disappear” (Friesen, 2009, p. 5).

We underestimated the amount of time needed to gain confidence in using the design-thinking process and mindsets. Based on observation and participant voice, our first two Communities of Practice focused on continuing to practice thinking like designers. When asked about next steps, Participant J requested help with “working through ideas for how design thinking might be used with students” and then pointed out that “some teachers struggle with the challenges and linking it to their work in the classroom.” This feedback illuminated the continued misunderstanding that design thinking is a linear process, rather than a shift in pedagogy integrally connected to the personalization of learning. An important learning is the necessity of evolving this work with time and practice.

Another key learning is the importance of a collaborative team. When school teams attended DTS as a cohort, there are more opportunities to practice design thinking in their context. One team expressed that a cohort helped them shift entrenched traditional modes of schooling and redesign these perceived barriers, with Participant F recognizing that “our classroom environment and schedule were contributing to some of the challenges we were encountering,” and a shift in organization and culture was needed to change this.

Many of our participants share stories in person and through our Twitter hashtag, #cbeshift. These stories indicate that students are engaging in learning with “an absorbing, creatively energizing focus” that demands “contemplation, interpretation, understanding, meaning-making and critique” (Friesen, 2009, p. 4). At our third Community of Practice, all teachers were successful in creating a learning task using design-thinking. Pondering the impact on student learning, Participant G noted, that the “first word that comes to mind is engagement. Students are taking up the work we are doing with focus, excitement and rigor. I believe this is due to the authenticity of our task design

which is a direct result of my work with DTS.” The emerging stories indicate small but significant changes to instructional design.

CONCLUSION

Through the design of DTS, and the analysis of participant feedback and observations, we have learned the importance of distinguishing that the design-thinking process as it applies to education is a different approach than that used in the world of business. By infusing concepts related to creativity and the personalization of learning into the design thinking process, teachers are beginning to show evidence that this approach creates the conditions where meaningful, authentic learning experiences can occur, a concept that we will explore in future research. Teachers engaged in a kind of experience that drew on “the human spirit’s desire to know” (Friesen, 2009, p.4). Experiencing this feeling helped them better understand how they might bring this thirst for learning to their students. Design-thinking brought a mindset of optimism, where participants could recognize that they would face barriers, but began to see challenges as opportunities for design. DTS opened a space where teachers could believe there could be another way of being in the world as educators and as humans.

References

- Calgary Board of Education (2016a). *Making teaching and learning visible*. Retrieved from http://galileo.org/wp-content/uploads/2014/09/guiding_principles_assessment.pdf
- Calgary Board of Education (2016b). *Three-year education plan 2016-19*. Retrieved from <http://www.cbe.ab.ca/FormsManuals/Three-Year-Education-Plan.pdf>
- Cassim, F. (2013). Hands on, hearts on, minds on: design thinking within an educational context. *International Journal of Art & Design Education*, 32 (2), 190-202.

Bartlett, Quinn, Dalton, & Clark

Camacho, M. (2016). David Kelley: From design to design thinking at Sanford and IDEO. She Ji: *The Journal of Design, Economics, and Innovation* 2(1), 88-101.

<https://doi-org.ezproxy.lib.ucalgary.ca/10.1016/j.sheji.2016.01.009>

Dalton, J., & Kahute, T. (2016). Why empathy and customer closeness is crucial for design thinking. *Design Management Institute Review*, 27(2), 20-27. doi:10.1111/drev.12004.

d.school (2016). *A d.school design project guide*. Retrieved from <https://static1.squarespace.com/static/57c6b79629687fde090a0fdd/t/589ba9321b10e3beb925e044/1486596453538/DESIGN-PROJECT-GUIDE-SEPT-2016-V3.pdf>

d.school (n.d.). *Bootcamp bootleg*. Retrieved from <https://static1.squarespace.com/static/57c6b79629687fde090a0fdd/t/58890239db29d6cc6c3338f7/1485374014340/METHODCARDS-v3-slim.pdf>

Edutopia (n.d.). *Design thinking*. Retrieved from <https://www.edutopia.org/blogs/tag/design-thinking>

Friesen, S. (2009). *What did you do in school today? Teaching effectiveness: A framework and rubric*. Toronto: Canadian Education Association.

Gagnon, S., Vough, H.C. & Nickerson, R. (2012). Learning to lead, unscripted: Developing affiliative leadership through improvisational theatre. *Human Resource Development Review*, 11(3), 299-325. doi: 10.1177/1534484312440566.

Kelly, R. (2016). *Creative development: Transforming education through design thinking, innovation, and invention*. Calgary: Brush Education Inc.

Martin, R.L. (2009) *The design of business: Why design thinking is the next competitive advantage*. Boston: Harvard Business Press.

Bartlett, Quinn, Dalton, & Clark

MindShift (n.d.). *Design thinking*. Retrieved from

<https://www.kqed.org/mindshift/tag/design-thinking/>

Noweski, C., Scheer, A., Buttner, N., von Thienen, J., Erdmann, J., & Meinel, C. (2012). Toward a paradigm shift in educational practice: Developing twenty-first century skills with design thinking. In H. Plattner, C. Meinel, & L. Leifer (Eds), *Design thinking research: Making design thinking foundational* (pp. 71-94). Stanford, CA: Springer

Watson, A.D. (2015). Design thinking for life. *Art Education*, 68(3), 12-18.

APPENDIX A: ROADMAP OF DESIGN THE SHIFT

Design the Shift Roadmap

2016-2017

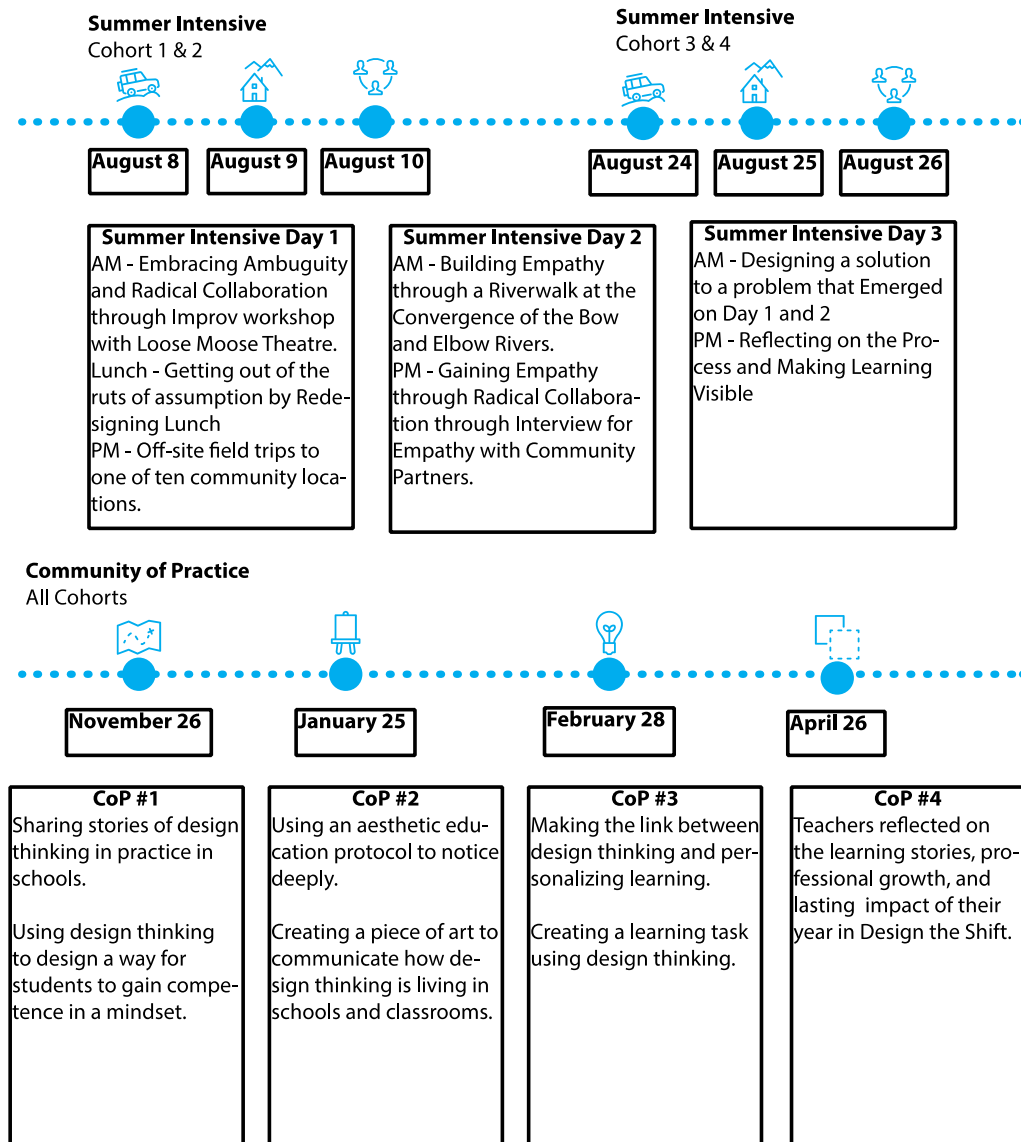


Figure 1: Design the shift roadmap 2016 - 2017

PLAGIARISM: MOVING FROM PUNITIVE TO PROACTIVE APPROACHES

Sarah Elaine Eaton, Melanie Guglielmin and Benedict Kojo Otoo

University of Calgary

Plagiarism continues to be an issue in postsecondary contexts. This paper discusses how educators can take a proactive stance to prevent plagiarism and cultivate students' sense of honour and academic integrity, rather than focusing on punitive consequences after plagiarism has already occurred. Strategies include assessment design, formative feedback, and academic integrity education. Recommendations for educators are included.

Keywords: higher education; plagiarism; academic integrity; academic misconduct; academic dishonesty

BACKGROUND AND CONTEXT

Despite decades of efforts to counter academic dishonesty in higher education, plagiarism remains a pressing issue (Altbach, 2015; Colella-Sandercock & Alahmadi, 2015; Leonard, Schwieder, Buhler, Beaubien Bennett, & Royster, 2015). The Internet provides more opportunities than ever for students to plagiarize, due to the ease of computer cut-and-paste features (Hodgkinson, Curtis, MacAlister, & Farrell, 2016; Ison, 2015). The Internet age has also led to complexities in defining precisely what counts as plagiarism. Traditional definitions refer to the theft of others' text or ideas (Eaton, 2017; Colella-Sandercock & Alahmadi, 2015).

Research shows that up to 85% of undergraduate students have cheated (Colella-Sandercock & Alahmadi, 2015; Dee & Jacob, 2012; Groark, Oblinger, & Choa, 2001; Hodgkinson et al., 2016).

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 28-36. Calgary, Canada: Werklund School of Education, University of Calgary.

The reasons students cheat are complex and numerous. They include both individual and contextual factors (McCabe, Trevino, & Butterfield, 2001). Individual reasons include low performance, time management, and laziness (McCabe et al., 2001). Contextual reasons for plagiarism include peer pressure; the perception that the consequences will be minimal; and the perception that instructors do not care, will not notice, or will not report it (Ellery, 2008; Groark et al., 2001; Hodgkinson et al., 2016; McCabe et al., 2001).

For the past few decades, a shift has been happening among scholars, policy makers, and classroom educators to focus on proactive approaches to prevent plagiarism, as opposed to developing harsher penalties for those who commit it (McCabe et al., 2001).

This paper draws from a study being conducted at a school of education in a Canadian postsecondary institution. At the time of writing, the study is in the data collection phase, and results have not yet emerged. This paper is based on the literature review that informed the study, with a specific focus on proactive approaches to plagiarism that can be used instead of more traditional punitive practices. The first author of this paper is an academic staff member, which will become relevant when she discusses practices she has incorporated into her teaching practice in higher education. The second and third authors are student research assistants.

It is noteworthy that plagiarism exists at various levels of education and professional practice (i.e., K-12, higher education, and the professoriate), and each has its own robust body of literature. Our study is deeply and narrowly focused on the context of higher education and, to be more precise, how educators in post-secondary contexts understand and address plagiarism in their teaching practice.

A number of approaches have been proposed in the literature to address plagiarism proactively, including the development of proactive institutional policies and honour codes. The literature also

suggests that educators can take a proactive approach in their professional practice to help students develop a sense of academic integrity, which has been shown to lower incidences of plagiarism (McCabe et al., 2001). One innovative practice is to develop a learning culture that focuses on academic integrity, rather than punishing cheating after it has been discovered (Chew, Ding, & Rowell, 2013; Groark et al., 2001). This paper examines how *educators* (as opposed to policy makers, for example) can cultivate productive approaches to preventing plagiarism using three proactive strategies. These include assessment design, formative feedback, and academic integrity education.

ASSESSMENT DESIGN

Modifications to assessment design can play a role in preventing plagiarism. A shift from high-stakes summative assessment to lower-stakes formative assessment practices is suggested to decrease incidents of plagiarism (Macdonald & Carroll, 2006). Offering feedback specifically focused on building research helps to cut down on citation errors, improve paraphrasing, and reduce overreliance on a single source (Davis & Carroll, 2009; Ellery, 2008; Volkov, Volkov, & Tedford, 2011). Designing assessment so that a significant portion of the grade depends on thoroughly documenting the research process has also been shown to assist in reducing instances of plagiarism (Walden & Peacock, 2006). Awareness of varied assessment strategies as part of a holistic approach to teaching and learning can assist in increasing student understanding and preventing incidents of plagiarism.

The first author has endeavoured to design assessments that include a reflective component, requiring students to reflect and comment upon their learning process, as well as the outcome of their work. She has observed that when students are asked to reflect on their learning they demonstrate deeper awareness of their learning as a *process*, with an increased sense of

accomplishment and pride in their learning *products* (e.g. final papers) (Hodgkinson, Curtis, MacAlister & Farrell, 2016).

FORMATIVE FEEDBACK

Formative assessment (Black & Wiliam, 2009) is one strategy to promote academic integrity, particularly when students arrive at university without significant previous writing experience (Pecorari, 2015). Formative feedback can take the form of in-class writing exercises, peer-to-peer feedback, or instructor review of draft work. As with other approaches to formative feedback, the focus is on helping students learn and improve their work. Formative assessment focuses on the process of learning, rather than identifying deficiencies in completed work (Morrisette, 2011). Ideally, formative feedback provides students with opportunities to build their competencies overall, rather than merely perform better on one particular task or assignment. The first author incorporates formative feedback into coursework through peer review, in-class writing time, and written feedback of students' work in progress.

ACADEMIC INTEGRITY EDUCATION

Instructors may assume that plagiarism is intentional, but it can also occur because students simply do not know what the protocols are or what is expected of them (Park, 2003). Institutions have begun to implement academic integrity education programs that include tutorials, websites, and workshops to help students understand what plagiarism is and how to avoid it (Dee & Jacob, 2012; Hodgkinson et al., 2016; Stagg, Kimmins, & Pavlovski, 2013). These institutional approaches to academic integrity education also aim to eliminate the possibility of students claiming ignorance as their reason for plagiarizing.

Individual instructors can also play a role in academic integrity education by engaging students in conversations about how to cite and reference their work according to discipline-specific standards

(e.g., APA, MLA, etc.) and coaching students through the process as they build their citing and referencing skills. The first author engages in open and candid conversations about how to cite and reference work using APA standards, why it is important, and how excellence in referencing showcases a post-secondary student's developing mastery of this key skill. In addition, she has students develop work plans for large projects that include a time-management component. These plans are designed to engage students more fully in the process of learning throughout the learning task.

RECOMMENDATIONS

Individual educators can create opportunities for students to develop confidence in their writing and create a personal ethic of integrity in their academic work. There are numerous strategies instructors can use to take a proactive approach to plagiarism. This paper outlines four strategies supported by the literature.

Initiate and facilitate candid conversations about plagiarism

Instead of merely pointing out mandatory clauses in course outlines and referring students to an institutional website, instructors can take the lead in starting conversations to help students understand what plagiarism is and how to avoid it (Colella-Sandercock & Alahmadi, 2015; Leonard et al., 2015).

Teach students skills to build their competence with citing and referencing

Instructors can explicitly teach how to reference sources properly, offering explicit instruction about not only the technical details of *how* to reference, but also *why* referencing is important. Teaching students to think about the authors of the sources they cite as human beings who deserve acknowledgement for the work they have created facilitates a deeper understanding of why

referencing is an important element of academic work (Colella-Sandercock & Alahmadi, 2015; Leonard et al., 2015).

Create opportunities for formative feedback as part of the learning process

Whether formative feedback is offered as an in-class activity or provided on draft writing, students benefit from assessment of their work without worrying about their grade. Instructors can incorporate formative feedback into their course design and lesson plans to create opportunities for students to focus on the process of learning and development of their skills. Black and Wiliam (2009) suggested five concrete formative assessment activities: (a) sharing success criteria with learners, (b) classroom questioning, (c) comment-only marking, (e) peer and self-assessment, and (f) formative use of summative tests (p. 6). Intentionally creating opportunities for formative assessment can help students focus on learning as a process rather than merely a product.

Design assessments to include both formative and summative feedback

Instructors can design assessments to include “formative interactions” (Black & William, 2009, p. 6). These include peer and instructor review of drafts, as well as oral feedback and consultations. The first author of this paper has adapted the rubrics she uses for coursework to include the submission of drafts and consideration of peer and instructor feedback in order to emphasize their importance.

CONCLUSIONS

Plagiarism is a complex issue with no single solution. A combination of institutional and instructional strategies can serve to help students understand why it is important to develop a personal sense of honour in their work, what academic integrity means, and, perhaps most importantly, how to develop it.

References

- Altbach, P. G. (2015). Academic corruption: The continuing challenge. *International Higher Education*, 38, 5-6. Retrieved from <http://ejournals.bc.edu/ojs/index.php/ihe>
- Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21(1), 5-31. doi:10.1007/s11092-008-9068-5.
- Chew, E., Ding, S. L., & Rowell, G. (2013). Changing attitudes in learning and assessment: cast-off 'plagiarism detection' and cast-on self-service assessment for learning. *Innovations in Education and Teaching International*, 52(5), 454-463. doi:10.1080/14703297.2013.832633.
- Colella-Sandercock, J. A., & Alahmadi, H. W. (2015). Plagiarism education: Strategies for instructors. *International Journal of Learning, Teaching and Educational Research*, 13(1), 76-84. Retrieved from <https://www.ijlter.org/index.php/ijlter/index>
- Davis, M., & Carroll, J. (2009). Formative feedback within plagiarism education: Is there a role for text-matching software? *International Journal for Educational Integrity*, 5(2), 58-70. doi:10.21913/IJEI.v5i2.614.
- Dee, T. S., & Jacob, B. A. (2012). Rational ignorance in education: A field experiment in student plagiarism. *Journal of Human Resources*, 47(2), 397-434. doi:10.1353/jhr.2012.0012.
- Eaton, S. E. (2017). Comparative analysis of institutional policy definitions of plagiarism: A pan-Canadian university study. *Interchange: A Quarterly Review of Education*, 1-11. doi:10.1007/s10780-017-9300-7.
- Ellery, K. (2008). Undergraduate plagiarism: A pedagogical perspective. *Assessment & Evaluation in Higher Education*, 33(5), 507-516. Retrieved from <http://www.tandfonline.com/loi/caeh20>

- Groark, M., Oblinger, D. G., & Choa, M. (2001). Term paper mills, anti-plagiarism tools, and academic integrity. *Educause Review*, 40-48. Retrieved from <http://er.educause.edu/>
- Hodgkinson, T., Curtis, H., MacAlister, D., & Farrell, G. (2016). Student academic dishonesty: The potential for situational prevention. *Journal of Criminal Justice Education*, 27(1), 1-18. doi:10.1080/10511253.2015.1064982.
- Ison, D. C. (2015). The influence of the Internet on plagiarism among doctoral dissertations: An empirical study. *Journal of Academic Ethics*, 13(2), 151-166. doi:10.1007/s10805-015-9233-7
- Leonard, M., Schwieder, D., Buhler, A., Beaubien Bennett, D., & Royster, M. (2015). Perceptions of plagiarism by STEM graduate students: A case study. *Science and Engineering Ethics*, 21(6), 1587-1608. doi:10.1007/s11948-014-9604-2.
- Macdonald, R., & Carroll, J. (2006). Plagiarism—a complex issue requiring a holistic institutional approach. *Assessment & Evaluation in Higher Education*, 31(2), 233-245. doi:10.1080/02602930500262536.
- McCabe, D. L., Trevino, L. K., & Butterfield, K. D. (2001). Cheating in academic institutions: A decade of research. *Ethics & Behavior*, 11(3), 219-232. doi:10.1207/S15327019EB1103_2.
- Morrisette, J. (2011). Formative assessment: Revisiting the territory from the point of view of teachers. *McGill Journal of Education*, 46(2), 247-265. Retrieved from <http://mje.mcgill.ca/index>
- Park, C. (2003). In other (people's) words: Plagiarism by university students - literature and lessons. *Assessment and Evaluation in Higher Education*, 28(5), 471-488. doi:10.1080/0260293032000120352.

- Pecorari, D. (2015). Plagiarism in second language writing: Is it time to close the case? *Journal of Second Language Writing*, 30, 94-99. doi: 10.1016/j.jslw.2015.08.003.
- Stagg, A., Kimmins, L., & Pavlovski, N. (2013). Academic style with substance: A collaborative screencasting project to support referencing skills. *The Electronic Library*, 31(4), 452-464. doi:10.1108/EL-01-2012-0005.
- Volkov, A., Volkov, M., & Tedford, P. (2011). Plagiarism: proactive prevention instead of reactive punishment. *e-Journal of Business Education and Scholarship Teaching*, 5(2), 22-35. Retrieved from <http://www.ejbest.org>
- Walden, K., & Peacock, A. (2006). The i-Map: A process-centered response to plagiarism. *Assessment & Evaluation in Higher Education*, 31(2), 201-214. doi:10.1080/02602930500262510

STRATEGIES FOR SUCCESSFUL GROUP WORK

Barb Brown and Christy Thomas

University of Calgary

Working collaboratively is a necessary competency for students engaging in complex interdisciplinary learning. However, students struggle when there are issues with the quality or timeliness of peer contributions and when negotiating ideas with others in a group. Instructors can use participatory technologies and formative assessment strategies to support collaborative work and set conditions to promote positive social networks. In this paper, three scenarios from instructors' reflective journals are used to discuss challenges in designing an interdisciplinary group project for undergraduate students. Reflecting on the challenges and strategies employed by the instructors can be used to inform subsequent iterations of collaborative activities.

Keywords: collaboration; group work; teaming; assessment; social networks

BACKGROUND

Undergraduate students can benefit from learning to work collaboratively while doing group work. There is extensive research concerning the use of group work in undergraduate programs in education as a way to help novice teachers learn how to work collaboratively (Barkley, Major, & Cross, 2014). In this study, the undergraduate students are pre-service teachers learning to work collaboratively with colleagues and foster collaboration with their own groups of students in classrooms. Group work provides a platform for student teachers to learn how to work

interdependently while developing a shared responsibility for improving their instructional practices (Battersby & Verdi, 2015) and strengthening collegiality (Guskey, 2003).

Moreover, teachers develop interpersonal interdependence when they work collaboratively. This is explained by Social Network Theory which highlights the positive and negative effects of these interactions (Moolenaar, Sleegers, & Daly, 2012). A positive aspect of these interdependent relationships is the contribution to a culture of learning (Friesen, 2009). When social networks are positive (Thoonen, Sleegers, Oort, & Peetsma, 2012), collaboration gives teachers the opportunity to test their ideas and dialogue with experts and their colleagues (Penuel, Sun, Frank, & Gallagher, 2012). Such collaboration generates a synergy and creates momentum for teachers improving their instructional practices (Coburn, Russell, Kaufman, & Stein, 2012). However, if social networks are negative this can result in inaction and inefficiencies (Field, 2003) that may hinder collaboration. Instructors can support student teachers working collaboratively by intentionally designing supports for group work and fostering positive social networks in their undergraduate classes.

Through careful design, instructors can make group work more effective (Darling-Hammond, et al., 2008) and work towards overcoming the challenges of group work. Learning designs that involve group work should consider the type of assessment that will support students both individually and as a group. Formative assessment strategies offer potential for instructors to scaffold group work appropriately (William, 2011) and provide students with ongoing feedback that allows them to improve their work (Darling-Hammond et al., 2008). In turn, students can monitor their own progress and their group's progress alongside instructor and peer feedback (Bransford, Brown, & Cocking, 2000), and identify areas for improvement (Dijkstra, Latijnhouwers, Norbart, & Tio, 2016). However, challenges of classroom group work persist, such as student free-loading

and the use of peer assessment to determine individual contributions in group work (Dijkstra et al., 2016).

OVERVIEW

The following sections of this paper will draw upon the authors' experiences assigning group work in a pre-service education course. A discussion of the context will be provided, followed by the methodology, and three scenarios to illustrate the challenges of group work. Finally, current strategies for group work utilized during the course will be shared. These strategies can be used to inform subsequent course iterations and other instructors interested in designing group work.

CONTEXT

The presenters are part of a team of instructors that supported more than 400 aspiring teachers to collaboratively design over 80 interdisciplinary projects (35 elementary, 27 junior high and 23 high school units of study). The undergraduate students worked in groups ranging in size from three members to six members. The learning opportunities were designed to engage students in understanding how to design interdisciplinary units of study in collaboration with others. Instructors were able to promote positive social networks by offering frequent opportunities for students to interact with peers, to ask the instructor questions (Penuel, et al., 2012), and to draw on other experts in the field (i.e. invited guests) during class time. Instructors provided in-class opportunities for students to interact with others and to encourage dialogue with their peers (Coburn, et al., 2012) as part of the collaborative process.

METHODOLOGY

Using a collaborative action-research approach and dialogic exchange (Hendricks, 2016; McNiff, 2016), we reflected on our experiences during the first iteration in designing and enacting interdisciplinary group work with the intention to improve our own teaching practice to inform subsequent design iterations. In our reflective journals and artifacts gathered as we taught the same course to different cohorts of students, we recognized that even though we co-developed detailed assessment rubrics and met bi-weekly during the term to discuss assessment, there were many variations with instructional and formative assessment approaches (Wiliam, 2011). In our dialogic exchange, we also noted, some student groupings were not as effective as others. Discussing team dysfunctions provided us with an opportunity to reflect on our assessment practices and clarify ideas about how individuals can work interdependently and demonstrate learning in group work situations for future course iterations.

SCENARIOS

To illustrate some of the challenges encountered by the instructors, three detailed scenarios from instructors' reflective journals are provided.

Scenario A: Group members who fail to meet expectations and contribute

Instructors were challenged when observing one or more group members failing to meet expectations. Students established group norms and set expectations together including communication, meeting times, and platforms (i.e. *Google Docs*) for collaborating. In some cases, groups reported to the instructor that one of their group members failed to follow through on the set goals and did not make any contributions (i.e. free-loading).

Scenario B: Group members do not provide timely contributions

Another challenge encountered by instructors was when a group member did not provide timely contributions. For example, a group had been working well together at the beginning of the course, but at the mid-way point a group member had missed several classes and the group members became concerned about the timeliness of their peer's contribution. When the student returned to class, the work was complete. However, the instructor noted this untimely contribution generated a temporary level of stress among the group members.

Scenario C: Difficulties in negotiating ideas

Negotiating ideas can be challenging for group members. For example, one group agreed on an idea and started to develop their interdisciplinary unit based on the grade level and topic selected. During the next class, one of the group members suggested a significant change involving a redirection to a different topic and grade level. The instructor observed the tension in the group as this new idea was presented. Group members may be reluctant to voice their opinions or cause any group friction through idea negotiation.

CURRENT STRATEGIES FOR GROUP WORK

The three scenarios provided in the previous section were part of the dialogic exchange where various strategies were shared and then utilized to address the concerns regarding group work. The following section presents some of the literature-informed strategies used by the instructors to mitigate group work challenges.

Use of Participatory Technology

One strategy used by instructors was to have students identify their individual contributions to their group work using an online shared document (i.e. google document) by highlighting or labelling them. This use of participatory technologies helped instructors to identify each group member's contribution. Researchers recommend considering the use of participatory technology as a strategy when designing learning involving collaboration (Clarke & Blissenden, 2013). The use of online shared documents by the instructors in this course is one example of a participatory technology that can be implemented to help provide individual accountabilities for contributions in group work.

Self-Assessment

Another strategy used by instructors involved having the students complete a self-assessment to identify their individual contributions and to encourage accountability. Along with their assignments, each group member was asked to submit a self-assessment of their group work using the assignment rubric. Students provided a rationale and evidence for their assessment with their identified achievement level. This formative strategy helped instructors to identify the individual contributions and it also helped students reflect upon their own contributions. By having to provide a rationale, the students recognized how they could improve upon their work before submitting the final assignment. This evidence was useful to instructors in formatively assessing the individual contributions. Giving students a way to improve their work through self-assessment, also contributes to student agency (Darling-Hammond et al., 2008). Dijkstra et al. (2016) discussed the use of formative assessment as a way to focus on developing collaboration skills as students identify their strengths and weaknesses and compare this with their peers. Self-assessment holds potential for strengthening students' collaboration skills.

Peer Assessment

Another strategy used by instructors in this course was peer feedback. When students were working on group assignments, they had the opportunity to engage in formative peer feedback loops. These loops consisted of different peer groups assessing each other's work using the rubric for the assignment. Instructors set aside time in class for groups to assess each other and then have dialogue about the rationale used for the level achieved in the rubric. This activity and conversation gave students ideas for how to improve the quality of their work as areas of strengths and weaknesses were identified. Group members also used the peer feedback to see what individual contributions to the work had been done, a strategy recognized by Dijkstra et al. (2016). Peer feedback, as a formative approach, helped inform students in their group work and instructors in their instructional design decisions for upcoming classes. Friesen (2009) suggested effective teaching involves assessment practices that help students improve their work and guide instructional decisions. This allows students to make gains in their learning and know where to go next as a result of formative strategies such as peer feedback (Wiliam, 2011). Peer assessment, as a strategy then, can be used to provide such opportunities and was used in this course to support collaborative group work.

Access to Instructor Expertise

The final strategy for discussion entailed how instructors from this course provided class time for group work on assignments that give students access to immediate instructor expertise. Instructors made themselves available by circulating the room and attempting to meet with each group during class work periods. Thus, students had access to the instructor and could ask questions, gain clarity on expectations, and receive immediate feedback on their work. The instructor would bring clarity and point out areas for improvement and students could then decide what learning targets to work on next. Also, the instructors used these conversations to inform their next steps in instructional

design. By working together, each instructor and his or her students developed interpersonal relationships supporting a classroom culture of learning (Friesen, 2009). Designing opportunities for students to individually reflect on learning, and dialogue with experts (i.e. the instructor, invited external experts) and their peers about the learning, contributes to a collaborative and positive social network (Penuel et al., 2012).

CONCLUSION

The presented scenarios and the strategies instructors used to face the challenges of group work, show the need to further examine assessment practices related to group work. Studies have been conducted on assessing the individual aspect of group work (Clarke & Blissenden, 2013; Dijkstra et al., 2016), but further study is needed to explore other faculty contexts involving preservice teachers and the associated assessment practices being utilized. We noted the use of participatory technologies to foster collaboration and gather evidence of student learning. Further study is needed to determine to what extent participatory technologies can support student collaboration and support instructors with assessment (formative and summative). Our next steps involve using a design-based research approach (McKenney & Reeves, 2012) to redesign instructional approaches and assessment strategies to support students and instructors when working collaboratively in groups and developing social networks.

References

- Barkley, E. F., Major, C. H., & Cross, K.P. (2014). *Collaborative learning techniques. A handbook for college faculty* (2). San Francisco, CA: Jossey-Bass.
- Battersby, S. L., & Verdi, B. (2015). The culture of professional learning communities and connections to improve teacher efficacy and support student learning. *Arts Education Policy Review*, 116(1), 22-29. doi: 10.1080/10632913.2015.970096.

- Bransford, J., Brown, A., & Cocking, R. (eds) (2000). *How people learn: Brain, mind, experience and school*. Washinton, DC: National Academies Press. Retrieved from http://www.nap.edu/catalog.php?record_id=9853 .
- Clark, S., & Blissenden, M. (2013). Assessing student group work: Is there a right way to do it? *The Law Teacher* (43)3, 368-381. doi: 1080/03069400.2013.851340.
- Coburn, C. E., Russell, J. L., Kaufman, J. H., & Stein, M. K. (2012). Supporting sustainability: Teachers' advice networks and ambitious instructional reform. *American Journal of Education*, 119(1), 137-182. doi: 10.1086/667699.
- Darling-Hammond, L., Barron, B., Pearson, P., Schoenfeld, A., Stage, E., Zimmerman, T., Cervetti, F., & Tilson, J. (2008). *Powerful learning: What we know about teaching for understanding*. San Francisco: Jossey-Bass.
- Dijkstra, J., Latijnhouwers, M., Nobart, A., & Tio, R. (2016). Assessing the “T” in group work assessment: State of the art and recommendations for practice. *Medical Teacher*, (38)7, 675-682. doi: 10.3109/0142159X.2016.1170796.
- Field, J. (2003). *Social Capital*. Florence, KY, USA: Routledge. Retrieved from <http://www.ebrary.com>.
- Friesen, S. (2009). *What did you do in school today? Teaching effectiveness: A framework and rubric*. Toronto: Canadian Education Association. Retrieved from <http://www.cea-ace.ca/publication/what-did-you-do-school-today-teaching-effectiveness-framework-and-rubric> .

- Guskey, T. R. (2003, April). The characteristics of effective professional development: A synthesis of lists. Paper presented at the annual meeting of the American Education Research Association, Chicago, IL.
- Hendricks, C. (2016). *Improving schools through action research: A reflective practice approach (4th Ed.)*. Upper Saddle River, NJ: Pearson Education.
- McKenny, S. & Reeves, T. (2012). *Conducting educational design research*. New York, NY: Routledge.
- McNiff, J. (2016). *You and your action research project (4th Ed.)*. London: Routledge.
- Moolenaar, N., Slegers, P., & Daly, A. (2012). Teaming up: Linking collaboration networks, collective efficacy, and student achievement. *Teaching and Teacher Education*, 28(2), 251-262. doi: 10.1016/j.tate.2011.10.001.
- Penuel, W.R., Sun, M., Frank, K.A., & Gallagher, H.A. (2012). Using social network analysis to study how collegial interactions can augment teacher learning from external professional development. *American Journal of Education*, 119(1), 103-136. doi: 10.1086/667756.
- Thoonen, E., Slegers, P., Oort, F., & Peetsma, T. (2012). Building school-wide capacity for improvement: The role of leadership, school organizational conditions, and teacher factors. *School Effectiveness and School Improvement*, 23(4), 441-460. doi: 10.1080/09243453.2012.678867.
- Wiliam, D. (2011). *Embedded formative assessment*. Bloomington, IN: Solution Tree Press.

A DISCUSSION OF STUDENT ENGAGEMENT INDICATORS AND STRATEGIES IN HIGHER EDUCATION

Nahum Arguera and Patti Dyjur

University of Calgary

Student engagement is critical in higher education because of the relationship to student satisfaction and achievement. Therefore, faculties could benefit from examining a variety of real examples of how to improve student engagement. This paper illustrates how a Canadian higher education institution collaborated to provide examples of fostering student engagement at the course, faculty, and institutional levels. Through knowledge sharing across disciplines, a Student Engagement Initiatives Map was created. Three initiatives are highlighted that show a particular emphasis on increasing collaboration among students, and recommendations are provided for other institutions.

Keywords: Student engagement; National Survey of Student Engagement; high-impact practices; collaboration; higher education

INTRODUCTION

Even though student engagement is widely seen as beneficial to student learning, there is a lack of communication about strategies that faculties and institutions use to enhance engagement. In this paper, we will provide examples of how the National Survey of Student Engagement (NSSE) has been used at a Canadian post-secondary institution to address the thematic indicators of Academic Challenge, Learning with Peers, Experiences with Faculty, and Campus Environment. Specifically, after presenting a student engagement model that highlights some of the initiatives designed to

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 47-56. Calgary, Canada: Werklund School of Education, University of Calgary.

enhance student engagement at various levels, we will showcase three specific initiatives that incorporate collaboration with peers, instructors, and the community. Such initiatives provide examples of how groups are leading educational change in innovative ways, inspiring others to consider novel possibilities that enhance the student learning experience.

LITERATURE REVIEW

Student engagement can be defined as the time or effort students in post-secondary education place on their studies and activities and how institutions use resources to encourage students to participate in activities that enhance engagement (Kuh, 2009). Recently there has been a focus on student engagement among post-secondary settings and activities, particularly because student engagement is associated positively with satisfaction, persistence, achievement, and intrinsic motivation towards learning (Webber, Bauer, & Zhang, 2013). Due to these results, many institutions across Canada and the United States have used the NSSE to inform and identify priorities for action that will improve student engagement, including improving writing across disciplines, enhancing first-year experiences, encouraging student-faculty interactions, and improving student advising (National Survey of Student Engagement, 2012).

The NSSE is a survey tool used to collect information on student experiences from four-year colleges and universities. Survey questions ask students about their educational experiences and participation in educational activities that are linked to aspects of student engagement (National Survey of Student Engagement, 2012). The NSSE sorts survey questions into themes known as engagement indicators. These themes are: (1) Academic Challenge which includes, indicators of higher-order learning, reflective and integrative learning, learning strategies, and quantitative reasoning; (2) Learning with Peers which includes, indicators of collaborative learning and discussions with diverse others; (3) Experiences with Faculty which includes, indicators of student-

faculty interactions and effective teaching practices; and (4) Campus Environment which includes, indicators of quality of interactions and supportive environments (NSSE, 2017). Different institutions have used the results from the NSSE in different ways. For example, NSSE results have been used to inform accreditation processes, benchmarking, retention studies, institutional research, and faculty and staff development across institutions in North America (National Survey of Student Engagement, 2012).

The following is a case study of a post-secondary institute that has used the NSSE to develop a culture of collaboration across their institute in the usage of NSSE and in creating meaningful collaborative interactions between faculty and students. Viterbo University, Wisconsin, developed benchmarks to report to several administrative groups across the campus. They focused on items related to active learning and situated faculty and staff as key contributors in creating these environments. Through this work, they created many diverse initiatives that include intercultural study and exchange experiences. The NSSE data at this institute has also been used to inform different pedagogies, and has been incorporated in accreditation processes (National Survey of Student Engagement, 2009).

CONTEXT OF STUDENT ENGAGEMENT INITIATIVES

A NSSE Strategy Task Force was created at the University of Calgary in order to manage NSSE processes, including developing communication strategies, promoting participation, and the dissemination and sharing of results. Based on recommendations from the task force a NSSE sub-committee was formed to support faculties in analyzing, discussing and moving forward with data from the 2014 cycle of the NSSE. Faculties and departments were provided with comprehensive reports, including both quantitative and qualitative data. The purpose of these reports was to enable them to further analyze student engagement related to each of the indicators, and to help faculties

compare their data to others within the institution and across the U15 Group of Canadian Research Universities.

At the University of Calgary, NSSE results are also analysed as part of the curriculum review process. Each program undergoing review receives a more detailed report with student responses broken down by engagement indicator, including statistics for each question. In addition to the summary snapshot, the detailed report offers in-depth information that can inform discussions about what is working well within the program, and areas in which they could strive to improve. It is left to each group to decide on how to improve the program, based on the NSSE results and supported by other sources of information such as curriculum mapping and instructor-provided data.

At the institutional level, NSSE retreats were held three times per year in order for faculty leaders to share student engagement initiatives they were implementing in their own units, get ideas from one another, and talk about next steps to enhance student engagement. These retreats served as a community of practice in which attendees motivated and learned from one another. NSSE results were used as a foundation for discussion, but it became evident that the conversations evolved beyond the data to address other critical, but interrelated questions such as:

- What is the vision of our program?
- What are the most impactful changes or initiatives that we could accomplish over the next year?
- How can we involve students in the planning?

Over time, the retreats fostered collaboration and discussion about enhancing student engagement and allowed us to identify many initiatives in all engagement themes and at the course, faculty, and

institutional levels. This helps to address the issue of a lack of examples that groups are using in a real context. The Student Engagement Initiatives Map found in the next section outlines this work.

Student Engagement Initiatives Map

Figure 1 shows an excerpt of the Student Engagement Initiatives Map (for the comprehensive map, please go to: <http://seactionmap.ucalgaryblogs.ca/>), which lists student engagement initiatives at the University of Calgary at the course, faculty, and institutional level, categorized by themes. Discussion and collaboration were central to the creation of the map, as different faculties and groups provided their own strategies to address student engagement. The map serves multiple purposes. Most importantly, it provides real examples of strategic, impactful programs and initiatives that can be inspirational for others who aim to increase student engagement. Additionally, it provides some measure of accountability to students and the public, and showcases the vital work that many people are doing to enhance the student learning experience.

Institutional Level	Academic Turnaround Program Co-curricular Record First Year Scholars Success seminars Undergraduate writing workshops	Emerging Leaders Program Global Friendship Program PASS Program Peer Helper Program Sophomore Leadership Program	Early and Formative Assessment Supports Open Classroom Week	
	Curriculum Review Honors Programs Program-level Learning Outcomes Teaching Across Borders Werklund YLC Service-Learning and Service Leadership Program	Communities of Practice Faculty mentorship programs (KSS Mentorship Program, Science Mentorship Program) Science Ambassadors Werklund YLC Service Leadership Program	PURE Awards Scholars Academy Technology Integration Coaches Program Faculty Mentoring Program (Vet Med) Faculty-specific teaching development	Aboriginal Relations Leadership Training Program Career Fairs Leadership Advising Program THRIVE/ Early Alert UCalgaryStrong Initiative
	Capstone courses Co-op and internship programs Diversity/ Global Learning (MGST 559.26) Research projects Service learning	Debates Group projects/ collaborative assignments In-class and online discussions Peer review Seminar courses	Honors Program Speaker Series & Symposia Vet-U-Can Course coordinators Undergraduate research projects	Faculty NSSE Action Groups Haskayne Huddle App Kindustry KSS Meet & Greet Days Science Ambassadors
Academic Challenge Learning with Peers Experiences with Faculty Campus Environment				

Figure 1: Student engagement initiatives map. Retrieved from

<http://seactionmap.ucalgaryblogs.ca/>

Examples of Student Engagement Initiatives

In this section, we describe three initiatives at the course, faculty, and institutional levels across various student engagement themes. These initiatives provide insight on how NSSE has been a springboard to increase collaboration on campus in diverse ways.

Learning with peers: STEM Education Course

The STEM Education course provides an introduction to science, technology, engineering and math education. It offers students the opportunity to incorporate STEM concepts and principles into lesson and unit planning. The course is organized around collaborative work in which groups engage in a STEM topic of their choice. Collaboration enhances project results, which tend to be stronger than individual assignments. Teams present their end product in a conference-style event. The goal is to develop and present a project on how they would design and teach a STEM topic in a K-12 classroom. Students gain ideas from one other, benefitting from multiple perspectives and approaches to teaching. As part of the project they evaluate their own teamwork and collaboration, in addition to providing peer feedback (Francis, 2015).

Campus environment: Haskayne huddle app

The Haskayne Huddle App in the School of Business is a tool created by the faculty's Students' Association to connect students to one another, track important dates, provide information about what is happening in the faculty, and foster a sense of belonging and engagement through a house system. Students get points for their particular house by participating in competitions, conferences, and faculty-run activities. At the end of the year the winning house receives a coveted house cup. Most importantly though, the app fosters a sense of school spirit and engagement in a large institution (Haskayne Students' Association of Haskayne School of Business, 2016).

Experiences with faculty: Scholars Academy

The Scholars Academy is an institutional initiative that enhances the academic and professional development of undergraduate students. Multi-disciplinary in approach, students form a community of peers with similar interests, inspiring success in each other. Coordinators, including community members and university personnel, provide one-on-one guidance with scholarship and

program applications. Participation is recognized through a co-curricular record. Scholars are paired with a mentor in order to increase their network, get advice on academic pursuits, and develop career goals. To conclude the program, there is a cohort-based project in which students collaborate with a charity such as Kids Cancer Care Foundation, Calgary Reads, or University of Calgary's Office of Sustainability to foster connections to community, providing support with strategic planning, evaluation, and research, while gaining valuable real-life experiences (University of Calgary, 2017).

RECOMMENDATIONS

During the process of creating the Student Engagement Initiatives Map, we have generated the following recommendations:

- 1) Working groups in teaching and learning can benefit from discussion and collaboration when developing innovative ideas to enhance student engagement. Ideas do not have to be from the same discipline in order to be helpful. In fact, examples from other fields can provide a new perspective that had not been previously considered.
- 2) Many initiatives can be incorporated at the course level. For example, high-impact practices have great potential to engage students in their learning.
- 3) Some initiatives are small and easy to implement; they do not necessarily need a huge time or dollar investment. Yet, they can have a positive impact on student engagement.
- 4) Student groups can be strong partners and collaborators as they have great ideas that can provide a different perspective on student engagement.
- 5) Discussions are an important way to discover what initiatives are already in place to enhance student engagement. Many things were being done across campus, but prior to the

map, they were not widely known. Using the resulting map has been an opportunity to showcase the amazing work done by many people across campus who are dedicated to student learning.

SUMMARY

In this paper, we discussed a Canadian university's approach to leveraging NSSE results with the goal of increasing student engagement through collaboration and sharing of ideas. A significant artifact that resulted from all-faculty discussions was the Student Engagement Initiatives Map, which lists many of the valuable programs and strategies being used to enhance student engagement on campus. Three initiatives were profiled to demonstrate the range of possibilities for this important work. We also provided recommendations for other institutions that seek to enhance the student learning experience.

References

- Francis, K. (2015). EDUC 427.03: STEM Education-Secondary [course outline]. Retrieved from <http://seactionmap.ucalgaryblogs.ca/high-impact-practices/collaborative-assignments-and-projects/>.
- Haskayne Students' Association of Haskayne School of Business. (2016). Haskayne Huddle. Retrieved from <https://www.hsaucalgary.com/huddle-app-info>.
- Kuh, G. D. (2009). What student affairs professionals need to know about student engagement. *Journal of College Student Development*, 50(6), 683-706. doi: 10.1353/csd.0.0099.
- NSSE. (2017). *Engagement Indicators*. Retrieved from http://nsse.indiana.edu/html/engagement_indicators.cfm.

National Survey of Student Engagement. (2012). *Moving from Data to Action: Lessons from the Field—Volume 2*. Bloomington, IN: Indiana University Center for Postsecondary Research.

National Survey of Student Engagement. (2009). *Using NSSE Data to Improve Undergraduate Education. Lessons from the Field. Volume 1*. Bloomington, IN: Indiana University Center for Postsecondary Research.

University of Calgary. (2017). *Scholars Academy*. Retrieved from <http://www.ucalgary.ca/sap/>

Webber, K. L., Krylow, R. B., & Zhang, Q. (2013). Does involvement really matter? Indicators of college student success and satisfaction. *Journal of College Student Development*, 54(6), 591-611. doi: 10.1353/csd.2013.0090

MAKING EVIDENCE INFORMED DECISIONS ABOUT FORMATIVE WRITTEN FEEDBACK

Lorelei Anselmo and Sarah Elaine Eaton

University of Calgary

This paper presents preliminary findings from qualitative research with international post-secondary English language learners (ELLs) studying in Canada. Initial results indicate that formative written feedback that invites the learner to reflect and act can help improve academic writing skills. Three key characteristics of reflective and actionable feedback are that it must be clear, goal-oriented, and reflective of the learners' preferences. These findings are then discussed within a classroom context.

Keywords: academic writing; learner-directed feedback; higher education; reflective learning

FORMATIVE WRITTEN FEEDBACK

Rae and Cochrane (2008) noted that, if assessment is to be effective in guiding learning, it should focus on “growth rather than on grading” (p. 217). One way to assess improvement in academic writing is to provide formative feedback that specifically focuses on progression and development. When formative written feedback requires reflection and action by the higher education learner it takes on added significance. Reflective and actionable formative written feedback can not only demonstrate that learning has taken place, but also that the learners themselves have used this feedback to improve their academic writing skills and become self-directed (Nicol & Macfarlane-Dick, 2006). A self-directed or learner-directed student actively participates in and contributes to

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 57-65. Calgary, Canada: Werklund School of Education, University of Calgary.

their own learning ultimately leading to academic success (Benson, 2012). However, as Nicol and MacFarlane-Dick (2006) noted, students must be taught how to self-manage learning for written feedback to be effective.

Hyland (2010) noted the importance of investigating specific feedback practices that lead to the development of reflective and self-directed learners. Despite the importance of formative feedback for successful writing, there is limited research concerning how higher education learners can become independent, engaging and acting on feedback. Supporting learners to become reflective and self-directed includes providing formative feedback that helps them “develop the skills needed to monitor, judge, and manage their learning” (Nicol, 2009, p. 338). These more confident learners experience increased chances of academic writing success (Rae & Cochrane, 2008; Wang & Li, 2011). In addition, identifying formative feedback practices that are both reflective and actionable gives instructors an important set of assessment tools.

This article discusses preliminary results of a study focusing on international post-secondary English language learners’ (ELL) experiences and perceptions with formative feedback. Nineteen full-time post-secondary ELL students were interviewed and completed a survey regarding their interactions with formative feedback both in their home countries and in Canada. An examination of the results is based on Nicol and Macfarlane-Dick’s (2006) seven principles of good feedback practice. Specifically, this research examines Principle 3 – “delivers high quality information to students about learning” (Nicol & Macfarlane-Dick, 2006, p. 205). The analysis revealed feedback must be (1) clear, (2) goal-oriented, and lastly, (3) learner-preferred (Nicol, 2009; Price, Handley, Millar, & Donovan, 2010, Rae & Cochrane, 2008; Sadler, 2010, Zhou, 2009). These results were then conceptualized in the following framework:

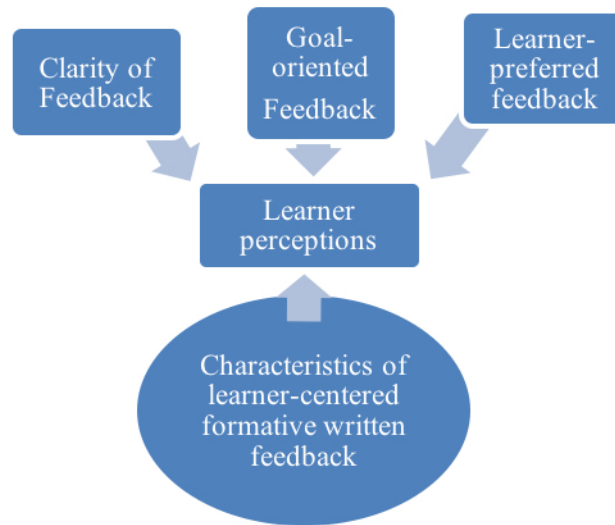


Figure 1: Conceptual framework of characteristics of formative written feedback

Next, we examine the results of the data against the three criteria to understand students' perceptions and experiences, assist instructors with identifying effective formative writing assessment strategies, and highlight the need for further research in this area.

ENGAGING LEARNERS TO REFLECT AND ACT ON FEEDBACK

Clear Feedback

For written feedback to result in learning, it must be clear and understandable (Rae & Cochrane, 2008). Ensuring that feedback is comprehensible is a major factor to learners engaging with the feedback (Hattie & Timperley, 2007; Moussu, 2013; Nicol, 2009; Rae & Cochrane, 2008; Seker & Dincer, 2014, Wang & Li, 2011). One of the main challenges that international post-secondary ELL learners may face is that they simply might not be acquainted with the educational institution's practices regarding formative feedback (Moussu, 2013; Wang & Li, 2011).

For example, some learners in our study indicated an inability to comprehend the language used in the feedback. This resulted in the participants not understanding the written feedback at all. In fact, four participants indicated that they had never received written feedback before so the process of

interpreting the meaning of feedback was completely new to them. In addition, three participants stated that they were not familiar with symbol charts that some instructors used. In six cases, students indicated a lack of understanding when instructors provided feedback in the form of reformulations. One participant stated, “At the time, I feel uncomfortable because my Canadian teacher re-write everything so it’s not my style”. Ellis (2007) defines reformulations as a type of corrective feedback involving rewriting a student’s text to make the language seem as “native-like as possible” (p. 98). Six participants emphasized that their style of writing was lost during this process. These participants further indicated that reformulations left them feeling confused as to what to do with the feedback. Rather than have their work re-written, the participants indicated a desire to have clarity and specific instructions on how to improve their writing.

One way to overcome misunderstandings is for instructors to engage in a feedback expectations discussion. This involves asking what kind of feedback students prefer, informing them of the type of feedback they will receive, and preparing them for what they should do with the feedback. Walker (2013) describes this as preparing the higher education student for their role as a “collaborator” with their instructor (p. 72).

This discussion takes place at the beginning of a term in the form of a needs analysis. It might include learners completing a form reflecting on their experiences and expectations with formative feedback as well as an actionable section where students commit to acting on feedback. In addition, this emphasizes formative assessment as part of reflective and constructivist learning (Hattie & Timperley, 2009; Nicol, 2009; Rae & Cochrane, 2008). A feedback expectations review not only helps transition the learner to become more reflective, but also helps alleviate any misunderstandings between the student and instructor.

Goal-Oriented Feedback

Goal-oriented feedback relating to specific criteria is more effective and actionable for the learner (Price, Handley, Millar & O'Donovan, 2012). This is supported by twelve participants in our study who indicated a desire for feedback to reflect specific goals of each assignment. For example, if the assignment required students to write a compare- and -contrast essay, then the feedback should reflect errors pertaining to the process of writing that type of essay and not necessarily individual grammar corrections. This finding supports Sadler's (2010) discovery that learners need to engage with feedback that "help[s] the student understand more about the learning goal" (p. 536). Rather than providing feedback that is general, instructors should provide specific goal-oriented feedback that supports and encourages learners to reflect and act on the feedback.

An example of encouraging reflection and action by the learner would include a comments section for the instructor and a separate comments section for the learner in the assignment rubric. The instructor would provide initial specific suggestions on which areas require improvement and the learner would then reflect and respond to these comments in the learner comments section. This method involves a gradual release of grades since the final grade is provided after the learner comments are completed. Including a learner comments section in an assignment rubric can eliminate misunderstanding of the comments, ensure the comments are goal-oriented, and require learners to reflect and act on the feedback resulting in demonstrated learning and improved academic writing skills.

Learner-Preferred Feedback

The type of formative feedback that learners receive also impacts their willingness to reflect and act on the feedback. Our study asked students to comment on their perceptions and experiences with oral, peer, and written formative feedback. The results indicated a strong desire from students

that feedback be varied and tailored to their preferences. Students found advantages and disadvantages to each of the three main types of formative feedback.

Oral feedback is a common feedback strategy used to assess academic writing. Examples of oral feedback include face-to-face meetings and video-conferencing. Oral feedback provides students with an opportunity to clarify an instructor's comments and ensure that specific student concerns regarding their writing have been addressed. Nine out of seventeen participants found advantages included clarity (students could ask for clarification of a comment); immediacy (there was no delay); and the actionable nature of the feedback (as students asked and answered questions they functioned as collaborators in the feedback process). Disadvantages of oral feedback included forgetting the comments unless the session was recorded and not having sufficient time to reflect.

Peer feedback, where students provide feedback on each other's written assignments, was unanimously disliked. Students found peer feedback to be ineffective as they viewed each other as equal learners and therefore did not see the benefits. While Rollinson (2005) suggests overcoming this aversion with pre-training, the time involved coupled with students' preference not to engage in peer editing, makes this form of feedback impractical in an English language learning setting.

Seventeen of the nineteen participants indicated written feedback was both effective and conducive to improved writing skills. This is supported by Hyland (2010) who found that instructor-provided feedback plays a dominant role in additional language writing classes. In our study, students appreciated the ability to reflect on written comments and ask instructors for clarification. One note of caution, however, is to ensure that comments are specific to the task and not a re-write of their essay which does not result in reflective or actionable behaviour for the learner.

One way to avoid the temptation for an instructor to re-write a student's essay is to use both written and oral feedback strategies. This engages and "optimize[s] the learners' processing of the

feedback” (Sheen, 2010, pg. 210). The goal should be for the learner to reflect and act on the feedback allowing them to process the comments themselves. Using oral and written feedback together meets the needs of the learner and maximizes time management for the instructor. This theory is supported by Bitchener, Young, and Cameron (2005) who found a combination of 5-minute oral conferences and written feedback led to more effective feedback.

CONCLUSION

Providing learners with reflective and actionable formative feedback that is clear, goal-oriented, and learner-preferred can improve academic writing skills. In addition, using rubrics that require both instructor and learner comments supports the self-directed learner and writing instructor relationship. Lastly, providing learners with a combination of oral and written feedback comments engages the learner-directed learner and may alleviate unnecessary time-consuming feedback practices for the writing instructor.

The findings of this study also point to a greater need for further research into the area of assessment and formative feedback, as well as how peer feedback can be effectively implemented among ELL students. While this study focused on post-secondary ELL perceptions and experiences with feedback, instructor experiences merit further investigation as well. For example, a future study might involve investigating teacher training programs and how they train and support instructors with formative feedback as well as studying the method in which instructors develop and present learning goals for each writing assignment. Learning more about formative feedback and the relationship between the instructor and the learner will benefit the field of formative assessment for post-secondary ELL students.

References

- Benson, P. (2012). Learner-centered teaching. In Burns, A. & Richards, J. (Eds.), *The Cambridge Guide to Pedagogy and Practice in Second Language Teaching* (pp. 30-37). New York, NY: Cambridge University Press.
- Bitchener, J., Young, S., & Cameron, D. (2005). The effect of different types of corrective feedback on ESL student writing. *Journal of Second Language Writing*, 14, 191-205. doi: 10.1016/j.jslw.2005.08.001
- Ellis, R. (2009). A typology of written corrective feedback types. *ELT Journal*, 63(2), 97-107. doi: 10.1093/elt/ccn203
- Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, 77(1). Retrieved from <http://www.jstor.org/stable/4624888>
- Hyland, F. (2010). Future directions in feedback on second language writing: overview and research agenda. *International Journal of English Studies*, 10(2). Retrieved from: <http://files.eric.ed.gov/fulltext/EJ936913.pdf>
- Nicol, D. (2009). Assessment for learner self-regulation: Enhancing achievement in the first year using learning technologies. *Assessment & Evaluation in Higher Education*, 34(3), 335-352. doi:10.1080/02602930802255139
- Nicol, D. & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Studies in Higher Education*, 31(2), 199-218. doi: 10.1080/03075070600572090

- Price, M., Handley, K., Millar, J. & O'Donovan, B. (2010). Feedback: All that effort, but what is the effect? *Assessment & Evaluation in Higher Education*, 35(3), 277-289. doi:10.1080/026029309035410087
- Rae, A., & Cochrane, D. (2008). Listening to students: How to make written assessment feedback useful. *Active Learning in Higher Education*, 9(3), 217-230. doi: 10.1177/1469787408095847
- Sadler, D.R. (2010). Beyond feedback: Developing student capability in complex appraisal. *Assessment & Evaluation in Higher Education*, 35(5), 535-550. doi: 10.1080/02602930903541015
- Seker, M., & Dincer, A. (2014). An insight to students' perceptions on teacher feedback in second language writing classes. *English Language Teaching*, 7(2), 73-83.
- Sheen, Y. (2010). Differential effects of oral and written corrective feedback in the ESL classroom. *Studies in Second Language Acquisition*, 32, 203-234. doi: 10.1017/S0272263109990507
- Rollinson, P. (2005). Using peer feedback in the ESL writing class. *ELT Journal*, 59(1), 23-30. doi: 10.1093/elt/cci003
- Walker, J. (2013). Exploring service logic in ESL. *TESL Canada Journal*, 30(2), 69-79. doi: 10.108806/tesl/v30i2.1143
- Wang, T., & Li, L. (2011). 'Tell me what to do' vs. 'guide me through it': Feedback experiences of international doctoral students. *Active Learning in Higher Education*, 12(2), 101-112. doi: 10.1177/1469787411402438
- Zhou, A. (2009). What adult ESL learners say about improving grammar and vocabulary in their writing for academic purposes. *Language Awareness*, 18(1), 31-46. doi: 10.1080/09658410802307923

SIGNATURE PEDAGOGIES IN ONLINE CLASSES

Barbara Brown, Sarah Elaine Eaton, and Meadow Schroeder

Werklund School of Education, University of Calgary

Instructors design interactivity during online sessions in different ways. In this exploratory study, researchers examined which signature pedagogies provided successful learning during online synchronous sessions. Researchers analysed online recordings of synchronous sessions from four courses throughout one semester and after each session students were invited to complete a survey to gather their perceptions about the learning activities. The preliminary findings inform future designs for online courses that incorporate synchronous sessions to foster a community of inquiry. Teachers using technologies for blended learning or those teaching fully online may be interested in the findings from this study.

Keywords: online learning; synchronous; signature pedagogies; higher education

SIGNATURE PEDAGOGIES

Signature pedagogies, first introduced by Shulman (2005), are forms of teaching and learning characteristic of a profession. They are forms of instruction that one typically associates with particular professions (Shulman, 2005). The Office of Teaching and Learning at the Werklund School of Education, University of Calgary (2017), lists these signature pedagogies as a starting point: problem-based learning, community-based learning, place-based learning, inquiry-based learning and case-based learning. In order to illustrate an example of signature pedagogies in educational professions, the authors describe case-based learning. Cases are generally written as narratives in need of a resolution. Cases can be used to provoke thinking about compelling issues,

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 66-74. Calgary, Canada: Werklund School of Education, University of Calgary.

providing students with opportunities to reflect on questions and negotiate understanding and be “prepared to think, to perform, and to act with integrity” (Shulman, 2005, p. 52). Students can also write their own cases and draw on personal and professional experiences, referred to as the pedagogy of case writing (Meyer & Shannon, 2010). In professional graduate programs, instructors can develop cases as provocations to help students contemplate how research can be designed in response to a relevant professional problem of practice.

SYNCHRONOUS SESSIONS

Synchronous sessions, or real-time virtual meeting rooms where students meet with the instructor simultaneously, are often elements of online courses. In the Werklund School of Education, it is common that synchronous sessions are offered three times throughout each term during graduate-level online courses. Instructors design interactivity during these sessions in different ways (Brown, Schroeder & Eaton, 2016). There is literature about web-conferencing software and courses taught fully online (Bower, 2016; Clark & Mayer, 2011); however, there is a gap in understanding how instructors facilitate interactivity during online synchronous sessions (Park & Bonk, 2007). Students indicate synchronous delivery offers little interaction (McBrien, Cheng & Jones; Park & Bonk, 2007) and researchers argue that student-centered approaches can improve a sense of community in online courses (Bower, 2016; Park & Bonk, 2007; Young & Bruce, 2011). Online courses continue to evolve as emerging technologies and signature pedagogies (Chick, Haynie & Gurung, 2012; Shulman, 2005) are understood and used by instructors for developing high quality and engaging communities of inquiry. As such, there is a need to study online synchronous sessions and the impact these sessions and signature pedagogies used during these sessions can have on student learning in order to continue redesigning and improving the quality of online courses.

THEORETICAL FRAMEWORK

This project uses the community of inquiry framework (Akyol & Garrison, 2008; Garrison, 2007, Garrison, Anderson & Archer, 2000) to examine how synchronous sessions support student learning, as teaching, learning and cognitive presence, while considering the notion of signature pedagogies. The layering of signature pedagogies with the community of inquiry framework allowed us to take an innovative approach for the project that we have not previously observed in the literature (Figure 1).

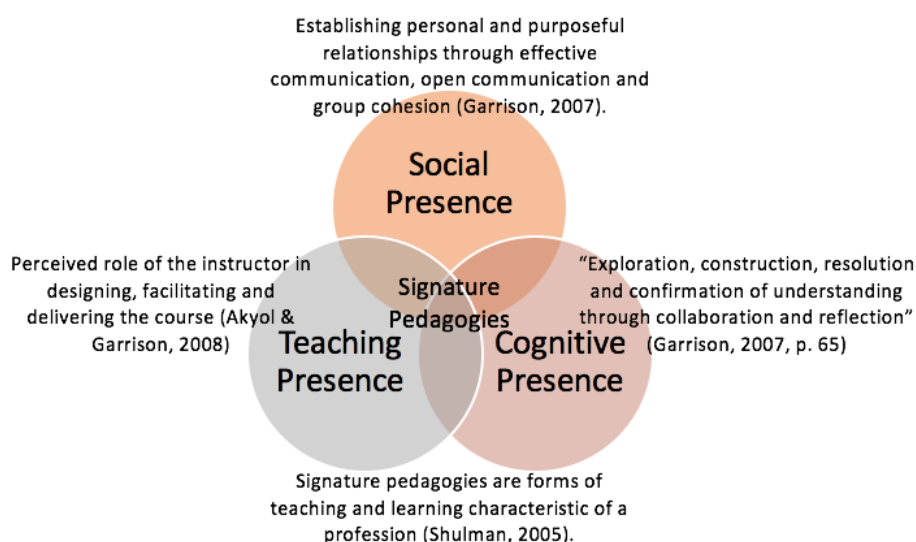


Figure 1: Layering Signature Pedagogies with the Community of Inquiry (COI) Framework

METHODOLOGY

Using a mixed methods action-research approach, this exploratory study drew data from four graduate research classes involving three different instructors. These courses focused on supporting working professionals with research projects during their graduate programs. The overall question guiding the research was: How do online synchronous sessions support student learning in professional graduate programs engaging in research-active opportunities for scholarship of the

profession? Each instructor recorded three synchronous sessions during one academic term. In this paper, preliminary findings are based on the first synchronous session offered to students at the beginning of the term. The sequence of teaching activities in the recordings were documented and analyzed by the research team. The transcripts were color coded to differentiate the instructors' oral communications using the microphone and written communications using the chat box. The research team reviewed the transcripts and conducted an analysis of teaching activities that occurred during the sessions. Following the first synchronous session, students received an invitation to complete an online survey. In the survey, students provided feedback about the teaching strategies used during the synchronous sessions and evaluated their experience in the synchronous session. Survey responses from students ($n = 15$) across four graduate classes were reviewed by the research team.

FINDINGS

Survey responses indicated the first synchronous session provided an introduction and roadmap for the course. One student commented, "It set the ground rules, expectations, answered questions, provided structure, and created a sense of purpose for the course." However, some students noted the first session did not serve to support learning about research design. As one student noted, "While beneficial, I would say this did not specifically address learning about research design."

Table 1 provides a sequence of teaching activities used in one synchronous session at the beginning of a term to provide an example of the flow of activities and how these activities demonstrate social, cognitive and teaching presence from the COI framework and signature pedagogies.

Teaching Activities	Description	COI & Signature Pedagogies
Introductions	The instructor used a prompt to invite each student to use the microphone and provide a self-introduction at the beginning of the class – “What do you see when you look out your favourite window?”	Social & Cognitive Presence
Whole Class Dialogue	Using a round robin technique, the instructor asked students to respond to the following questions: <ul style="list-style-type: none"> • What do you need for support this term? How can I provide you with the best learning experience this term? • How were discussion forums used in your previous online courses? • Do you have other input on what worked for you? How were you held accountable to put together your work? 	Social & Teaching Presence
Presentation	The instructor provided an overview of the course: <ul style="list-style-type: none"> • Instructor discussed tasks and expectations in the course. • Instructor discussed feedback and the importance in gathering feedback during the course from the course instructor but also from expertise outside of the course (i.e. their research supervisor). 	Teaching Presence
Case-Based Learning Discussion	The instructor provided a case in a brief scenario format describing a challenging research situation. The scenario provided a provocation and prompted dialogue about what students should do to avoid this type of situation.	Signature Pedagogy & COI
Chat Box Question	The instructor asked students to simultaneously provide the name of their research supervisor using text communication in the chat box.	Teaching Presence
Last word	Each student was provided with an opportunity to ask a question or make a comment before closing the session. The instructor ended the session by thanking the students for helping to collaboratively design and tailor their learning experiences.	Social Presence

Table 1: Sequence of Teaching Activities

One of the learning outcomes common to all of the research courses that are part of this study is to engage in a scholarly community of inquiry. Based on the preliminary analysis of the survey results, students indicated they were engaged during the initial synchronous session by the dialogue that occurred during the session and having an opportunity to receive immediate instructor and peer feedback. Common instructional strategies that promoted student dialogue and engagement during introductory synchronous sessions included providing students with provocations, seeking student input and instructor responsiveness. Instructors asked students to respond to provocations such as case-based scenarios for learning. One instructor prompted students with a quote from one of the course readings to invite students to reflect and dialogue about challenges in their professional contexts – “Caring, conscientious educators reflect on their practice and work to improve it. That

kind of reflection is at the heart of action research” (Hendricks, 2013, p. iv). One of the instructors used a visual artifact of balancing rocks as a provocation. The instructor commented on how the visual represents the upcoming work and how everyone will be “learning together” and “building foundations.”

Instructors regularly invited students to contribute and provide their input during the synchronous sessions. For example, one instructor encouraged participants to provide input by stating, “I would love to hear from others in the group...I would like to open up the microphone and get your input.” Students were regularly invited to respond to instructor questions and instructors were also responsive to student questions. Students also reported they appreciated receiving feedback about their research ideas. These active student engagement techniques used by the instructors during the introductory online sessions align with field-tested activities found effective by other researchers (Barkley, 2009; Zepke & Leach, 2010).

Communication challenges also occurred during these introductory sessions. In one of the sessions, the instructor’s sound faded for short durations seven times during the initial 1 hour and 16-minute session. One survey respondent commented, “Had the connection been better, it would have created an opportunity for the cohort to have a scholarly discussion.” Exploring the impact of technical issues during synchronous sessions on the development of community of inquiry is an area that requires further exploration. As the study was still in process at the time of publication, the findings presented here present interim results of the analysis of initial synchronous sessions. Subsequent publications will report on the completed study, including synchronous sessions that take place in the middle and at the end of the course, additional survey data and student, instructor and administrator interview data.

CONCLUSION

In the synchronous sessions, instructors used a variety of strategies to foster social, cognitive and teaching presence and encourage students to contribute using oral and written communications. Instructional strategies promoting social presence and providing opportunities for all students to respond (i.e. opening introductions, closing final words) are commonly used by instructors. Student engagement is also supported through provocations, seeking student input and instructor responsiveness throughout the sessions. Furthermore, instructors use signature pedagogies, such as case-based learning approaches for promoting interactions in a community of inquiry.

References

- Akyol, Z., & Garrison, D. R. (2008). The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks*, 12(3-4), 3-22.
- Barkley, E. F. (2009). *Student engagement techniques: A handbook for college faculty*. San Francisco, CA: John Wiley & Sons.
- Bower, M. (2016). A framework for adaptive learning design in a web-conferencing environment. *Journal of Interactive Media in Education*, 1(11), 1-21. doi:10.5334/jime.406
- Brown, B., Schroeder, M., & Eaton, S.E. (2016, May). Designing Synchronous Online Interactions and Discussions. In M. Takeuchi, A.P. Preciado Babb, & J. Lock. *IDEAS 2016: Designing for Innovation Selected Proceedings*. Paper presented at IDEAS 2016: Designing for Innovation, Calgary, Canada (pp. 51-60). Calgary, Canada: Werklund School of Education, University of Calgary. Retrieved from <http://hdl.handle.net/1880/51209> .

- Chick, N.L, Haynie, A. & Gurung, R.A.R. (2012). *Exploring more signature pedagogies: Approaches to teaching disciplinary habits of mind*. Sterling, VA: Stylus Publishing.
- Clark, R. C. & Mayer, R. E. (2011). *e-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning (3rd Ed)*. Hoboken, US: Pfeiffer. Retrieved from <http://www.ebrary.com> .
- Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks*, 11(1), 61-72.
- Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education model. *The Internet and Higher Education*, 2(2-3), 87-105.
- McBrien, J. L., Cheng, R., & Jones, P. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *The International Review of Research in Open and Distributed Learning*, 10(3). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/605/1264> .
- Meyer, H-D., & Shannon, B. (2010). Case writing as a signature pedagogy in education leadership. *Journal of Educational Administration*, 48(1), 89-101. doi: 10.1108/09578231011015430
- Park, Y. J., & Bonk, C. J. (2007). Synchronous learning experiences: Distance and residential learners' perspectives in a blended graduate course. *Journal of Interactive Online Learning*, 6(3), 245-264.
- Shulman, L.S. (2005). Signature pedagogies in the professions. *Daedalus*, 134(3), 52-59. doi: 10.1162/0011526054622015

University of Calgary (2017). *Signature Pedagogies*. Retrieved from:

<https://werklund.ucalgary.ca/tandl/resources/signature-pedagogies> .

Young, S., & Bruce, M. A. (2011). Classroom community and student engagement in online courses. *Journal of Online Learning and Teaching*, 7(2), 219.

Zepke, N. & Leach, L. (2010). Improving student engagement: Ten proposals for action. *Active Learning in Higher Education*, 11(3), 167-177. doi: 10.1177/1469787410379680.

HOW CAN GRADUATE STUDENTS CONTRIBUTE? REFLECTIONS ON CREATING A JOURNAL FOR AND BY GRADUATE STUDENTS

Jon Woodend, Maisha M. Syeda, Britney M. Paris, Gina Ko, and Konstantinos Chondros,

Brianna Hilman, and Teresa Fowler

University of Calgary

In March 2016, the Emerging Perspectives: Interdisciplinary Graduate Research in Education and Psychology journal officially launched with the purpose of being a journal for and by graduate students, where they can gain support and experience with the peer-review process. While graduate students are encouraged to publish, many struggle to get involved in the process. One year after launching, the founding editorial board members reflected on the impetus for starting the journal, how they grew from this experience, and what they foresaw as the next steps for the journal.

Keywords: graduate student training; higher education; peer-review process

INTRODUCTION AND THEORETICAL UNDERPINNINGS

Being involved in the publication process is extremely beneficial for students as it provides opportunities for developing important skills such as problem solving and critical thinking (Ni Uigin, Higgins & McHale, 2015). It is also considered an integral component of professional development for budding academics (Gardner & Barnes, 2007). Garbati and Samuels (2013) demonstrated, however, that graduate student participation in publishing accounted for only 8.60% of all authors. Garbati and Samuels called for graduate programs to revisit their role in facilitating student authorship, either by formally transforming their degree requirements to allow first-time authors to get their work published or supporting their involvement in the peer-review practice. To

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 75-83. Calgary, Canada: Werklund School of Education, University of Calgary.

address this gap and the recommendations provided regarding student authorship, graduate students in education and psychology created *Emerging Perspectives: Interdisciplinary Graduate Research in Education and Psychology (EPIGREP)*, a publication outlet for graduate students to gain experience in the peer-reviewed process as authors, reviewers, editors, or a combination of these roles. Specifically, the founding editorial team of EPIGREP consisted of seven graduate students in various specializations at the Werklund School of Education, University of Calgary. In this paper, we look back on the first year of the journal's development through a duo-ethnographic lens, to reflect on the "bridges and barriers" (Morse, Nielsen-Pincus, Force, & Wulfhorst, 2007, p. 1) that we encountered throughout this collaborative process to better inform ours' and others' efforts and initiatives to increase student authorship.

In starting a student-run journal and writing this article, we experienced transformative learning, which is the theoretical underpinning that guided our inquiry. Mezirow (1991) noted transformative learning is a process whereby expectations and habits can be challenged through reflection and critique that may result in the transformation of "meaning perspectives" and "experience" of the interpretation (p. 6). A transformation occurs when new or transformed meaning schemas emerge, or when reflections centered on these assumptions transform meaning perspectives.

METHOD AND DATA ANALYSIS

To facilitate our reflective practice, we used Norris and Sawyer's (2012) duo-ethnography. In duo-ethnography, two or more individuals offer their interpretations of a particular shared social experience and explore the points where interpretations meet and diverge in order to foster the development of ideas and perspectives (Nabavi & Lund, 2012). Through duo-ethnography participants can engage in ethical and trusting dialogue to understand their life as curriculum, gain different perspectives, challenge assumptions, switch from universal to subjective truth, and see

the connections between theory and practice (Norris & Sawyer, 2012). Specific to the current study, the authors engaged in an in-person, recorded, two-hour conversation around the research question “How does a group of graduate students make meaning of their experience starting and operating a journal?” Specifically, each author first shared an opening reflection about what brought them to the journal, and then the conversation moved into new reflections. The authors transcribed the recording, reviewed the transcript, and negotiated which were the critical learnings from the conversation.

DISCUSSION OF FINDINGS

Although there is no prescriptive way to engage in duo-ethnography, Norris (2008) noted that one approach could be to synthesize data collection (i.e., stories) and analysis (identifying key shifts in learning) for an integrated discussion of findings. In duo-ethnography, whole conversations are presented in the discussion as evidence for shifts in learning and to support the identified themes. In the current study, there were two main themes, *new beginnings* and *future directions*.

New Beginnings: Impetus for Joining the Journal and Growing Pains

As seen in the literature, there is lack of resources to support the development of publishing skills among graduate students (Garbati & Samuels, 2013). Hence, the conversation began with the editorial team discussing their experiences in publishing and how this brought them to the journal, constituting the first theme of *new beginnings*.

Maisha: Thinking about what brought me to the journal, when I came to Werklund I met a lot of graduate students for whom the focus was not on academia but practice. This was different from my previous experience where everyone was pushing for research. I thought about it from a structural point of view, do we provide the resources and the training where students think, “I’m comfortable being in academia?” I thought that having a journal that comes out of Werklund would

maybe be a beginning step for students to become more comfortable and get more opportunities and mentorship with publishing.

Jon: As someone who came to graduate school to become a practitioner, I understand where you're coming from Maisha, publishing seemed daunting to me. So, when I was invited to join the editorial team, I really wanted the journal to fill a niche, to target this gap that blocks students from participating in the publishing process.

Brianna: I had a negative experience where, in my master's, my supervisor encouraged me to submit one of my papers to a journal for publication. I just submitted the paper to a journal as a course paper without making any changes, not even changing the title page. The journal told me to re-submit with revisions, but I thought that it was a rejection, and I stopped the process—it was intimidating. I thought being involved in a journal where I know some of the people and they won't just get an online e-mail response from editors would be helpful.

Konstantinos: I was also thinking about my CV. I had already reviewed a few manuscripts with my supervisor sort of assisting, just to learn about the process of reviewing someone else's work for an academic journal. So, I was thinking, if this is the trajectory that I'm going to take in my future career, being involved in academia, I think that's a great opportunity for me to come in and learn from the inside-out, what's going on behind the scenes of publishing.

Brit: As for me it was more serendipitous than future career planning. I had just gone to a conference in open access publishing where I saw a presentation on someone creating a student journal. I was like yeah, I could help with online journal systems, I know who to talk to, I am already in contact with somebody. So, I then really saw it as my role to figure out the website and get us trained on that so it became tangible. Because I think that was one of our big roadblocks,

knowing what goes into a journal, what the expectations for editors, reviewers, and authors would be. These were all things that needed to be decided and outlined.

Maisha: That's right. In forming the initial editorial team, as a founding member, I thought that we needed to invite people we knew were hard workers. They would be consistent in their contributions, dedicated, and bold enough to take on a leadership role. Because being an editor it can be intimidating, you really have to be willing to create and put yourself and ideas out there to create something from scratch, something none of us have done before.

Teresa: A welcome surprise for me has been reaching out to faculty for help and getting so much support—they want us to succeed. For example, I published a few book reviews and found this was a good way to get your feet wet so wanted to help our authors, but when I contacted publishers, I was pretty much ignored until Dr. Shirley Steinberg sent me some of her contacts. We soon had 8 books ready to be reviewed! Working with these students on their book reviews has been very rewarding, and I'm appreciative of faculty support in making this happen.

From the conversation, we noted a shared experience of needing a training experience beyond the curriculum of our programs. Similar to findings from previous research (Ni Uigin et al., 2015), we received informal mentorship in our first publishing attempt and wanted to formalize an opportunity where other students could learn from these experiences. The journal seemed to be an ideal and concrete platform for this. As the conversation moved into some of the surprises we encountered during the establishment of the journal, we noticed that each member of the team brought an area of expertise that was a valuable piece in figuring how the journal would operate. Importantly, we recognized persistent gaps in our knowledge and our continued need for mentorship from faculty, mirroring the experience of the beginning authors we sought to help.

Moving Forward: Impact on Editorial Team and Future Direction

The conversation then evolved into how the journal impacted the editorial team with respect to their personal growth as beginning scholars and the concerns and goals they have to sustain the journal, making up the second theme of *moving forward*.

Teresa: What I have learned about myself through this process is to be in the moment when I am reviewing submissions. I have understood that it is important to take time to deeply read the work that is coming in and provide feedback that does not turn away an author but empowers them.

Gina: I see it as practicing self-compassion, learning to give myself permission to ask questions and for help. I would also like to model that with our student authors. When you are working on a paper, submitting it for review—it is understandably an anxious process, but it does not have to be perfect. There's a team at the journal that authors can learn from and that's really powerful.

Jon: Similar to what Gina said, I can be humble about what I don't know, but I can also be bold about what I do know. Being with the journal has given me the confidence to be bold in putting myself forward in whatever expertise I do have. As editors who are also students, we all have expertise at this point in our research area. My mentors have been saying this for a while and logically this made sense, but being in the journal, I have felt what they were saying.

Brit: That makes sense about where we are now and makes me curious, what's next?

Konstantinos: As we begin to think about future steps, I am cautious about outcomes. I am hoping our endeavour isn't a "Titanic" where we started something big and ambitious, but then it sinks.

Maisha: I think enticing student authors to publish with us is also a contributing factor to sustain the journal. We want to establish our journal as a platform in which beginning authors are enthusiastic and motivated to participate, learn how to develop manuscripts, get trained in peer-

reviewing and related skills, and processes associated with publishing. I think we are still lacking in this area and need to work on this in particular.

Jon: That makes me think about how we could collaborate with faculties to enhance students' participation with the journal. One suggestion would be to modify course curriculum slightly and have students write a paper for EPIGREP on whatever topic they would have written the course paper. This way, even if beginning authors are not confident about the publication process, they will be required to begin working on manuscripts and will receive mentorship from experienced faculty members. In return, our journal will also receive manuscripts that have been evaluated by faculty members, which will add to our peer-review process.

Konstantinos: I agree, we could put this forward to the Teaching and Learning Committee at Werklund, they always ask me what the journal is up to. It will be important to keep seeking faculty support to fill in our gaps of knowledge to make the journal successful.

As observed from the conversation, participating in the journal sparked further inspiration among the editors to empower graduate students to enhance their publishing skills. The editors envisioned themselves empowering graduate students through a collaborative process, which consists of peer mentorship and meaningful feedback to encourage students to take pride in their work and develop publishing skills. Simultaneously, the journal served as a learning platform for editors to apply their learned skills and expertise through various tasks, such as validating the suitability of manuscripts for publication and developing the journal's policies. Therefore, the journal has begun to fill in a gap for the editors (Garbati & Samuels, 2013), providing explicit training opportunities in publishing and scholarship. In regard to future directions, the conversation focused on the future steps necessary to sustain the journal. Along with financial support, the editors identified that there

will be a continuous need to increase student engagement and participation with the journal, preferably through collaboration with faculty and graduate programs.

IMPLICATIONS AND CONCLUSION

A critical implication of this study was that the authors noted the importance of including students in the solution to address gaps in graduate student training for participating in the publication process. Specifically, the editorial team realized that they each had their own relative expertise that allowed them to help empathize with beginning authors' struggles to enter the publication process and to address gaps in their abilities. At the same time, the editorial team also identified their own gaps in training that they hoped would be addressed through other members of the editorial board's expertise or through the assistance of faculty mentors to the journal. As such, the journal was a platform that the authors saw as both a means to assist and to be assisted in graduate student training for participating in the publication process.

A careful examination of the literature highlighted the importance of student involvement in the publication process (e.g., Garbati & Samuels, 2013; Gardner & Barnes, 2007). Using Norris and Sawyer's (2012) duo-ethnography, we, an interdisciplinary group of graduate students, engaged in a reflective conversation that allowed us to construct new meaning regarding the development of a student-run journal. Although rooted in each participant's experience (Mezirow, 1991), the duo-ethnographic analysis privileged our collective voice, giving "both similar and different meanings to a shared phenomenon" (Norris, 2008, p. 235) of establishing a graduate student journal. Our dialogue led to insights of our motives for the creation of the journal, the knowledge we have acquired, and our anticipations for the future. We hope that our experience will serve as a springboard for other graduate students aspiring to enhance the research culture of their programs.

References

- Garbati, J., & Samuels, B. (2013). Publishing in educational research journals: Are graduate students participating? *Journal of Scholarly Publishing*, 44(4), 355–372. doi:10.3138/jsp.44-4-004
- Gardner, S. K., & Barnes, B. J. (2007). Graduate student involvement: Socialization for the professional role. *Journal of College Student Development*, 48(4), 369–387. doi:10.1353/csd.2007.0036
- Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco, CA: Jossey-Bass.
- Morse, W., Nielsen-Pincus, M., Force, J., & Wulforth, J. D. (2007). Bridges and barriers to developing and conducting Interdisciplinary graduate-student team research. *Ecology & Society*, 12(2), 1-14. doi:10.5751/es-02082-120208
- Nabavi, M., & Lund, D. E. (2012). Tensions and contradictions of living in a multicultural nation in an era of bounded identities. In J. Norris, R. Sawyer, & D. E. Lund (Eds.), *Duoethnography* (pp. 177-197). Walnut Creek, CA: Left Coast Press.
- Ni Uigin, D., Higgins, N., & Mchale, B. (2015). The benefits of student-led, peer-reviewed journals in enhancing students' engagement with the academy. *Research in Education*, 93, 60–65. doi:10.7227/RIE.0010
- Norris, J. & Sawyer, R. (2012). Towards a dialogic methodology. In J. Norris, R. Sawyer & D. Lund (Eds.), *Duoethnography* (pp. 9-39). Walnut Creek, CA: Left Coast Press.
- Norris, J. (2008). *Duoethnography*. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (pp. 233-236). Thousand Oaks, CA: Sage.

INTERPRETING 21ST CENTURY EDUCATIONAL REFORM IN ALBERTA: A PILOT STUDY

Amy Burns and Dianne Gereluk

University of Calgary

This paper will highlight the unique findings of a pilot study designed to understand the interpretations made by classroom teachers of 21st century educational reform, with particular attention on the effects of these findings for pre-service teacher education. The study was conducted with two teachers and two school-based leaders in one Alberta school division known for its commitment to 21st century educational ideals. It was found that both teachers and school-based leaders are interpreting 21st century education in very different ways. Most interestingly is the propensity for 21st century education to become hallmarked by one aspect that then becomes foundational.

Keywords: 21st century; reform; K-12; teachers; pre-service teachers

INTRODUCTION

Alberta Education has invested considerable time and resources in the creation of policies outlining their vision of education for the 21st century in Alberta. Under the previous Conservative government this was communicated to schools via the Framework for Student Learning (Alberta Education, 2011), which outlined competencies all students in Alberta schools should have upon graduation. While this document, under the current New Democratic Party (NDP), has lost its position of significance, 21st-century educational reform is still being addressed through whole-scale curriculum reform designed to address the need for competency-based curricula. In 21st-

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 84-92. Calgary, Canada: Werklund School of Education, University of Calgary.

century educational literature a discussion of competencies addresses both what teachers ought to do and what knowledge and skills are valued (Saavedra & Opfer, 2012).

There is little research to suggest, however, whether teaching and learning has changed with the introduction of competency-based education. The pilot study described here, conducted by two researchers from the University of Calgary, aimed to shed light on that important reality by examining teacher and school-based leader interpretations of 21st century educational reform and the ways in which those interpretations were then enacted at the classroom level. As a result, implications for both kindergarten-to-grade-twelve education and post-secondary education were developed as they continue to strive towards the attainment of a 21st century educational model, a model that has implications nation-wide as provincial departments of education continue to grapple with educational reform (Burns, 2017).

ABBREVIATED LITERATURE REVIEW

Three bodies of distinct yet interconnected literature supported this study. Of greatest significance to the teachers and school-based leaders in this study was the policy literature created by Alberta Education, which spoke specifically to the theoretical construct of 21st century educational reform including those competencies that were deemed necessary for social resilience and learning excellence (Alberta Education, 2010, 2011, 2013; Hull, 2013; Peterson, 2004; Task Force for Teaching Excellence, 2014). The theoretical and legislative framework from which school-based personnel both create programming for children and create a vision and mission for schools was presented in this literature. Of particular importance to schools, and to teachers more specifically, was the vision of the educated Albertan of 2030 in the Alberta Education (2010) document, *Inspiring Education*. Through a consultative process with Alberta Education, “Albertans articulated their vision for education through specific outcomes which have been summarized as ‘the Three

Es' of education for the 21st century,” which describe a student who is an “engaged thinker and an ethical citizen with an entrepreneurial spirit” (pp. 5-6). In a follow-up to this report, a framework describing seven competences associated with the Three E's (Alberta Education, 2011) was developed and, along with supporting literature, has informed the work of schools, school leaders and educational policymakers for several years.

Literature concerned with effective 21st century teaching strategies that encouraged the development of 21st century educational competencies (Jacobsen, Lock & Friesen, 2013; McFarlane, 2011; Pence, 2010) and school leadership for educational reform (Butler, 2014; Fullan, 1998; Gaetane, 2008; Male & Palaiologou, 2015; Mullen, 2011) also formed a foundation for this study. This literature spoke primarily to methods of teaching and leading, focused on the role of specific teaching methods and the development of a school vision for that prioritized change and innovation. The underlying premise of these two bodies of literature were that leadership practices or instructional methods “...of the industrial past are inadequate for the myriad challenges and opportunities facing 21st century students” (Friesen & Scott, 2013, p. 2). Both teachers and leaders were called upon as change agents.

METHOD

This pilot study was undertaken in one elementary school in southern Alberta. The school was approached based on its reputation for excellence in competency-based educational reform efforts. The school-based leaders in the participant school selected two teachers for inclusion in the study and the two teachers and the two school-based leaders were interviewed using a semi-structured approach. Semi-structured interviews were employed to ensure adequate opportunity for each of the participants to describe in their own words their interpretations of 21st century educational reform and competency-based education. Additionally, observations were conducted for one-half

day each in the classrooms of the two teachers using Friesen's (2009) teaching effectiveness framework as a guide for the observations. Observations were conducted to permit the researcher to observe evidence of the interpretations gathered through the interview process. Finally, publically available school documents were examined for their descriptions of and attentions to reform efforts in the school and school division as evidence of a school-wide or district-wide strategy for educational reform. All data was analyzed thematically.

FINDINGS

Two key findings presented themselves within the scope of this pilot study. The first was that the teachers in this study tended to privilege one aspect of 21st century educational reform to the neglect of others. For example, technology in one case and environmental stewardship in another become the definition of 21st century learning for those particular teachers. A second finding brought to light was the inherent difficulties of and need for leadership supports in establishing and implementing a school-wide vision of 21st century learning. Both teachers were apt to focus in on one element of the Alberta Education (2010) document and tended to exclude other aspects of competency-based education. For example, Teacher A noted, "21st century teaching is all about the environment. If I don't do anything else with these kids, I want them to see that the planet needs their care." On the other hand, Teacher B felt the same passion but about technology, noting the same desire to instil in his students the importance of technological advancement. Technology was not seen by this teacher to be a tool for learning, but instead was seen as the learning itself. He noted that, "students don't really like school but they do like computers and it's because computers are their reality. If we don't include technology in everything we aren't preparing them for real life" (Teacher B). In both cases the teachers had intricately intertwined their classroom design with one aspect of competency-base education.

A second finding that emerged was that each teacher had a very different view of the future of educational reform, one that differed significantly from the views held by school leaders. The school-based leaders upheld a more rounded idea of competency-based reform, noting the need for multiple competencies to work together to prepare students for an unknown future. Leader A stated that, “Schools are really changed. Our students don’t know it’s different. For them this is their normal, collaboration, thinking skills, working together as a team and all those associated creative thinking skills. It has to be this way because we don’t even know what jobs might exist for them so we can’t train kids like we used to. We have to get them to want to learn and know how to learn.” This integrated vision for educational reform in the classroom appeared difficult to support in the lived realities of individual classrooms, showing that 21st-century educational reform was being shaped and driven by multiple interpretations of government policy. As the two teachers interpreted competency-based education for themselves, each implemented only those aspects they deemed critical, noting that time and curricular expectations didn’t allow for a more integrated approach. This also showed a tendency to view the competencies put forth in government policy as additional to the curriculum, not as a means to delivering curriculum.

DISCUSSION AND IMPLICATIONS

The findings suggest three important implications: 1) the success of competency-based educational reform, 2) the success of postsecondary teacher education programs, and 3) potential changes to practice for educators within postsecondary teacher education programs. First, if such differing interpretations are being made, and enacted, within the scope of this pilot study done at a small elementary school, it is reasonable to expect that such interpretations are being made by other teachers also. This has implications for school-based leaders as they attempt to enact a school-wide vision of competency-based education in a political climate where the future of competency-

based education is also in flux. If teachers now find it necessary to prioritize one competency over the others, one can assume this will only intensify with the introduction of new government policies including an entirely redesigned curriculum and new definitions of educational success. School-based leaders will be called upon, more than ever before, to interpret competencies with teachers and to provide support for the integration of multiple competencies in the delivery of curriculum as opposed to in addition to curriculum.

Secondly, the findings in this pilot study suggest a more immediate role for teacher education programs in the development of an integrated approach to competency-based education. If new teachers can enter the classroom with a holistic idea of educational reform and its role in the delivery of curriculum, school-based leaders may find it easier to create a school-wide vision of 21st century education. This is, however, dependent on a number of factors including the shifting reform agendas of government and school division interpretations of competency-based education. In both of these circumstances, teacher education programs do not have any jurisdictional authority; this said, teacher education programs can lead the way in developing solid understandings of educational reform through research and the development of strong community and government partnerships.

Finally, acknowledgement of the shifting interpretations and enactments of 21st century educational reform will require a contemplative response from university educators. This research suggests that teacher education instructors will need to be cognizant of providing a well-balanced and holistic presentation of educational reform literature to students. Currently, this literature is taken up in a variety of ways in the teacher education program at the University of Calgary and this research suggests that, while we are attentive to these innovations, instructors will need to be increasingly mindful of their interpretations of educational reform so as not to unduly prioritize one

element over another. Indeed, an examination of the ways in which university instructors interpret educational reform literature may be a next step in addressing how educational reform lives within the context of teaching and learning and the requisite role that teacher education may provide.

CONCLUSION

This pilot study stands as the beginning of an examination on the interpretations that school-based personnel make in the implementation of 21st century educational reform efforts. It is clear that what is required is continued research on a provincial and national scale, for until it is understood how competency-based education is interpreted and enacted in the classroom, it is unclear as to the extent to which teaching and learning has, in fact, changed. Until this is known, both the implementation of educational reform and the education of future teachers will remain moving targets.

References

- Alberta Education (2010). *Inspiring education: A dialogue with Albertans*. Edmonton, AB: Alberta Education. Retrieved from <https://open.alberta.ca/publications/9780778586104> .
- Alberta Education (2011). *Framework for student learning: Competencies for engaged thinkers and ethical citizens with an entrepreneurial spirit*. Edmonton, AB: Author. Retrieved from <https://education.alberta.ca/media/6581166/framework.pdf>
- Alberta Education. (2013). *Ministerial order on student learning (#001/2013)*. Retrieved from http://www.education.alberta.ca/media/6951645/skmbt_c36413050707450.pdf
- Burns, A. (Online First, 2017). A cross Canada inventory: Evidence of 21st century educational reform in Canada. *Interchange*, 1-10. doi: 10.1007/s10780-017-9301-6

- Butler, T.A. (2014). School leadership in the 21st century: Leading in the age of reform. *Peabody Journal of Education*, 89, 593–602. doi: 10.1080/0161956X.2014.956524
- Friesen, S. (2009). *What did you do in school today? Teaching Effectiveness: A Framework and Rubric*. Toronto: Canadian Education Association. Retrieved from <http://www.galileo.org/cea-2009-wdydist-teaching.pdf>
- Friesen, S., & Scott, D. (2013). I Retrieved from: <https://inspiring.education.alberta.ca/wp-content/uploads/2014/04/Inquiry-Based-Learning-A-Review-of-the-Research-Literature.pdf>
- Fullan, M. (1998). Leadership for the 21st century: Breaking the bonds of dependency, *Educational Leadership*, 55(7), 1–6.
- Gaetane, J-M. (2008). Leadership for social justice: An agenda for 21st century schools. *The Educational Forum*, 72(4), 340–354. doi: 10.1080/00131720802362058
- Hull, J.E. (2013). Framing a new standard for teaching in Alberta. *Alberta Journal of Educational Research*, 59(1), 17-28.
- Jacobsen, M., Lock, J., & Friesen, S. (2013). Strategies for engagement: Knowledge building and intellectual engagement in participatory learning environments. *Education Canada*, 53(1). Retrieved from <http://www.cea-ace.ca/education-canada/article/strategies-engagement> .
- Male, T. & Palaiologou, I. (2015). Pedagogical leadership in the 21st century: Evidence from the field. *Educational Management Administration and Leadership*, 43(2), 214–231. doi: 10.1177/1741143213494889
- McFarlane, D.A. (2011). Multiple intelligences: The most effective platform for global 21st century educational and instructional methodologies. *College Quarterly: Seneca College of Applied Arts and Technology*, 14(2), 1-8. Retrieved from <http://www.files.eric.ed.gov/fulltext/EJ962362.pdf>

- Mullen, C.A. (2011). 21st-century priorities for leadership education and prospective school leaders. *Scholar-Practitioner Quarterly*, 4(4). 331–333.
- Pence, H. E. (2010). Teaching in the 21st century. *Journal of Educational Technology Systems*, 38(2), 103-110. doi: 10.2190/ET.38.2.c
- Peterson, M. (2004). Towards whole schools: Building a movement for dialogue and action in the 21st century. *International Journal of Whole Schooling*, 1(1), 4-7.
- Saavedra, A. R., & Opfer, V. D. (2012). Learning 21st-century skills requires 21st-century teaching. *Phi Delta Kappan*, 94(2), 8–13.
- Task Force for Teaching Excellence. (2014). *Report to the Minister of Education, Government of Alberta: What we heard- Community and stakeholder consultation*. Edmonton, AB: Alberta Education.

ENHANCING STUDENT ASSESSMENT THROUGH VEEDBACK

Soroush Sabbaghan

University of Calgary

Providing audio-visual feedback through screencast technology has been shown to reinforce learning after submission. However, these video feedbacks are often limited by the annotation tools afforded by the word processing software, making them difficult to follow. The combination of a tablet and stylus along with screencast technology offers more freedom and can enhance student experience. This presentation reports the results of an investigation into whether these new enriched feedbacks for assignments, called veedbacks, boost student experience. The qualitative and quantitative findings reveal that students are very positive about veedbacks.

Keywords: Higher education; assessment; technology

INTRODUCTION

The recent shift towards a student-centred approach in higher education has prompted attention to the shortcomings of the long-standing summative measure of student learning. The shift has also highlighted the significant role feedback has in the learning process. Most instructors who employ a student-centred approach now believe learning should not stop when an assignment is submitted. Effective feedback assists students to engage with knowledge at a deeper level (Hatzipanagos & Warburton, 2009) and provides students with the skills to monitor and sustain continuous learning (Boud, 2007).

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 93-102. Calgary, Canada: Werklund School of Education, University of Calgary.

Although I have observed many of my colleagues designing real-word tasks – a hallmark of the student-centred approach – I have also noticed that they provide summative feedback that focuses on letter grades, highlights errors, or underlines limitations. Comments such as “good work,” “well-structured and written,” and “APA format observed,” are not sufficient to increase understanding and there remains a need “for students to develop the capabilities to operate and judges of their own learning” (Boud & Molloy, 2013, p. 68). Clearly, feedback methods that aim to engage students at a deep level are required.

FEEDBACK AND STUDENT ENGAGEMENT

Research has highlighted the lack of student engagement and responsiveness to feedback. Boud and Molloy (2013) identified lack of student engagement as a weakness in undergraduate curriculum and design and one of the least satisfying aspects of the student experience. Other research has suggested that the feedback provided in academia is authoritative, ambiguous, and cryptic (Chanock, 2000; Thompson & Lee, 2012)

Research about the efficacy of feedback has suggested that students attend to feedback that is explanatory and which develops learning (Thompson & Lee, 2012). Feedback which explains gaps in knowledge and understanding also increases the sustainability of learning beyond the immediate task (Glover & Brown, 2006) and promotes student confidence and self-esteem (Boud, 2007). In contrast, generic comments can block further learning as they omit the specific information required for the students to build their knowledge and capabilities (Chanock, 2000; Thompson & Lee, 2012).

The assumption that students implicitly know how to engage with feedback has also been challenged (Thompson & Lee, 2012). Even when finally students learn to understand their instructor’s feedback, it may be too late to be of real benefit to students. According to Boud (2007),

”Feedback should be provided quickly enough to be useful to students and should be given both often enough and in enough detail” (p. 97). For students to make sense of and engage with feedback they should understand the process and criteria of assessment (Glover & Brown, 2006; Thompson & Lee, 2012). Students may also require direction about assessment expectations (Evans, 2013).

Beaumont, O’Doherty, and Shannon (2011) argue that feedback should be a continuous dialogue within a cyclical assessment process. Directed and illustrative feedback is required if students are to be actively engaged in learning (Boud & Molloy, 2013). To do this, a discourse must be established between instructors and students (Chanock, 2000) consisting of “high quality feedback exchanges” (Evans, 2013, p. 106) that enable students to make sense of the feedback offered and which stimulate informed learning (Boud, 2007; Crook et al., 2012; Thompson & Lee, 2012).

Providing Feedback with Technology

There is a growing body of evidence suggesting that using technology to provide feedback may be one means of making feedback more meaningful for students (Campbell, 2005; Crook et al., 2012; Evans, 2013). Specifically, the use of video as the medium of providing feedback, called *veedback*, (coined by Thompson & Lee, 2012) has received much attention. For instance, Thompson and Lee (2012) explored using video accompanied by written comments. Turner and West (2013) provide evidence for the benefit of using video for individualized assessment.

Research comparing student perceptions of both written and veedback shows that, for a significant number of students, veedback increased their understanding of marked comments (Crook et al., 2012; Thompson & Lee, 2012) and students were able to better engage with the feedback to revise and advance their work (Thompson & Lee, 2012). Video also allows students to watch veedbacks at their own pace and use it to inform their academic practice as well as evaluate their assessed submissions (Brick & Holmes, 2008).

It is evident that the use of video may have several potential advantages as a means of providing assessment feedback. Crook et al. (2012) suggested that the use of online video feedback encourages instructors to "reflect on their current feedback practices so that they can provide more detailed, comprehensible and engaging feedback" (p. 387). Using veedbacks may also stimulate recall and trigger the noticing of aspects of writing that the instructor does not specifically point out but the student discerns nonetheless (Sabbaghan, 2013). In this study, students were provided with veedbacks in the form of individualized video screencasts with accompanying annotations and narration. The combination of a tablet and stylus was used to further enhance the visualization aspect of veedbacks.

METHOD

Veedbacks

Students enrolled in two online graduate courses at the University of Calgary in 2016 received assessment feedback in the form of individualized video screencasts. Each video was approximately four minutes in length. Students submitted a 400-word response to weekly tasks in Microsoft Word format. The files were opened on the iPad Pro using the MS Word application because the application offers the most versatile set of annotation tools this researcher is aware of. The instructor would first read the submission once and then proceed to annotate the submission using the Apple pencil while the screencast of the iPad was being recorded. This type of screen casting is possible with the iPad when it is directly connected to a laptop. The instructor provided a commentary of the assessment process while the annotations were made.

The researcher speculated that the combination of the commentary and the live annotations would increase comprehensibility of the feedback and trigger the student to notice what the instructor was drawing attention to. At the end of each video, the instructor used the split screen option and

provided a live assessment using the rubric previously given to students. The live assessment included marking the submission against the rubric with a commentary of why a level was selected.

The recorded videos were attached to the score given to the submission and uploaded via the University's learning management system (D2L). This provided a timely and paperless means of providing feedback that can be accessed using a variety of mobile devices. Students were also provided with written feedback in the form of a digital copy of the completed assessment rubric.

Online Survey

Students were invited to complete an anonymous online questionnaire at the end of the term; however, from 32 students, only 18 participated. The questionnaire was developed using an online form accessed via D2L. The online form sought information regarding the perceived quantity and quality of the feedbacks, the degree to which students understood them, and the amount of time they spent reviewing their feedback. Students were asked to rate each item of the 15-item survey on a five-point Likert scale. Finally, students were given the opportunity to provide any additional comments on their experience with feedbacks.

RESULTS

The first six questions of the survey focused on the quality of annotated feedback compared to non-video feedback students had received in previous courses. A summary of the responses obtained for these items is presented in Figure 1.

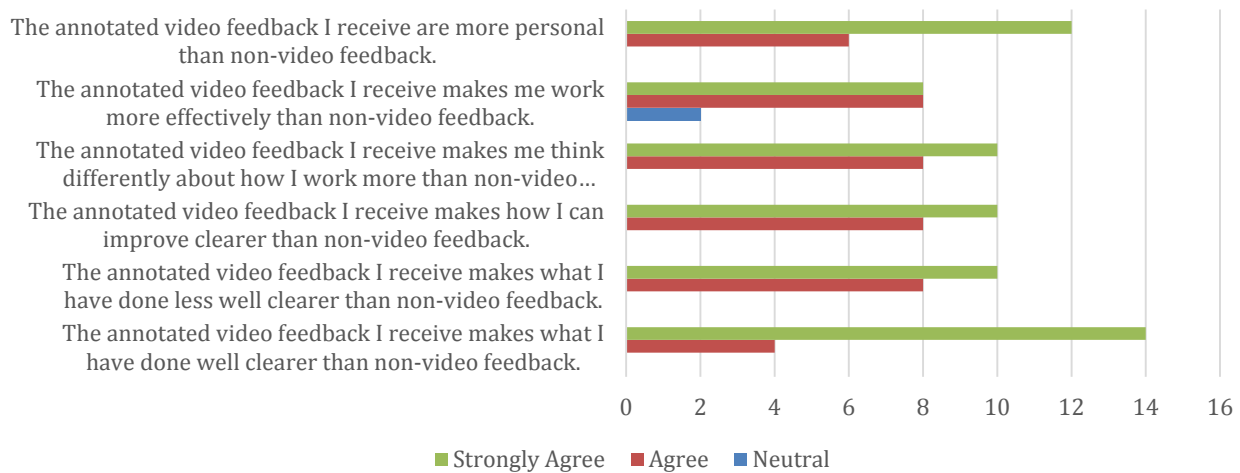


Figure 1: Summary of results comparing veedbacks to non-video feedback

As can be seen, most respondents believe that annotated veedbacks makes both what they have done well and less well clearer than non-video feedback. Additionally, most of the respondents believe that annotated veedbacks provokes them to think differently about their submissions. However, fewer respondents felt that veedbacks will inspire more effective future submissions. Finally, many respondents felt that veedbacks are more personal than non-video feedbacks.

The next nine questions focus on the effectiveness, quality, and quantity of the annotated veedbacks. Figure 2 offers a summary of the results.

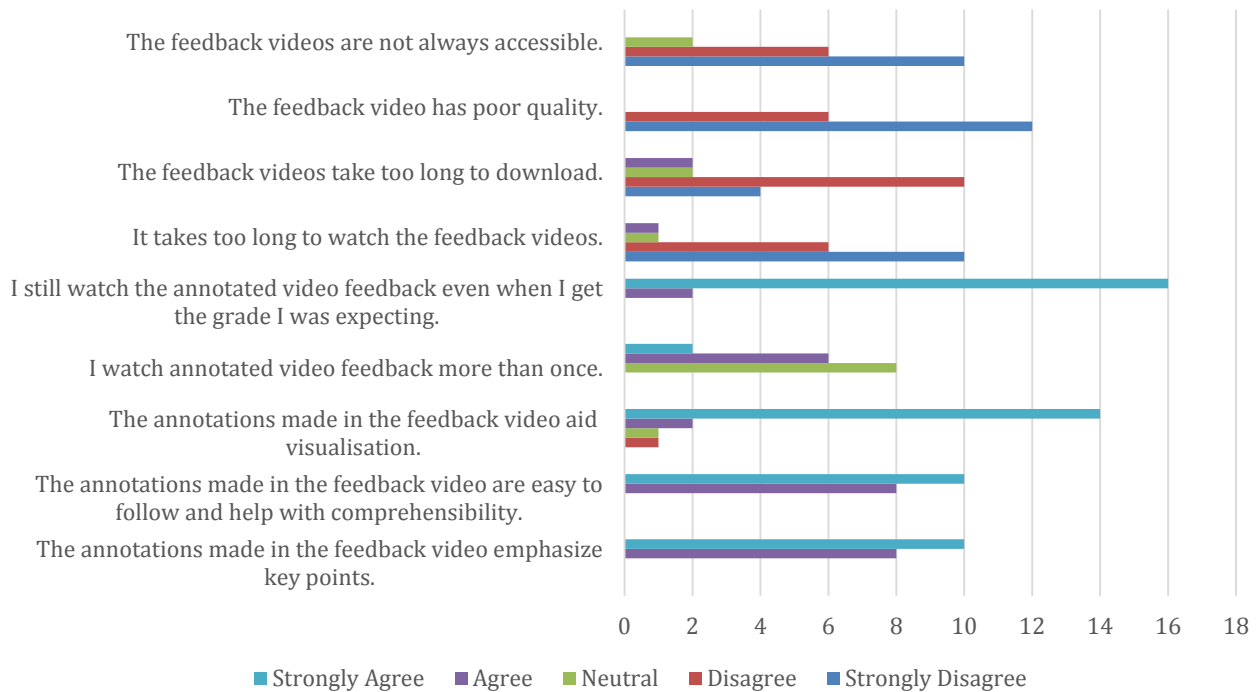


Figure 2: Summary of results on effectiveness, quality, and quantity of veeedbacks

As indicated in the chart, although most the respondents did not have issues regarding the accessibility of the videos, some students flagged accessibility as a problem. There were no significant issues with the quality of the video feedbacks, however, due to high quality of the videos, some files were rather large and resulted in longer download times, as reflected in the responses. The length of the videos was also an issue for some students. About 22% of the respondents indicated that the videos were too long. An overwhelming majority of the respondents suggested that they watched the videos regardless of the score they had received. However, many students indicated that they watched the veeedbacks only once, although a minority (22%) indicated that they watched the veeedbacks more than once. Although about 88% of students felt that the annotations in veeedbacks aided visualisation, one student disagreed that annotations were an enhancement and another student rated this question as neutral. Finally, all the respondents had strong opinions favouring veeedbacks as adding to comprehensibility and emphasizing key points.

Feedback From Students

Students also provided comments in the survey, each focusing on a different theme. For instance, on the theme of personal connection a student stated:

I very much like the feedback videos because they are quite personal and give me a sense of connection to the instructor. The intonation and expression in the instructor's voice gives me a clearer cue of whether I have done well or not and being able to see and hear the feedback at the same time makes it much easier to understand the good and bad points.

On the theme of improving the effectiveness of future practice, a student said “When I received full marks, it meant I had met the assignment requirements but having a video allowed me to get feedback on other aspects of my assignment which helped improve my teaching practice.” Another student wrote: “...my classroom practices have changed as a result of the video feedback I have received.”

Finally, on the theme of accessibility, a respondent indicated ‘...Easy to follow with the audio and visual annotations. I sometimes re-watch these feedback videos, especially those that are positive (as a confidence booster), but will never find myself re-reading feedback that is written.’

DISCUSSION AND CONCLUSION

This paper has described how students perceive feedback as a method for providing annotated individualized feedback. Most students favoured feedbacks. However, since most of the students had received this form of feedback for the first time, their strong preference may be due to the novelty factor. Nevertheless, other studies (Turner & West, 2013; West & Turner, 2016) reveal a strong preference for feedback among university students. Student responses, as well as comments provided on the combination of auditory and visual modalities, support Thompson and Lee’s (2012)

claim that veedbacks serve as a better vehicle for in-depth explanation than other mono-modal feedback. The live annotations, coupled with spoken commentary and harmonized with the explanation of where and why marks were allocated, likely provided the greater depth of explanatory feedback that may be required to engage students (Crook et al., 2012; Evans, 2013; Thompson & Lee, 2012). Veedbacks may therefore be an effective means of increasing student engagement and exposing students to more detailed explanations than they would normally receive with only written commentary.

References

- Beaumont, C., O'Doherty, M., & Shannon, L. (2011). Reconceptualising assessment feedback: a key to improving student learning? *Studies in Higher Education*, 36(6), 671-687.
- Boud, D. (2007). Reframing assessment as if learning were important. In D. Boud & N. Falchikov (Eds.), *Rethinking assessment in higher education: Learning for the longer term* (pp. 14-25). London Routledge.
- Boud, D., & Molloy, E. (2013). Rethinking models of feedback for learning: the challenge of design. *Assessment & Evaluation in Higher Education*, 38(6), 698-712.
- Brick, B., & Holmes, J. (2008). Using screen capture software for student feedback: Towards a methodology. Paper presented at the IADIS International Conference on Cognition and Exploratory Learning in the Digital Age (CELDA 2008), Freiburg, Germany.
- Campbell, G. (2005). Podcasting in education. *EDUCAUSE*, Nov/Dec, 5, 33-44.
- Chanock, K. (2000). Comments on essays: Do students understand what tutors write? *Teaching in Higher Education*, 5, 95-105.

Crook, A., Mauchline, A., Maw, S., Lawson, C., Drinkwater, R., Lundqvist, K., . . . Park, J. (2012).

The use of video technology for providing feedback to students: Can it enhance the feedback experience for staff and students? *Computers & Education*, 58(1), 386-396.

Evans, C. (2013). Making sense of assessment feedback in higher education. *Review of Educational Research*, 83(1), 70-120.

Glover, C., & Brown, E. (2006). Written feedback for students: too much, too detailed or too incomprehensible to be effective? *Bioscience Education*, 7(1), 1-16.

Hatzipanagos, S., & Warburton, S. (2009). Feedback as dialogue: Exploring the links between formative assessment and social software in distance learning. *Learning, Media and Technology*, 34(1), 45-59.

Sabbaghan, S. (2013). How noticing is affected by replay of writing process during stimulated recall. *Procedia-Social and Behavioral Sciences*, 83, 629-633.

Thompson, R., & Lee, M. J. (2012). Talking with students through screencasting: Experimentations with video feedback to improve student learning. *The Journal of Interactive Technology and Pedagogy*, 1(1).

Turner, W., & West, J. (2013). Assessment for" Digital First Language" Speakers: Online Video Assessment and Feedback in Higher Education. *International Journal of Teaching and Learning in Higher Education*, 25(3), 288-296.

West, J., & Turner, W. (2016). Enhancing the assessment experience: improving student perceptions, engagement and understanding using online video feedback. *Innovations in Education and Teaching International*, 53(4), 400-410.

RESPONDING TO THE CALLS TO ACTION: INDIGENIZING A GRADUATE PROGRAM

Yvonne Poitras Pratt, Solange Lalonde, Aubrey Hanson, and Patricia Danyluk

Werklund School of Education

In this article, we present our work on Indigenizing pedagogy as a response to the Truth and Reconciliation Commission (2015) Calls to Action. While Indigenous scholars provide access to the written voices of First Peoples (Battiste, 2013; Donald, 2009; Smith, 2012), the graduate program we created around the topic of reconciliation intentionally invited in Elders and allies to teach and learn alongside students. Our research reveals that inclusion of knowledge keepers, a respectful learning environment, along with creative pedagogical approaches, fostered transformative learning; yet we argue these innovations were only possible because our visions were supported by allied leadership.

Keywords: Indigenous education; reconciliation; reconciliatory pedagogy

RECONCILIATION: A SHARED RESPONSIBILITY

As Indigenous educators and allies, we have responded to the Truth and Reconciliation Commission (TRC) (2015) *Calls to Action* with the Indigenization of a new graduate program focused on realizing reconciliation. A move to Indigenization has strengthened in recent years, led by Indigenous scholars and frontrunners who bring a variety of perspectives and responses to their readers (Alfred, 1999; Battiste, 2013; Smith, 2012; Wilson, 2004). These efforts are further strengthened by the involvement of allies committed to making positive change in the relationships between Indigenous and non-Indigenous peoples (Association of Canadian Deans of Education,

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 103-111. Calgary, Canada: Werklund School of Education, University of Calgary.

2010; Regan, 2010). We see reconciliation, where dark truths are brought to light, as a place where difficult conversations in safe places are requisite to moving forward (St. Denis, 2007). Chief Justice Murray Sinclair, in his work for the Truth and Reconciliation Commission, spent countless hours with Indian Residential School survivors and singled out education as key to moving forward with the work of reconciliation:

Education is what got us into this mess—the use of education at least in terms of residential schools—but education is the key to reconciliation . . . That's why we say that this is not an aboriginal [sic] problem. It's a Canadian problem. (Watters, 2015, para. 17-18)

While the TRC *Calls to Action* extend across diverse realms, including the legal system, media, museums, and other public sites, it is the role of education that stands out in this important work. For many educators, the reticence to engage in Indigenous perspectives is not due to a lack of caring; rather, it stems from an uneasiness, or fear of not knowing how to undertake this work in a respectful manner. Having learned some of the atrocities that are hallmarks of Indigenous education, including residential schooling, educators are understandably anxious about not recreating the injustices of the past. As Paulette Regan (2010) describes it, “settlers may respond to [this] injustice with empathy, but lacking strategies for taking personal and political action, they simply intellectualize and compartmentalize their newfound knowledge and do nothing” (pp. 64-65). For the Indigenous and non-Indigenous students who signed up for the inaugural year of our graduate course, further inaction was not an option. Our students committed to making a genuine difference by designing critical service-learning responses to the TRC’s calls to action.

A CALL TO ACTION: IMAGINING A WAY TOWARDS RECONCILING

In 2015, the authors were encouraged by faculty leadership to design a graduate program grounded in Indigenous perspectives. We were drawn to the emerging work of reconciliation through

education as a powerful way to address some of the injustices of Canada's historical past. Understanding the potential inherent in this focus, our task was to create a respectful learning environment to empower learners with theories, stories, deep dialogue, creative works, ceremony, and a strong sense of community as a way to inspire and mobilize their reconciliatory intent. We also recognized that, without a clear pedagogical model of reconciliation to follow, we would need to create a program design based on our lived experiences and our knowledge of the literature that spoke to us about possibilities (see Figure 1 below).



Figure 1: Indigenous education: A call to action program (Werklund School of Education)

In designing this program, each author brought varied professional backgrounds working in Indigenous communities to the task, yet we were united by a shared vision of realizing reconciliation. In our various roles, we had each experienced the difficulties and challenges of bringing Indigenous truths to educators and, in our more successful moments, we had similarly shared in the triumph of transformative learning (Mezirow, 2000). We understood that studying the impact of this program on its inaugural cohort would help improve subsequent course offerings, and that the feedback and stories might help inspire others to take up their own reconciliatory actions. To gather insights into how we might achieve momentum around this type of work, we designed a research study that solicited feedback from all participants: the graduate students, who took part in a World Café event; the knowledge keepers, who were individually interviewed; and the instructors, who provided reflective feedback through journal entries. The authors were instructors in three of the four program courses.

In designing our program, we intentionally included a mix of readings, resources, and presentations by Indigenous scholars and non-Indigenous allies to ensure a balanced representation of voices. Our readings represented the range of responses to reconciliation: empowerment through reclamation of Indigenous knowledge (Smith, 2012); political agency (Battiste, 2013); community and adult education initiatives (Burton & Point, 2006); imagining decolonizing responses (Donald, 2009); resistance through humour (King, 2012); anger (Loft, 2012); and, importantly, aesthetic responses (Robinson & Martin, 2016). Students reported these readings as intense yet essential. We supplemented these scholarly explorations with the spoken word through the sharing of stories, podcasts, and short videos in order to expand our learners' vocabulary beyond the print tradition to a more creative and affective domain of learning. As one example, we devoted an entire afternoon to a screening of digital stories from a northern Alberta community so students could experience contemporary lived experiences from a Métis settlement perspective. We incorporated field trips, one to a nearby First Nations community to experience the power of place, ceremony, and land-based traditions, and another to a downtown art gallery that featured contemporary Indigenous artists. These off-campus experiences allowed students to experience "personal connections to the land [and gain] opportunities to explore self through art and creativity" (World Café response, July 2016).

In creating course assignments, we were similarly purposeful: we asked students to work collaboratively, creatively, and courageously as a way of imagining, experiencing, and understanding reconciliation (Donald, 2009; Robinson & Martin, 2016). In response, students composed an original "decolonizing ditty" based on a required course reading which was then performed in front of our class with a live grand piano accompaniment. Having both Indigenous and non-Indigenous educators leading the program brought a sense of the interplay between theory

and action, Indigenous and settler, decolonization and Indigenization. Finally, we intentionally included the design and delivery of a critical service-learning project into their final two courses as a way of transforming from theory into the realm of praxis, where social change is possible.

Importantly, our work in Indigenous education has proven to us the potential of aesthetic approaches to open up conversations and individual reflections on how individuals might envision their own role in reconciliation. As Robinson and Martin (2016) remind us, the arts “unsettle us, provoke us, and make us reconsider our assumptions” (p. 3). Fittingly, the students revealed that they were given “multimodal opportunities for self-reflection inspired by learning” (World Café collective response, July 2016). Moreover, students maintained that they were provided with a “variety of perspectives [in] an attempt to understand each other, *even when uncomfortable and/or fearful*” (World Café response, July 2016, emphasis added). In taking up this difficult work, we recognize our roles and our responsibilities in enacting transformative learning for future educators and other leaders who, in turn, will positively impact future generations.

DECOLONIZING, MOVING TOWARDS INDIGENIZING

By insisting on the need to work as a collective on the design of our graduate program, we were rooting ourselves in Indigenous principles wherein the goals of decolonizing (Smith, 2012) and reconciling (Regan, 2010; TRC, 2015a) were far more likely to be realized. Aligning with critical theory, we understand decolonization as locating and dismantling the structures of colonialism that perpetuate inequities against Indigenous peoples. We also see decolonization as a shared and relational undertaking with settler peoples (Bishop, 2008; Regan, 2010). We learn from Māori scholar Linda Tuhiwai Smith (2012) that “[c]oming to know the past has been part of the critical pedagogy of decolonization” (p. 36). Yet, we are also cognizant that coming to know must purposefully transition to praxis, or *learning to do*, if we are to inspire an active response to

reconciliation. As we see it, reconciliation is best realized through those willing to respond in intentional and respectful ways, where even “small, symbolic, and everyday actions” (Robinson & Martin, 2016, p. 2) can be reconciliatory. Intrinsically, we see reconciliation in First Peoples and allies working *together* while respecting our differences.

Indigenous educators are deeply implicated in this work as a result of lived experiences and the ongoing challenges faced by our communities. These realities regularly remind us of our ethical responsibility to leverage our education to serve those in need. In *Moving Forward, Giving Back*, Indigenous advocate Larry Morrisette (2013) speaks to this responsibility in his professional role as a “change agent” working with those on the north side of Winnipeg, where “Aboriginal cultures and values have much to teach about building communities of sharing and cooperation and equality” (p. 41). In articulating our own roles in reconciliation, we remind readers that the work of reconciliation is a shared responsibility amongst Indigenous and non-Indigenous peoples.

Significantly, moving from decolonizing towards Indigenizing requires us to learn alongside Indigenous knowledge keepers, and particularly to honour local Indigenous places and voices. To this end, we acknowledged the territory where our learning took place by inviting Blackfoot Elder Casey Eagle Speaker to open our learning space with a traditional prayer. Our two program Elders, or knowledge keepers, who taught and learned alongside our students for the duration of the 10-day summer program, gifted our host Elder with tobacco as a sign of respect in keeping with local cultural protocol. The extent of involvement of these respected knowledge keepers was the greatest innovation in our program, and students noted the “intentional authentic Indigenous delivery” (World Café collective response, July 2016) as meeting their learning needs. Miss Betty, a *Kehteyak* from northern Alberta, relayed an important recognition: “they [the University] finally know what it’s about” (Letendre, personal communication, August 30, 2016).

Similarly, instructor reflections revealed that the support of university leadership was requisite to fostering our collective orientation and the respectful integration of knowledge keepers within our program. With faculty leadership supporting our program vision, we were able to come together as a group of Indigenous educators and allies to create an innovative and change-enabling graduate program—a place where we “faced our history together in spaces where we could be vulnerable” (World Café collective response, July 2016).

MOVING FORWARD

As program instructors, we have relied on our lived experiences, our academic expertise, and a range of Indigenous knowledge traditions to guide us. Our research on the program’s first cohort reveals that our students recognized and valued our pedagogical intentions as they affirmed the inclusion of knowledge keepers and place-based learning as integral and authentic. Given the relational aspect of reconciliation, the essential role of dialogue in strengthening relationships was another key finding from our study. Our students are true innovators in the work of reconciliation, imagining and creating reconciliatory actions where there was no path to follow.

Finally, our emerging vision of reconciliatory pedagogy relies on the support of university leadership in Indigenizing education. The ongoing involvement of knowledge keepers throughout the summer program was made possible only because of senior faculty leadership honouring the lived experiences of Indigenous community knowledge keepers. If the academy is to be Indigenized, we will need all strengths gathered together around this work.

References

Alfred, T. (1999). *Peace, power, righteousness: An Indigenous manifesto*. Don Mills, ON: Oxford University Press.

Association of Canadian Deans of Education. (2010). *Accord on Indigenous education*. Retrieved from http://www.csse-scee.ca/docs/acde/acde_accord_indigenousresearch_en.pdf.

Battiste, M. (2013). *Decolonizing education: Nourishing the learning spirit*. Saskatoon, SK: Purich.

Burton, W. & Point, G. (2006). Histories of Aboriginal adult education in Canada. In T. Fenwick, T. Nesbit, and B. Spencer (Eds.), *Contexts of adult education: Canadian perspectives* (pp. 36-48). Toronto, ON: Thompson Educational.

Donald, D. (2009). The curricular problem of Indigeness: Colonial frontier logics, teacher resistances, and the acknowledgment of ethical space. In J. Nahachewsky & I. Johnston (Eds.), *Beyond presentism: Re-imagining the historical, personal, and social places of curriculum* (pp. 23–41). Rotterdam, The Netherlands: Sense Publishers.

King, T. (2012). We are sorry. In *The inconvenient Indian: A curious account of Native people in North America* (pp. 99-126). Toronto, ON: Anchor Canada.

Loft, S. (2012, Summer). Reconciliation...Really? From MacDonald to Harper: A legacy of colonial violence. *West Coast Line*, 46, 40-47, 185.

Mezirow, J., & Associates (Eds.). (2000). *Learning as transformation: Critical perspectives on a theory in progress*. San Francisco, CA: Jossey-Bass.

Morrisette, L. (2013). We are the agents of change: Thoughts on Aboriginal adult education. In J. Silver (Ed.), *Moving forward, giving back: Transformative Aboriginal adult education*. Black Point, NS: Fernwood.

- Regan, P. (2010). Peace warriors and settler allies. In *Unsettling the settler within: Indian residential schools, truth telling, and reconciliation in Canada* (pp. 213-237). Toronto, ON: UBC Press.
- Robinson, D. & Martin, K. (2016). Introduction: 'The body is a resonant chamber.' In D. Robinson & K. Martin (Eds.), *Arts of engagement: Taking aesthetic action in and beyond the Truth and Reconciliation Commission of Canada* (pp. 21-41). Waterloo, ON: Wilfred Laurier University Press.
- Smith, L.T. (2012). *Decolonizing methodologies: Research and Indigenous peoples (2nd ed.)*. New York, NY: Zed Books.
- St. Denis, V. (2007). Aboriginal education with anti-racist education: Building alliances across cultural and racial identity politics. *Canadian Journal of Education*, 30(4), 1068-1092.
- Truth and Reconciliation Commission of Canada (2015). *Honouring the truth, reconciling for the future: Summary of the Final Report of the Truth and Reconciliation Commission of Canada*. Ottawa, ON: Government of Canada.
- Watters, H. (2015, June 1). Truth and Reconciliation chair urges Canada to adopt UN declaration on Indigenous Peoples. *CBC News*. Retrieved from <http://www.cbc.ca/news/politics/truth-and-reconciliation-chair-urges-canada-to-adopt-un-declaration-on-indigenous-peoples-1.3096225> .
- Wilson, A. C. (2004). Reclaiming our humanity: Decolonization and the recovery of Indigenous knowledge. In D. A. Mihesuah & A. C. Wilson (Eds.), *Indigenizing the academy: Transforming scholarship and empowering communities* (pp. 69-87). Lincoln, NE: University of Nebraska Press.

SCHOOL WORK, ADOLESCENT DEPRESSION AND THE CLASSROOM

Nahum Arguera

University of Calgary

Studies suggest that adolescents report a variety of academic stressors, which can have detrimental effects on mental health. Using the Health Behavior in School-Aged Children survey (2005/6 data), this paper provides an analysis of the effects of schoolwork pressures on depressive symptomology in Canada. Results indicate that school work pressure is associated with depressive symptoms in a negative way. Implications and stress-reduction strategies in the classroom are also discussed.

Keywords: school work pressure; stress; depression; stress reduction; adolescents

INTRODUCTION

Depression is a mental disorder, the symptoms of which can include unhappy mood, loss of interest/pleasure, decreased energy, feelings of guilt, low self-worth, disturbed sleep and appetite, and poor concentration (World Federation for Mental Health, 2012). There is evidence to suggest that depression occurs with considerable frequency in childhood and adolescence (Avenevoli, Knight, Kessler, & Merikangas, 2008). The purpose of this study was to understand the relationship between school work pressure and school related student concerns with depressive symptoms. The findings of this study will have implications for teachers, educators, and administrators to become aware of the effects of increased school pressures on mental health of adolescents. This will allow teachers to become leaders in promoting wellness strategies within schools and classrooms. Recommendations are included to continue the important work of enhancing student mental health within the classroom.

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 112-120. Calgary, Canada: Werklund School of Education, University of Calgary.

LITERATURE REVIEW

Over the past two decades, research has shown that depression among children and adolescents is rapidly increasing. However, the prevalence of depression is higher among adolescents aged 12-18 years of age (Avenevoli et al., 2008). It is essential to engage in a study of adolescents because it is a time period in individuals' lives where there are tremendous changes physically, sexually, psychologically and emotionally (WHO, 2015). Longitudinal studies in high income nations have shown that if it is left unattended, depression in adolescence can have longstanding social and economic implications in adulthood, including lower levels of educational attainment, increased criminal involvement, higher levels of unemployment and difficulties with personal relationships (World Federation for Mental Health. 2012). As well as the costs incurred by the health system, the largest additional societal costs of depression among adolescents come from criminal justice services and extra educational provisions (Henderson, Henderson, Lavikainen, & McDaid, 2004). Risk factors for depression include biological factors, emotional difficulties, family circumstances, interpersonal problems and school problems (Greenberg, Domitrovich, & Bumbarger, 2001). This paper does not attempt to account for all the risk factors affecting depression, but rather to examine the link between school work pressure and depression among adolescents in Canada. Many educational boards now acknowledge the stresses and workloads that adolescents experience in school and recognize that these stresses may have detrimental effects on their health (Alberta Education, 2015; Wilmott, 2014). This research is necessary to gain more insight into the effect of school work pressure on adolescent mental health.

It is well established that children and adolescents go through many different types of school-related pressures and stresses. These can include stress produced by teaching methods, school work load, school environment, anxieties about the future, and expectations from adults (de Anda et al.,

2000; Matheny, Aycock, & McCarthy, 1993). This paper focuses on stress caused by school work load. Some studies find that school pressures have a lot to do with emotional, psychological and even physical well-being, indicating a negative relationship between school pressures and well-being (Lin & Chen, 1995; Matheny et al, 1993; Phelan et al., 1991). Low et al. (2012) found that there was a significant effect of schoolwork stress on depressive symptomology among adolescents. In a representative sample of 7th grade Quebec students, the researchers found that adolescents who reported having schoolwork stress were about three times more likely to report having depressive symptoms than those adolescents that reported having no stress due to schoolwork.

Qualitative studies have also been conducted to better explain these relationships through the lived experiences of the adolescents affected. Phelan et al. (1991) reported that 90% of their participants reported tremendous pressure to achieve academically which resulted in students expressing feelings of depressive symptomology. Another study done by Lin & Chen (1995) provided insight to the voices of students experiencing school stress and how these stressors affected their lives. For example, a quote by one of their participants illustrates the effect of school work pressure on mental health: “It [academic pressure] is just like a devil, hanging around me all day long and depriving me of the beautiful life. The sky changed from blue into gray and there is no sign of life left in the surroundings... Every day, the six subjects are like six huge mountains on top of me. Only the ten minutes or so on the way back home is the time I can have a rest. But even then my mind is blank and numb....” (p. 156-157). A study done by Matheny et al. (1993) states that academic stress can be referred to as an “invisible disability,” because it leads to worry and feelings of being overwhelmed among adolescents.

THE STUDY

The Health Behaviour in School-aged Children (HBSC) study is an interdisciplinary, cross-national data collection collaboration. Cross-sectional data are collected every four years from students in over 40 countries. The HBSC was one of the first international surveys on adolescent health. The study aim is to understand youth's health in their social environment (Roberts et al., 2009). The objective of this quantitative study is to highlight the results of the analysis of the relationship between school variables and depressive symptoms among Canadian adolescent sample.

The sample consisted of 5930 students. The average age of the students in the study was 13.84 years old. These students were randomly selected from 187 publicly funded schools. The schools were chosen using weighted probability techniques to ensure that the sample was representative by regional geography and demographic features. Data were obtained from students in all 10 provinces and three territories. Schools and classrooms were chosen to reflect the distribution of students from grades 6-10 in the Canadian population (Saab & Klinger, 2010).

RESULTS

The results from Table 1 show that all three school-related variables are significantly related to frequency of reporting depressive symptoms among Canadian adolescents. A positive correlation coefficient of 0.30 indicates that as students report more school work stress, they report depressive symptoms more frequently. A negative correlation coefficient of -0.19 shows that reporting lower academic achievement is related to higher frequency of reporting depressive symptoms. Similarly, a correlation coefficient -0.22 signifies that reporting lower school satisfaction is related to higher frequency of reporting depressive symptoms among Canadian adolescent students.

	<i>Depressive Symptoms</i>	<i>School Work Pressure</i>	<i>Academic Achievement</i>	<i>School Satisfaction</i>
<i>Depressive Symptoms</i>	1.00			
<i>School Work Pressure</i>	0.30***	1.00		
<i>Academic Achievement</i>	-0.19***	-0.18***	1.00	
<i>School Satisfaction</i>	-0.22***	-0.20***	0.31***	1.00

Table 1: Correlation Matrix of Variables from the Canadian Health Behavior in School Aged Children 2006 Survey (***p<0.001).

DISCUSSIONS/EDUCATIONAL IMPLICATIONS

Controlling for socio-demographic variables, the results show that the stressor of school work pressure is significantly, positively associated with depressive symptomology. In other words increased levels of school work pressure is associated with increased frequency of reporting depressive symptoms. It is evident that school work pressure creates a considerable amount of strain which in turn results in depressive symptoms. This is also supported by literature that suggests that school work pressure is associated with depressive symptomology (Ang & Huan, 2006; Anderman, 2002; Low et al., 2012).

These findings have several implications in schools and classrooms. Research suggests that schools are important for prevention of negative mental health outcomes and health promotion (Jennings & Greenberg, 2009; Russell-Mayhew et al., 2015). Students express many stresses related to school work or academic stress that include examinations, studying, assignments, achievement, and learning (de Anda et al., 2000; Kouzma & Kennedy, 2004). As educators, it is critical to be able to identify these sources of stress and be provided with professional development opportunities in order to successfully help students manage stress. Schools and curricula should incorporate stress

management initiatives which integrate improvement of time management, mindfulness, relaxation, problem solving, and career counselling (Kouzma & Kennedy, 2004; Kraag, Zeegers, Kok, Hosman & Abu-Saad, 2006; Meiklejohn et al., 2012). Additionally, research demonstrates that students experience stress due to unclear assignments, timing and spacing of assignments, unclear subject objectives, uninteresting curriculum, and boring classes (Kouzma & Kennedy, 2004). This evidence also has potential to inform curriculum development and course design in schools and classrooms in order to develop programs and lesson plans that ameliorate effects of academic stress.

RECOMMENDATIONS

Based on the results of the study, I offer the following recommendations to teachers, administrators, and others who play a role within the education system.

- 1) Be aware that increased pressure in the classroom can increase level of student depression.
- 2) Consider how punitive policies, unclear directions, timing and spacing of assignments, and other curriculum decisions may have an impact on student mental health. While no teacher is perfect, there are practical things that can be done to mitigate student stress in the classroom.
- 3) Engage in professional development opportunities in student mental health.
- 4) Examine how you might incorporate wellness strategies into everyday classroom routines.
- 5) Be strategic about workload, assignments, expectations and due dates. A lean design can be a thoughtful approach.

CONCLUSION

Teachers and administrators can play a key role in becoming leaders in their schools in addressing student stress, and therefore negative health outcomes. This study provides insight on the effects of school pressures on depressive symptoms. The paper highlights that school work pressure, school satisfaction, and achievement are significantly related to increased levels of reporting depressive symptoms among Canadian adolescents. This provides evidence for teachers and administrators to intentionally consider and develop strategies that can assist students to develop skills that can mitigate the effects of school stress.

References

- Alberta Education. (2015). *Diploma Examinations*. Retrieved from <http://education.alberta.ca/admin/testing/diplomaexams.asp> .
- Anderman, E. (2002). School effects on psychological outcomes during adolescence. *Journal of Educational Psychology*, 94(4), 795-809. doi: 10.1037/0022-0663.94.4.795
- Ang, R. P., & Huan, V. S. (2006). Relationship between academic stress and suicidal ideation: Testing for depression as a mediator using multiple regression. *Child Psychiatry and Human development*, 37(2), 133.
- Avenevoli, S., Knight, E., Kessler, R., & Merikangas, K. (2008). Epidemiology of Depression in Children and Adolescents. In J. Abela, & B. Hankin (Eds.), *Handbook of Depression in Children and Adolescents* (pp. 6-34). New York: The Guilford Press.
- de Anda, D., Baroni, S., Boskin, L., Buchwald, L., Morgan, J., Ow, J., ... & Weiss, R. (2000). Stress, stressors and coping among high school students. *Children and youth services review*, 22(6), 441-463. doi: 10.1016/S0190-7409(00)00096-7

- Greenberg, M. T., Domitrovich, C., & Bumbarger, B. (2001). The prevention of mental disorders in school-aged children: Current state of the field. *Prevention & treatment*, 4(1), 1a.
doi: 10.1037/1522-3736.4.1.41a
- Henderson, J., Henderson, G., Lavikainen, J., & McDaid, D. (2004). Actions against depression: improving mental health and wellbeing by combating the adverse health, social and economic consequences of depression, European Commission.
- Jennings, P. A., & Greenberg, M. T. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational research*, 79(1), 491-525. doi: 10.3102/0034654308325693
- Kouzma, N. M., & Kennedy, G. A. (2004). Self-reported sources of stress in senior high school students. *Psychological reports*, 94(1), 314-316. doi: 10.2466/pr0.94.1.314-316
- Kraag, G., Zeegers, M. P., Kok, G., Hosman, C., & Abu-Saad, H. H. (2006). School programs targeting stress management in children and adolescents: A meta-analysis. *Journal of School Psychology*, 44(6), 449-472. doi: 10.1016/j.jsp.2006.07.001
- Lin, J., & Chen, Q. (1995). Academic Pressure and Impact on Students' Development in China. *Mcgill Journal of Education*, 30(002), 149-168.
- Low, N. C., Dugas, E., O'Loughlin, E., Rodriguez, D., Contreras, G., Chaiton, M., & O'Loughlin, J. (2012). Common stressful life events and difficulties are associated with mental health symptoms and substance use in young adolescents. *BMC psychiatry*, 12(1), 116.
- Matheny, K. B., Aycok, D. W., & McCarthy, C. J. (1993). Stress in school-aged children and youth. *Educational Psychology Review*, 5(2), 109-134.

- Meiklejohn, J., Phillips, C., Freedman, M. L., Griffin, M. L., Biegel, G., Roach, A., ... & Isberg, R. (2012). Integrating mindfulness training into K-12 education: Fostering the resilience of teachers and students. *Mindfulness*, 3(4), 291-307. doi: 10.1007/s12671-012-0094-5
- Phelan, P., Davidson, A., & Cao, H. (1991). Students' multiple worlds: Negotiating the boundaries of family, peer and school cultures. *Anthropology & Education Quarterly*, 22(3) 224-250
- Roberts, C., Freeman, J., Samdal, O., Schnohr, C. W., De Looze, M. E., Gabhainn, S. N., ... & Rasmussen, M. (2009). The Health Behaviour in School-aged Children (HBSC) study: methodological developments and current tensions. *International Journal of Public Health*, 54(2), 140-150. doi: 0.1007/s00038-009-5405-9
- Russell-Mayhew, S., Nutter, S., Ireland, A., Gabriele, T., Bardick, A., Crooks, J., & Peat, G. (2015). Pilot testing a professional development model for preservice teachers in the area of health and weight: feasibility, utility, and efficacy. *Advances in School Mental Health Promotion*, 8(3), 176-186. doi: 10.1080/1754730X.2015.1040040
- Saab, H., & Klinger, D. (2010). School differences in adolescent health and wellbeing: Findings from the Canadian Health Behaviour in School-aged Children Study. *Social Science & Medicine*, 70(6), 850-858.
- Wilmott, C. (2014). *A Little Less Stress for Alberta Students Writing Final Exams*. Retrieved from <http://studymagazine.com/2014/11/27/little-less-stress-alberta-students-writing-final-exams/>.
- WHO. (2015). Adolescent Development. Retrieved from http://www.who.int/maternal_child_adolescent/topics/adolescence/dev/en/
- World Federation for Mental Health. (2012). Depression a Global Crisis: World Mental Health day, October 10, 2012. World Health Organization.

PROFESSIONAL DEVELOPMENT PARTNERS

Christy Thomas

University of Calgary

Professional development is integral for improving teaching and learning. This paper highlights research from a mixed methods study on the potential impact of a partnership providing teacher Professional Development (PD) at a school in Southern Alberta. In this paper, three main findings will also be discussed: (a) scheduled time for PD; (b) a culture of pressure and support; (c) changes in teaching practices. This research is valuable for leadership and those considering innovative ways to provide PD through partnerships.

Keywords: partnerships; professional development; sustained; Canada; K-12

PROVISION OF PROFESSIONAL DEVELOPMENT

In Alberta, one of the recommendations for improving student learning outcomes is to improve instruction (Alberta Government, 2010). Instruction can be enhanced by offering teachers effective professional development (PD) opportunities (Fogarty & Pete, 2009; Guskey & Yoon, 2009; Joyce, 2002; Killion & Hirsh, 2013; Showers, 1990). Although principals play an important role as instructional leaders in teachers' PD (Honig, 2012; Thoonen, Slegers, Oort, & Peetsma, 2012), some suggest PD leadership should be shared and extend beyond the school to include other actors (Mulford, 2008; Spillane, Diamond, & Jita, 2003). This can include permanent coaches, consultants, or external experts interested in partnering with schools to deliver job-embedded PD. The value of these partners facilitating PD is that they can offer new insights and additional expertise. Such partnerships are an alternative way to provide PD in schools (Killion, 2011;

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 121-130. Calgary, Canada: Werklund School of Education, University of Calgary.

Neumerski, 2012; Supovitz, Sirinides, & May, 2009) and are worth exploring as an innovative approach to leading PD.

CONTEXT

In Alberta, parents have several choices for schooling, including alternative programs. Alternative programs emphasize “a particular language, culture, religion, or subject-matter” or use “a particular teaching philosophy” (Alberta Education, 2003, p. 1). In this study, a formal society was established for the alternative program at the school in order to provide leadership and form a partnership with a school district (Alberta Education, 2003). Alternative programs can charge tuition (Alberta Education, 2003), and some of these funds covered the costs of PD activities at the school and the salary of employees who led the PD in this study. These employees of the formal society represented the partners. The partners provided leadership for weekly job-embedded PD at the school, which was attended by both teachers and administrators.

METHODOLOGY

A mixed methods design was followed for this study, which drew upon the strengths of both qualitative and quantitative approaches. The research question explored in this study was as follows: What are teachers’, administrators’, and partners’ perspectives about the impact of sustained PD provided through a partnership at an alternative school for K-12 in Southern Alberta? The impact of the partnership was explored through semi-structured interviews and focus groups. Once ethics approval was obtained, population sampling was used to study the whole population. 29 teachers, three administrators, and three partners chose to participate. The participation response rate was as follows: teachers (73%), principals (100%), and partners (100%). The qualitative data (i.e. interviews and focus groups) was analysed through iterative thematic coding. The quantitative data consisted of quantified qualitative data (i.e. frequency and ranking of each

theme) and pre-existing numeric data identified during document analysis (i.e. accountability pillar and school review data). The numeric data from the document analysis was used to describe and discuss trends in order to explore the partnership's influence. The qualitative and quantitative data were then analysed by taking the qualitative inductive categories and quantitative data and reviewing the literature for overlapping themes. The quantitative data was also integrated and compared with the qualitative data. The use of these different forms of data allowed for triangulation and strengthened the accuracy of the study.

FINDINGS

Three broad themes were determined through content analysis and frequency of coding. These frequencies were then used to rank the themes and their subsequent categories. Each theme and their subsequent categories are listed in order of their prevalence. The three broad themes were: (a) scheduled time for PD; (b) a culture of pressure and support; and (c) changes in teacher practice. Scheduled time for PD was ranked number one, and the three related categories were collaboration, direct instruction, and implementation. A culture of pressure and support was ranked number two and included four categories: challenge and accountability, vision, soft landings, and access to one-on-one support. Changes in teacher practice was the final theme, and this was ranked number three. This theme consisted of four categories: alignment to practice, teacher thinking, student-centred, and transferability. During document analysis, the pre-existing quantitative data presented in the School Effectiveness Review (2009 & 2013) and Accountability Pillar (2008-2014) were integrated where applicable and relevant. These documents showed a possible connection between the partnership and positive impacts on student learning.

DISCUSSION OF FINDINGS

The participants' perspectives offered insight into the influence of the partnership and PD at the school. They also hi-lighted the perceived impacts on teaching and learning and the partnership's potential influence on school culture. The key findings related to the partner-led PD will be discussed using the three broad themes: (a) scheduled time for PD; (b) a culture of pressure and support; and (c) changes in teacher practice.

Scheduled time for PD

The first theme – scheduled time for PD – hi-lighted that scheduled time for PD supported teacher collaboration, and this generated synergy and cultivated joy. Others report the benefits of collaboration such as increased job satisfaction (Viel-Ruma, Houchins, Jolivette, & Benson, 2010), lower stress, increased confidence (Schlicte, Yssel, & Merbler, 2005), and a reduction in teacher workload (Guskey, 1991). This scheduled time also allowed for direct instruction and was important for modelling concepts to teachers. Regular PD seminars have been shown to support teachers in changing their practices (Showers & Joyce, 1996), and providing scheduled time for PD contributes to teacher buy-in (Fogarty & Pete, 2009). Furthermore, time for practical implementation of the PD content appeared to make a difference in changing teacher practices. Joyce and Showers (2002) also suggest that modelling best practices for teachers during PD aids in implementation. Providing teachers time to think and create is valuable in order to support adult learners in their need for both reflection and dialogue (Merriam, 2008).

Culture of pressure and support

The second theme – a culture of pressure and support – suggested teachers needed to be challenged and held accountable for changing their practices, while at the same time given support to do so. Professional learning needs to offer both challenge and support to be effective (Timperley, Wilson, Barrar, & Fung, 2008). A strong vision for the PD was evident, and teachers were challenged with clear goals. Core leadership practices such as setting direction (Leithwood & Louis, 2012), establishing goals, and forming high expectations (Robinson, 2011) are recognized as integral to seeing school improvement and increasing organizational commitment (Brynjulf Hjerto, Merok Paulsen, & Petteri Tihveräinen, 2014). This positive pressure was important for most teachers, although some were uncomfortable with this approach. Applying this external push is recognized as necessary for teachers to be critical about their practice (Levine, 2011). There was variation in response to the pressure of high expectations, but this was balanced with supportive conditions. A culture of “soft-landings” was promoted where teachers felt supported to take risks. They also had one-on-one access to the partners, who were onsite daily. Robinson (2011) suggests leaders should encourage teachers and reward them for making mistakes, which connects to the notion of “soft-landings.” Giving teachers the help they need when they need it is noted as important for PD (Fogarty & Pete, 2009), and having daily access to experts supports classroom implementation of teaching strategies (Joyce & Showers, 2002). Even so, some teachers needed additional encouragement to take advantage of these supports.

Changes in teacher practice

The third theme – changes in teaching practice – indicated that the sustained PD offered by the partners was influencing teaching. Teachers were implementing what was taught and modelled to them during the PD, and this was a sign of teachers changing their practice. Change in teacher

practice is noted as an indication of successful PD (Killion & Hirsh, 2013), and taking action by implementing ideas is evidence of adult learning (Merriam, 1987). Not all of the teachers were moving forward at the same rate, but the partners accepted this as normal and were comfortable with this variation. Rogers (1995) explains the rate of adoption of new innovations and notes a similar variation. Teachers who were moving forward were also more comfortable with changing their practice, indicating a change in teacher thinking. These teachers were more efficacious and willing to take on the challenge. Bandura's (1989) work on self-efficacy, the efforts individuals exert, and their willingness to overcome challenges links to this finding. Changes in practices, from teacher-centred approaches to student-centred approaches, showed potential for impacting student learning outcomes. Although no direct correlation was noted between the Accountability Pillar data and the PD, the trends were mostly positive, suggesting the PD was making a difference in student learning at the school. Linking PD to student learning is essential to see changes in teaching practices (Guskey, 2012), and determining what measures to use is strongly advised for successful PD (Guskey & Sparks, 1996). Moreover, some teachers needed additional individual support and further opportunities to work together in order to transfer the ideas from PD and change their practices. Collaboration is valuable and aids in this transferability (Fogarty & Pete, 2009; Fullan, 2008). As noted earlier, having access to one-on-one support can also assist in the transferability and implementation of new practices.

CONCLUSION

This study suggests partnerships are an innovative way to offer leadership for PD in schools and uncovered three key aspects related to this: (a) scheduled time; (b) a culture of pressure and support; and (c) changes in teaching practices. The PD partners (PDP) in this study illustrate how other actors or informal leaders can play a role in the oversight of PD in schools. Although there is a

lack of generalisability in this study of one school and one partnership, there are transferable elements that leaders can use to see what is possible in their own contexts. An implication of this research is to explore who could act as potential PD partners in schools (i.e. universities, district leaders, coaches, consultants, teacher-leaders, etc.). Another consideration is for school leaders to examine the key aspects of the PD presented in this study that seemed to be effective. Leaders can look at finding ways to provide scheduled onsite time for PD and work towards creating a culture of pressure and support to promote changes in teacher practice.

References

- Alberta Education. (2003). *Alternative Programs Handbook*. Retrieved from https://education.alberta.ca/media/1626689/alternative_programs_handbook.pdf
- Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist*, 44(9), 1175-1184.
- Brynjulf Hjertø, K., Merok Paulsen, J., & Petteri Tihveräinen, S. (2014). Social-cognitive outcomes of teachers' engagement in learning communities. *Journal of Educational Administration*, 52(6), 775-791. doi: 10.1108/JEA-07-2013-0074
- Fogarty, R., & Pete, B. (2009). Professional learning 101: A syllabus of seven protocols. *The Phi Delta Kappan*, 91(4), 32-34. Retrieved from http://www.robinfoarty.com/documents/2.15_PD_101_Kappan.pdf.
- Fullan, M. (2008). *Six secrets of change*. San Francisco, CA: John Wiley & Sons, Inc.
- Guskey, T. R. (1991). Enhancing the effectiveness of professional development programs. *Journal of Educational and Psychological Consultation*, 2(3), 239-247. doi: 10.1207/s1532768xjepc0203_3

- Guskey, T. R. (2012). The rules of evidence: Focus on key points to develop the best strategy to evaluate professional learning. *Journal of Staff Development*, 33(4), 40-43. Retrieved from <http://www.learningforward.org> .
- Guskey, T. R., & Sparks, D. (1996). Exploring the relationship between staff development and improvements in student learning. *Journal of Staff Development*, 17(Fall), 33-38.
- Guskey, T. R. & Yoon, K. S. (2009). What works in professional development? *The Phi Delta Kappan*, 90(7), 495-500. Retrieved from <http://www.jstor.org/stable/20446159> .
- Honig, M. (2012). District Central Office Leadership as Teaching: How Central Office Administrators Support Principals' Development as Instructional Leaders. *Educational Administration Quarterly*, 48, 733. doi: 10.1177/0013161X12443258
- Joyce, B., & Showers, B. (2002). Student achievement through staff development [Electronic Book version]. Retrieved from <http://ebookcentral.proquest.com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=3002066> .
- Killion, J. (2011). The perfect partnership: What it takes to build and sustain relationships that benefit students. *Journal of Staff Development*, 32(1), 10-12.
- Killion, J. & Hirsh, S. (2013). Investments in professional learning must change. *Journal of Staff Development*, 34(4), 10.
- Leithwood, K. & Louis, K. (2012). *Linking leadership to student learning*. San Francisco, California: John Wiley & Sons.

- Levine, T. (2011). Experienced teachers and school reform: Exploring how two different professional communities facilitated and complicated change. *Improving Schools (14)*1, 30-47. doi: 10.1177/1365480211398233
- Merriam, S.B. (1987). Adult learning and theory building: A review. *Adult Education Quarterly*, (37)4, 187-198. doi: 10.1177/0001848187037004001
- Merriam, S.B. (2008). Adult learning theory for the twenty-first century. *New Directions for Adult & Continuing Education*, 2008(119), 93-98. doi: 10.1002/ace.309
- Mulford, B. (2008). The leadership challenge: Improving learning in schools. Australian Council for Educational Research. Retrieved from http://www.acer.edu.au/documents/AER_53-TheLeadershipChallenge.pdf.
- Neumerski, C. (2012). Rethinking instructional leadership, a review: What do we know about principal, teacher, and coach instructional leadership, and where should we go from here? *Educational Administration Quarterly*, 49(2), 310-347. doi: 1177/0013161X12456700
- Robinson, V. (2011). *Student-centred leadership*. San Francisco, CA: John Wiley & Sons, Inc.
- Rogers, E. (1995). *Diffusion of innovations*. New York, NY: The Free Press. A division of Simon & Schuster, Inc.
- Schlichte, J., Yssel, N., & Merbler, J. (2005). Pathways to burnout: Case studies in teacher isolation and alienation. *Preventing School Failure*, 50(1), 35.
- Showers, B. (1990). Aiming for superior classroom instruction for all children: A comprehensive staff development model. *Remedial and Special Education*, 11(3), 35-39. doi: 10.1177/074193259001100309

Showers, B., & Joyce, B. (1996). The evolution of peer coaching. *Educational Leadership*, 53(6), 12-16.

Spillane, J.P., Diamond, J.B., & Jita, L. (2003). Leading instruction: The distribution of leadership for instruction. *Journal of Curriculum Studies*, 35(5), 533-543.

Supovitz, J., Sirinides, P., & May, H. (2009). How Principals and Peers Influence Teaching and Learning. *Educational Administration Quarterly*, 46, 31-56. doi:10.1177/1094670509353043

Thoonen, E., Slegers, P., Oort, F., & Peetsma, T. (2012). Building school-wide capacity for improvement: The role of leadership, school organizational conditions, and teacher factors. *School Effectiveness and School Improvement*, 23(4), 441-460. doi: 10.1080/09243453.2012.678867

Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2008). *Teacher Professional Learning and Development: Best Evidence Synthesis Iteration*. Wellington, New Zealand: Ministry of Education.

Viel-Ruma, K., Houchins, D., Jolivette, K., & Benson, G. (2010). Efficacy beliefs of special educators: The relationships among collective efficacy, teacher self-efficacy, and job satisfaction. *Teacher Education and Special Education*, 33(3), 225-233. doi: 10.1177/0888406409360129

INSTRUCTIONAL LEADERSHIP: THE ART OF ASKING QUESTIONS TO PROMOTE TEACHING EFFECTIVENESS

Kenzie Rushton

Galileo Educational Network, University of Calgary

There is a growing body of literature that highlights the ways to support professional conversations on the part of leadership through processes and protocols. However, there are few opportunities for instructional leaders to engage in professional learning, which strengthens their skills in asking questions as part of those protocols and processes. Our goal in this paper will be to share how a partnership between a rural school division and an independent, charitable organization that consists of thought-leading educators have developed professional learning to support instructional leaders in their understanding of teaching effectiveness and the art of asking questions around authentic task design.

Keywords: teaching effectiveness; instructional leadership; professional learning; asking questions

A growing body of literature recognizes the importance of teaching quality, leading teacher learning and its relationship to student achievement. (Robinson, 2011; Timperley, 2011; Wiliam, 2016). Inherent in any instructional leader's work is that of promoting and engaging in what Timperley (2015) refers to as professional conversations to strengthen teaching quality. As part of the social construct of building new knowledge, professionals draw upon the collective wisdom of the individuals that are present in those conversations as well as the research informed practices of effective teaching. A key element of those conversations is the art of asking questions to promote

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 131-139. Calgary, Canada: Werklund School of Education, University of Calgary.

reflection around effective teaching practices. It is the goal in this paper to highlight the importance of supporting instructional leaders in strengthening teaching quality through effective professional learning. Specifically, we would like to highlight the role of ensuring instructional leaders have opportunities to deepen their understanding of effective teaching practices through the use of case studies. As well, we would like to emphasize the necessity for providing deliberate practice of asking questions to support those leaders in engaging their colleagues in effective professional conversations.

TEXTURING AN UNDERSTANDING OF EFFECTIVE TEACHING PRACTICES

First and foremost for any leader to effectively ask questions regarding teaching quality, they need to be well versed in effective teaching practices. Drawing upon the Teaching Effectiveness Framework (TEF) of Friesen (2009), instructional leaders are provided a knowledge input that strongly supports their ability to engage colleagues in these types of conversations. The framework itself is not enough for individuals to have a clear understanding of what it means in practice. Thus, there is a need for leaders to texture their understanding of the five effective teaching principles. Due to the difficulty of having instructional leaders visit numerous classrooms and teaching spaces, it has become clear to us that the use of case studies provides the most effective use of time and resources to help leaders deepen their understanding of effective teaching.

In practice what does it look like to deepen the understanding of participants in the principles of effective teaching? Case studies can come in a number of forms. Firstly, there are a variety of video sources to draw upon. The Galileo Educational Network in the Werklund School of Education at the University of Calgary has numerous video examples online ranging from kindergarten to grade twelve across all disciplines. Additionally, case studies of effective lessons, created using the “Rubric for Discipline-Based and Interdisciplinary Inquiry Studies” (Galileo Educational Network,

2000- 2016), are drawn upon to help engage participants in these conversations. These written examples are intentionally created in a manner that mirrors the ways of knowing within a discipline. They are directly connected to the program of studies and clearly articulate the subtasks that students would be engaged in. Both what the teacher would be doing and what the students would be doing are highlighted for each of those subtasks as part of the instructional design for an authentic learning experience.

The question then arises as to how one uses these case studies to help instructional leaders texture their understanding of effective teaching practices? For the purposes of this article, we would like to draw upon the experience of the partnership between a rural school jurisdiction and an independent, charitable organization that consists of thought-leading educators as an example of how this might occur. As part of the professional learning that was being provided for instructional leaders we began with deepening their understanding of effective teaching practices. Initially, participants were introduced to an overview of the five principles of effective teaching. As participants were seated in small groups of four to five individuals, they were provided short (one to three minute) video clips of what each principle might look like in a school setting. Participants were provided with questions, which they reflected upon in relation to the video examples. These questions were designed to help participants articulate the evidence they see in the video clips. For example, a question such as: “In what ways has your school or grade team built capacity around this principle?” was used. Upon completion of the five video clips and their reflections, the participants were invited to build their collective understanding of the principles by engaging in a discussion with the colleagues with whom they were sitting.

To help ensure that participants fully understood effective teaching, a second round of case studies were used. In this round, participants were divided up, selecting one of the five different principles

of effective teaching to use as a lens to watch a case study. While watching a full video case study (five to ten minutes in length), the participants were asked to record any evidence they saw in the video that they felt was related to their chosen principle. After the video had been watched participants then combined the information with one another, articulating what they saw in the video. Finally, in a third round, the participants were then asked to watch a final case study from a different perspective choosing a different principle the previous one. In this way, they furthered their understanding as they pooled their ideas for a second time.

We have found that using video case studies is not the only way to help instructional leaders texture their understanding of effective teaching practices. Written examples also can provide a great way for people to reflect about authentic task design and ways to help support the strengthening of those designs. As a way to make visible teaching practices and instructional design, we drew upon the Galileo Educational Network, which uses a variety of heuristics, templates and design tools. One such design tool is a “Task Design Arrow” (Galileo Educational Network, 2016). At the end of the arrow, a designer would write the learning intentions they had for their overall task. This becomes the target for their students learning. Along the top of the arrow the designer would include subtasks that students would engage in as they work towards completing an overall task. The teacher needs to think intentionally about the scaffolding that they are going to provide for their students. The underside of the arrow is used to weave formative assessment strategies. This purposely draws the designer’s attention to the importance of supporting students throughout the learning process, helping them move forward in their learning. Specifically, designers are asked to consider Dylan Wiliam’s (2011) five key formative assessment strategies as part of the design. The simplicity of this tool understates the impact it has in prompting reflection around effective teaching practices.

The task design arrow is a great tool to make our thinking visible in relation to effective instructional design. We used this arrow with participants to help them deepen their understanding of effective teaching practices. To begin, participants were asked to draw an arrow lengthwise across the midline of a piece of chart paper. Participants were then given a handout that contained an overview of a written task including its learning intentions. Each group was then provided an envelope that contained a mixture of ten subtasks and ten formative assessment components all that were in service of the larger overall task. The challenge that was put forward to the groups (ranging in size from three to four individuals) was to come to a consensus about where the subtasks and formative assessment components should be placed on the arrow (subtasks along the top of the arrow and formative assessment components along the bottom). This task was challenging and yet successful. It generated much discussion around scaffolding of learning, the importance of weaving formative assessment throughout the task design and the complexity of creating a well-designed authentic learning experience for students. Upon completion, participants identified that they had a much deeper understanding of effective instructional design as indicated by their responses to the question “What have you come to understand about teaching effectiveness?” as part of a feedback survey.

DELIBERATE PRACTICE: ASKING QUESTIONS TO PROMOTE REFLECTION

At the core of instructional leaders’ work are professional conversations. It is through these professional conversations that they have a unique opportunity to prompt reflection on the part of colleagues with whom they work. Bryk and Schneider (2003) highlight the mutual dependence that stakeholders have in a social exchange and the importance of maintaining trusting relationships as part of those exchanges. Timperley (2015) writes about a number of enablers for professional conversations including: the processes we use to engage in those conversations; the resources in

the form of tools and expertise to help identify effective practice and relevant evidence; and the relationships between the individuals that are based on mutual respect, trust and challenge. Once an instructional leader is armed with the expertise of effective teaching practices they are better prepared to ask colleagues questions in relation to their teaching practice. The subtle nature of asking these questions of colleagues is one that requires thoughtful consideration for a leader. They must maintain that relational trust while still challenging the thinking of the other. How can professional learning effectively support instructional leaders in developing this skill of asking questions?

To start, creating the conditions for this type of learning opportunity requires a focus for the conversation. Prior to coming to the professional learning, participants were requested to bring a piece of evidence from their school that was related to the teaching that was happening in their buildings. The intention of bringing this piece of evidence was twofold: 1. it provides focus to the conversation and 2. the leaders would have a vested interest in the work that they are sharing as it is coming from their school. Drawing upon the evidence, the leaders were asked to prepare for a conversation with their colleagues using question prompts. We have found that providing this individual reflection time for people is an integral step for the preparation of these conversations. The resulting conversations are deeper and more focused when participants are prepared for them compared to when participants are not given this time.

Structure to the conversation is another key component to ensuring that the opportunity is successful. Timperley (2015) identifies clear purpose and structured processes that engage individuals as a core enabler of professional conversations. In our particular example, we had our participants arranged in triads. These individuals were each given roles: recorder, leader of learning and teacher presenter. They would rotate through these roles during the activity to ensure equal

participation and benefit. The role of the teacher presenter was to set the context of the task and respond thoughtfully to any questions that were asked on the part of the leader of learning. The leader of learning was tasked with asking thought provoking questions to prompt the thinking of the teacher. The recorder's job was to record the context of the evidence as well as any questions the leader of learning asked throughout the conversation in an online form that populates a spreadsheet. Each conversation was given a limited amount of time. Upon stopping the conversation, the participants reviewed all the questions that were recorded. They were tasked with selecting and submitting what they thought were the best three questions that were asked. Upon completion of this first round, each participant rotated roles and then repeated the entire process until everyone had had a chance to practice asking questions.

After the three rounds of engaging in questions, participants' attention was brought to the fact that this was not easily done in the spur of the moment. In light of relational trust, knowing the impact that breaking that trust may have, participants were asked to reflect on the implications. It became clear there is a need for instructional leaders to be well prepared for these conversations, specifically in using questions that are highly effective in promoting reflection on the part of their colleagues. Subsequently we discussed elements of effective questions such as: 1. being kind, non-judgemental, assuming a positive intent; 2. specific, grounded in the knowledge of effective teaching practices and 3. helpful, promoting reflection on principles that matter. After having a clear understanding of what effective questions look like we had some final considerations.

The final activity that we engaged participants in during the session was centred on the specific nature of the questions that we use and how they must be grounded in knowledge that is evidence based. To this end, we asked participants to review the spreadsheet that contained all the questions from the day that were selected and submitted as good questions. A final lens was added, that of

filtering those questions through the principles of effective teaching highlighted in the TEF. Participants were asked specifically to choose or write three questions that they could use in a variety of different situations. These “back pocket” questions then became the final product of the work that we engaged in.

CONCLUSION

The results of this professional learning opportunity were very strong. A synthesis of the feedback highlighted numerous insights on the part of participants. Leaders felt that they had a deeper understanding of teaching effectiveness as well as identifying that using reflective questions is a supportive way to engage their teachers in conversations around teaching effectiveness. Leaders identified that the reflective questioning strategies will be implemented in their own practice, as they lead staff meetings, mentor new teachers and professional development days in their own context. Leaders had new insights about how to develop protocols, structures and processes to have evidence informed conversations around student thinking as well they articulated that having a reflective practice needs to be a part of school culture (developing a scholarship of teaching). Leaders articulated that they appreciated practicing asking reflective questions. Finally, leaders identified that nurturing teacher learning needs to be reflective, not prescriptive or judgmental. An atmosphere of trust is key to having an effective reflective conversation and leaders felt more prepared to focus reflective conversations around the TEF.

Preparing instructional leaders for asking questions as part of professional conversations supports the common good of promoting effective teaching practices. Instructional leaders need to have a strong understanding of these interactions and how they might leverage them to promote teacher learning. If not, conversations that leaders engage in will be more of a social occasion than a professional conversation.

References

- Bryk, A.S. & Schneider, B. (2003). Trust in schools: A core resource for school reform. *Educational Leadership*, 60(6), 40-45.
- Friesen, S. (2009). *What did you do in school today? Teaching effectiveness: A framework and rubric*. Toronto, ON: Canadian Education Association.
- Galileo Educational Network. (2000-2016). *Rubric for discipline-based and inter-disciplinary inquiry studies*. Retrieved from <http://galileo.org/rubric.pdf> .
- Galileo Educational Network. (2016, June 13). *Tasks and activities: Challenges and misunderstandings* [Weblog Post]. Retrieved from <http://galileo.org/blog/tasks-and-activities> .
- Timperley, H. S. (2011). *Realizing the power of professional learning*. New York, NY: Open University Press.
- Timperley, H. (2015). *Professional conversations and improvement-focused feedback: A review of the research literature and the impact on practice and student outcomes, prepared for the Australian Institute of Teaching and School Leadership*. Retrieved from <http://www.aitsl.edu.au/docs/default-source/professional-growth-resources/Research/professional-conversations-literature-review-oct-2015.pdf> .
- Robinson, V. (2011). *Student-centered leadership*. San Francisco, CA: Josey-Bass.
- Wiliam, D. (2011). *Embedded formative assessment*. Bloomington, IN: Solution Tree Press.
- Wiliam, D. (2016). *Leadership for teacher learning: Creating a culture where all teachers improve so that all students succeed*. West Palm Beach, FL: Learning Science International.

BETTER TOGETHER: FOSTERING EFFECTIVE RELATIONSHIPS FOR AUTHENTIC LEARNING PARTNERSHIPS

Jennifer Meredith,¹ Travis Robertson,¹ Ita Kistorma,² Sanghamitra Dhar McKenty,¹ and

Frank McClernon²

Calgary Board of Education¹ and Calgary Catholic School District²

Educational leaders need to consider the necessity of effective collaboration in complex educational networks. The Campus Calgary/Open Minds model allows students to directly benefit from complex relationships between educational districts within Calgary, community learning sites, funders, and educational supports. In pursuit of personalized, inquiry-driven learning, intentional relationships can help foster approaches for meaningfully incorporating contemporary teaching and learning best practices together.

Keywords: Experiential Learning; Instructional Leadership; Communities of Practice; Partnerships; Interdisciplinary Learning

Campus Calgary/Open Minds (CC/OM) brings the entire community together to meet the unique learning needs of today's students. The Calgary Board of Education (CBE) and Calgary Catholic School District (CCSD) lead an innovative educational model that has celebrated over 24 years of excellence in education, alongside corporate Calgary and local community venues. Creating personalized and flexible learning programs for each student, CC/OM provides a dynamic learning experience by taking students into the community and connecting them to experts who are passionate about experiential learning and able to connect with each class's big idea in a unique way (Kydd, 2004). We have come to understand first hand the necessity of effective collaboration

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 140-149. Calgary, Canada: Werklund School of Education, University of Calgary.

in complex educational networks and the importance of this to be considered by all educational leaders. When partnering with both school districts, engaging all types of school communities within the city, partnering with the community in a variety of unique and effective ways, we see how a variety of people are better together for the benefits of students and education. Having this leadership at the front end within and across organizations, teachers alongside classes are then able to access a complex and ever evolving network as needed in a way they would be unable to achieve on their own.

In the 2016/2017 school year, over 230 teachers and nearly 6,500 students in Calgary are participating in the program for a year of inspired learning that centres on a week of experiential programming in various intellectually rich community settings. The partnerships that CC/OM has developed over the years with various community sites and funders enables CC/OM to provide opportunities for students throughout the city that may not otherwise be able to have their classrooms ‘moved’ for an immersive field study week. In addition to this being a rigorous and meaningful experience for students, it is also transformative for teachers who choose to work in these ways (Kydd, 2004). Authentic learning and intellectual work allows students to acquire information and operate necessarily to be able to accomplish problems and tasks that they encounter while working in the disciplines (Doyle, as cited in Ritchart, 2015).

A dedicated CC/OM Operations Team is comprised of three educators: one from the CBE, one from CCSD, and one funded by school participation. Opportunities for professional development are provided through CC/OM: working alongside experts, developing relationships with various stakeholders including the site coordinators and the Operations Team leads teachers to deepen their pedagogical understanding and to benefit from being part of a connected community.

A CC/OM week is a time for students to ask questions, work alongside experts in the community, to slow down and reflect, to document, journal and to sketch, and to move learning deeper through the unique opportunities that an immersive week provides. It is not a week in isolation, but rather a week that brings all classroom learning together and is part of the year's work (Kydd, 2004). Campus Calgary/Open Minds looks at meaningful and authentic ways of planning, addressing, and implementing strategies for contemporary contexts with long-term visions inclusive of incorporating current district strategies including: Indigenous ways of knowing, development of literacy and numeracy, Science, Technology, Engineering, and Mathematics (STEM) learning environments, and the development local Citizenship with global Worldviews.

CAMPUS CALGARY/OPEN MINDS' UNIQUE PARTNERSHIPS

Campus Calgary/Open Minds focuses on complex relationships between educational districts within Calgary, community sites, funders, and educational supports. Representing both Calgary school districts (CBE and CCSD), the CC/OM Operations Team informs and supports the educational integrity of the program. These two school districts are also able to accept participation from all Calgary schools beyond both major districts. A Memorandum of Understanding (MOU) between the CBE and CCSD for CC/OM is unique in that it provides avenues for all Calgary teachers to have opportunities to take their students to community sites. The MOU also allows the two school boards to work together to ensure that the educational integrity of both boards are represented and thrives in this valuable and unique partnership.

CC/OM Advisors are made up of community members who have various backgrounds related to program needs and to CC/OM's three pillars: education, funders, and community sites. Having this expert volunteer group allows CC/OM to understand the needs of the community at large and draw from their expertise with various backgrounds. Just as students and teachers learn from

experts in the field, Advisors are experts for the Operations Team, supporting CC/OM in better understanding the complexities of the teaching, learning, and leadership work.

With the leadership and support of system executive sponsors, Superintendent of Learning (CBE) and Superintendent of Instructional Services (CCSD), the program as well as Advisors can remain confident that it can continue to ensure optimal learning from the program by implementing actions designed to meet program goals and ensuring the program philosophy is preserved and aligned at all participating sites (Fullan, 2007). The Operations Team works with two specifically allotted Advisor portfolios within the Education pillar: the System Assistant Principal of Corporate Partnerships/Global Learning (CBE) and a Supervisor of Instructional Services (CCSD), having ongoing discussions regarding programming, supporting student needs, and meeting the expectations of both school districts.

Funders establish long-term partnerships with CC/OM. Meeting community investment goals by supporting a community site is the beginning of a valued relationship. Funder voice contributes to the strategic plan and evolution of the program, and employees of the funding organization are often invited to bring expertise and to work alongside the students. A sense of broad impact comes from qualitative and quantitative data, including a comprehensive Social Return on Investment (SROI) study completed by Chevron for the Open Minds sites. In 2014, Chevron Canada embarked on a study of Campus Calgary/Open Minds. The social return on investment (SROI) results show that for every dollar invested into the program, whether by funder or the school boards, the benefit to the community averages \$3.76. This aggregate benefit demonstrates the lasting impact of professional teacher development, increased job satisfaction and increased use of inquiry-based learning in the classroom (CC/OM, 2016). Another indicator of success of interest to current and potential funders is the oversubscription—currently 100% oversubscribed—by interested teachers.

Community Sites operating as CC/OM classrooms are acknowledged as a source of leadership and expertise, and this increases employee pride and satisfaction. Working with teachers as they leverage a custom-designed week benefits site personnel as they look at the spaces and experts in and around their venue in a new way. Site Coordinators are resources for their sites. Communicating the varied educational opportunities at the site will increase utilization and can lead to access by a broader audience. The result is a symbiotic relationship where community sites and school districts can continually learn from one another (Kydd, 2004).

AUTHENTIC PERSONALIZATION THROUGH STRONG RELATIONSHIPS

Personalization of the weeks on site is critical for ensuring that community site experience best suits the needs of the learners and the vision that the teacher has for his/her yearlong inquiry. Creating flexible learning programs for each student, CC/OM provides a dynamic learning experience by taking students into the community and connecting them to experts who are passionate about experiential learning.

With classrooms embedded in vibrant community settings around the city, these behind the scenes continual and intentional efforts result in authentic and interdisciplinary experiences, with an emphasis on literacy development. Through the use of journals for reflection and thinking routines (Ritchart, 2011), teachers take a more active role team-teaching with coordinators because of efforts in preparing both. Instructional rounds throughout the year, within each of the 230 weeks of programming, maintain the integrity and rigor of the program (City, et al., 2010). Alignment to the Alberta provincial Ministerial Order Competencies and high school redesign, allows for congruency throughout CC/OM programming, as teachers can see their School Development Plans and Teacher Professional Growth Plans as part of their CC/OM work. The relationships created amongst all of these entities allows for students to have authentic and real-world

disciplinary/interdisciplinary experiences to link directly the work happening at their schools and in the community at large (Lent, 2016). When students know and see their learning and their work alive in the world, they are better able to understand the importance of their learning and their place(s) within the world.

RESPONSIVE TO CHANGE

As Friesen (2009) states in the Teaching Effectiveness Framework, teachers improve their practice in the company of their peers. CC/OM's shared work with teachers, their students, site coordinators, a community advisory group, and community stakeholders, gives teachers opportunities to work alongside an array of disciplinary and interdisciplinary experts to help push their practices, leading to authentic and community-rich learning experiences. Fullan (2001) describes relationships as essential to leading through change and remaining responsive.

While some coordinators are certificated teachers and others are not, regular coordinator meetings prioritize professional learning. Time with coordinators is modelled on both Professional Learning Communities and Communities of Practice. Getting beyond administrative discussions, student work is at the heart of discussions. This year, a professional book study has also framed discussions. The Operations Team alongside coordinators chose Perkins Future Wise: Educating our Children for a Changing World (2014). This provided opportunities for a shared vocabulary and common understandings for pedagogical and curricular interactions.

Understanding that education is continually growing and changing, CC/OM is a flexible and adaptive program that stays true to its key elements and is responsive to community needs at large. Research that has been essential has included learner-centred communities of practice (Timperley, 2011), importance of relationships and continual complexity of the educational networks (Fullan, 2001) and the importance of having personalized life worthy student work at the centre of all that

we do (Perkins, 2014). Keeping evidence and research at the core of all that is done within communities of practice, with site coordinators, participating teachers, and the CC/OM Operations Team is essential to keep abreast with the continually evolving nature of education.

Campus Calgary/Open Minds' mission and vision reflects the importance of relationships and having a connected community. The CC/OM mission is "to transform teaching and learning by increasing student engagement through community, funder, and educational partnerships." This mission highlights CC/OM's three pillars and the importance of many entities coming together for the betterment of learning and students. The CC/OM vision continues along the same vein, "each student experiences personalized learning within a connected community," leading to many opportunities for engagement by multiple stakeholders. The mission and vision were co-designed by the Operations Team and Advisors.

Throughout the work of CC/OM there have always been elements that have found their way into the work, no matter what the grade or which site. Through its 24 year history, the program has come to know these as some of the formalized foundational aspects of CC/OM now known as the key elements. Each of these key elements grew out of a deep understanding of effective teaching practice. As Friesen (2009) states, "First and foremost, effective teaching practice begins with thoughtful, intentional designs for learning – designs that deepen understanding and open the disciplines to genuine inquiry" (p. 33). CC/OM enables students and their teachers to come to know and experience the importance of experiential learning. Teachers participating with CC/OM have opportunities to recognize and reflect on these elements often realizing they are already alive in their work.

Effective relationships are integral in all that is done in Campus Calgary/Open Minds. It is through the development of these diverse relationships that students are ultimately able to pursue life

worthy (Perkins, 2015) and life changing experiences. Stakeholders continue to celebrate looking ahead to the program's 25th anniversary next year, to a vast alumni network acknowledging 100 000 students through unique sites, as well as to the programs historic roots right here in Calgary, seeing the program grow to other cities across the country, such as Edmonton and St. John's, and world, for example in Michigan and Singapore, these sites are catalogued on the Beyond the Classroom Network website and updated regularly (Kydd, 2016). The network meets every two to three years to co-consider growth and sustainability and experiential pedagogy. When students know that their work matters and exists in the world, outside of just the four walls of their classroom, their experiences with education and the world around them can be transformed. The continued challenge, recognizing that we are better together, is to steward and shepherd this work with recognition of the complexities of a program so dependent on the relationships within a vast and diverse network. Countless behind the scenes conversations allow new opportunities to begin each week as busses across the city are filled with students ready to begin new learning adventures propelled by community of experts.

References

- Campus Calgary/Open Minds. (2016). 2016 annual report of Campus Calgary/Open Minds. Retrieved from: <http://cbe.ab.ca/ccom/Documents/CCOM-overview-annualreport.pdf>.
- City, E.A., et al. (2010). Instructional rounds in education: A network approach to improving teaching and learning. Cambridge, Massachusetts: Harvard Education Press.
- DuFour, R. (2007). Professional learning communities: A bandwagon, an idea worth considering, or our best hope for high levels of learning? *Middle School Journal*, 39(1), 4-8.

Meredith, Robertson, Kistorma, McKenty & McClernon

Friesen, S. (2009) *What did you do in school today? Teaching effectiveness: A framework and rubric*. Toronto: Canadian Education Association.

Fullan, M. (2001). *Leading in a culture of change*. San Francisco: Wiley & Sons.

Fullan, M. (2007). Change theory as a force for school improvement. In J. M. Burger, C. Webber, & P. Klinck (Eds.), *Intelligent leadership* (pp. 27-39). Toronto, Ontario, Canada: Springer.

Kydd, G. (2016). *Participating sites by geography*. Retrieved from http://btcn.ca/participating_sitesgeography .

Kydd, G. (2004). *Seeing the world in 3D: Learning in the community*. Victoria, B.C.: Trafford.

Lent, R. C. (2016). *This is disciplinary literacy: Reading, writing, thinking and doing ... content area by content area*. Thousand Oaks, California: Corwin Literacy.

Perkins, D.N. (2014). *Future wise: Educating our children for a changing world*. San Francisco, California: Jossey Bass.

Ritchart, R. (2015) *Creating cultures of thinking: The 8 forces we must master to truly transform our schools*. San Francisco: Jossey-Bass

Ritchart, R., Church, M., & Morrison, K. (2011). *Making thinking visible: How to promote engagement, understanding, and independence for all learners*. Hoboken, New Jersey: John Wiley and Sons, Inc.

Timperley, H. (2011). *Realizing the power of professional learning*. Maidenhead, Berkshire, England: McGraw Hill, Open University Press.

APPENDIX 1:

Table 1: Mission, Vision, and Key Elements of Campus Calgary / Open Minds

Campus Calgary / Open Minds Mission:
To transform teaching and learning by increasing student engagement through community, funder, and educational partnerships.
Campus Calgary / Open Minds Vision:
Each student experiences personalized learning within a connected community.
Campus Calgary / Open Minds Key Elements:
<ul style="list-style-type: none">-Teachers as designers, in collaboration with a site coordinator and education coordinator, co-constructing learning-Work alongside experts-Engage in hands on activities and experiential learning-Slow down and go beyond the obvious-Explore, discover, reflect, and share-Build strong relationships-Inspire ownership and stewardship-Maintain high standards for quality learning experiences for all students-Inquiry driven interdisciplinary approach-Develop action and awareness-Personalized learning opportunities to meet individual needs

AN INTERPRETIVE EXERCISE IN MOVING FROM RESEARCH TO ASSESSMENT IN LANGUAGE ARTS

Galia Blackman

University of Calgary

Research on dialogic learning practices supports the use of dialogic contexts for language students, but actual teaching practice provides little evidence of corresponding assessments. In order to facilitate a qualitative research project on dialogic practices in language classes, I used audio-journals. This paper reports on an interpretive exercise, which came out of that research. In the interpretive exercise, I considered the strengths and challenges of using audio-journals in research. Furthermore, I contemplated the possibilities of using audio-journals in Language Arts instruction, to close in on the research gap regarding assessment of oral literacy.

Keywords: language learning; audio-journals; assessment

INTRODUCTION

With the click of a digit, we send photos, videos, and audio notes to each other. What if language teachers could use that ease of communication for assessments of oral literacies? In this paper, I report on an interpretive exercise, which evaluated the potentiality of using audio-journals as an assessment method in Language Arts classes. This exercise was the result of an analysis of the concept of audio-journals as a data collection method. I analyzed audio-journals in preparation for research within a secondary school. The purpose of that research was to understand students'

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 150-158. Calgary, Canada: Werklund School of Education, University of Calgary.

experiences of classroom talk. As I proceeded with the actual research, I noticed that there was little correlation between classroom talk and formal assessments. As a result of that observation, I devised a research question for this interpretive exercise: if audio-journals can yield meaningful data for research purposes, can they be used as an assessment method for literacy education?

CONTEXT

Teachers are often preoccupied with preparing students for pen and paper testing. However, the Alberta English Language Arts syllabus (2003) states, “oral language is the foundation of literacy” (p. 3). Students are expected to develop oral competencies, but there are no corresponding formal evaluations. What happens to a curriculum objective and student learning if there is no mandate to evaluate it? Research shows that dialogic learning practices, which bring orality into the classroom, are essential to Language Arts classrooms (Alexander, 2008; Juzwik, Borsheim-Black, Caughlan, & Heintz, 2013). Students’ cognitive abilities and social skills can be strengthened through dialogic learning practices which harness students’ multi-literacies. Can and should these practices be evaluated? What can we learn from the use of audio-journals in research?

In this interpretive exercise, I wonder what curriculum can look like if instructors make small steps in these directions. Writing on higher education, Lang (2015) makes a case for the importance of small teaching steps to support students’ learning. This is important for the secondary school language-learning context because that foundation sets a tone for what students think is required of them in higher education. Students may find themselves challenged to harness their multi-literacies and creativity, in post-secondary educational contexts or career opportunities. In the absence of opportunities to enact oral literacies through dialogic classroom practices, these challenges become more pronounced.

THEORETICAL BACKGROUND

Dialogic approaches in educational practice share many common features, including open exchange of ideas, jointly undertaken inquiry, mastery of disciplinary knowledge and ways of reasoning, engagement with multiple voices and perspectives, and respectful classroom relations, but such contexts can be difficult to facilitate (Haneda, 2016). That difficulty often stems from the challenge in assessing dialogic exchanges. In online classroom environments, there is the greater potentiality to assess dialogic exchanges because of how speech acts can be contained in online classrooms. Simpson (2016) reports a successful implementation of dialogic teaching in an online classroom. In fluid face-to-face situations, that kind of assessment can be more difficult to implement.

There is a wide canon of research on dialogic learning practices, from Sinclair and Coulthard (1975), to more recent research (Alexander, 2008; Langer, 1992; Nystrand, 1997). These sources are essential readings for teachers attempting to include more classroom dialogue in their teaching practice. However, there is little research on ways to assess students' learning in these contexts. Furthermore, research on secondary school students' experiences of dialogic encounters in language classes tends to emphasize teachers' perspectives.

In my background research, which led to the use of audio-journals, I was curious about what students had to say about face-to-face dialogic learning contexts. Student voice theory was useful for that research because it argues for the opportunity to give students a sense of presence, power, and agency (Cook-Sather, 2006, pp. 3-5). I pursued research with audio-journals, from the theoretical perspectives on student voice work (Cook-Sather, 2006; Lensmire, 1998). The goal was to provide students with mediums to be heard. However, the research on audio-journals as qualitative inquiry was sparse.

METHODS

The research process for the interpretive exercise of this paper was a series of literature reviews. I conducted a critical evaluation of the use of diaries in research and I present some of my findings here (Blackman, 2016). Then I conducted a literature review of assessments of oral literacies. Here, I present preliminary conclusions on the use of audio-journals as a data collection method, to consider how they can inform oral literacy assessment in Language Arts.

Audio-journals in Research

I reviewed the use of audio-diaries in qualitative research and I considered the recurring recommendations and limitations of various forms of diaries as data collection methods (Crozier & Cassell, 2016; Day & Thatcher, 2009; Hewitt, 2015; Jacelon & Imperio, 2005; Kenten, 2010; Worth, 2009). I concluded that audio-journaling can strengthen research because: it can be participatory by empowering participants during the research process; it can minimize researcher interference in studies where participants' voices are key; it can be convenient, spontaneous, and versatile; it can provide self-reflective opportunities for participants; and it can provide research opportunities to access participants who are difficult to access otherwise, through distance or disability.

Audio-journaling has challenges: technological glitches and practicalities can be unpredictable; participants may need prompts or reminders to record; journals can produce too much data or conversely too little data; the researcher distance runs the risk of participants going off topic. I devised some counter-challenges: discuss the process with the participants prior to data collection; describe the data which is sought; practice a rehearsal; provide participants with prompts; use a check-in or follow up interview; use the journaling with other data collection methods. Based on my research with audio-journals where I collected nine submissions from three participants, I

concluded that these strengths and challenges were sound representations of audio-journals in the field. These strengths are opportunities for Language Arts instruction to address students' multi-literacies.

I sought to determine how this analysis could help understandings of assessments of oral literacies. From a literature review of assessments of multi-literacies (Kalantzis, Cope, & Harvey, 2010; Moni, van, K., & Baker, 2002; Whitehead, 2007; Wyatt-Smith, & Cumming, 2010), I concluded that there is a gap in research on assessment of oral competencies in Language Arts, because there is a gap in evidence. Not only is evidence of oral literacy sometimes challenging to find in research, evidence of assessments of oral literacies in Language Arts is sparse. Alternative assessments tend to reinforce reading and writing assessment objectives (Bauer, 1999; Kalantzis, Cope, & Harvey, 2010) and do not explicitly address multiliteracies. Audio-journals in research may yield insight regarding the possibilities for assessments of students' oral literacies.

Implications for Language Learning and Recommendations for Action

While I worked out the actual strengths and challenges of using the audio-journals in the field, I made field notes about the possibilities for using audio-journals in language instruction. In a digitally enhanced age, where students transmit voice notes with the click of a digit, and create vlogs with casual expertise, audio assessments are an underexplored tool in language learning contexts. In spite of the traditional challenges, dialogic practices in language learning could be strengthened if instructors make use of audio assessments. Such assessments could harness students' daily skills. These assessments can also be connected to future occupational prospects and even address the same skills evaluated by current standardized tests.

Instructors can create powerful learning for their students through the small everyday decisions, and assessments ought to be considered in those decisions (Lang, 2016, p. 243). Teaching and

assessments are always interrelated. Revolutions do not always begin in grand gestures. Cultures flow from small, almost invisible actions. Recognizing that our students are immersed in digitally enhanced contexts, recognizing the value of promoting dialogic exchanges, and conceding that formal assessments might not move at the pace in which people actually live, it is worth thinking of ways to introduce small gestures of alternative assessments. Audio-journals, not just as research tools, could be relevant in terms of assessing current language learning objectives. I am curious to see how instructors try out audio assessments in an action research manner, to determine the merit of my assertions.

This paper is conceptualized as a proposal, a dialogic engagement with instructors and students, for ongoing discussion, and subsequent research. Wolfe and Alexander (2008) emphasize that in dialogic interactions, individuals can be exposed to alternative perspectives and expected to engage with another person's point of view in ways that challenge and deepen their own conceptual understandings. Therefore, I invite correspondence on the query: what can audio-journals offer as assessment in Language Arts?

CONCLUSION

Audio-journals are sound research tools. They could be practical audio assessments which strengthen current language assessment, support language teaching, harness multiliteracies, and provide avenues of inclusion for differently-abled students. Experimenting intentionally with voice-notes, as snippets of content, knowledge, skills, or even as audio-journals, calls upon instructors to be more critical teachers. Critical teachers can benefit from harnessing the stance of critical teacher researchers who decide what needs to be learned and discovered in their classes, and how such learning is assessed (Steinberg, 2015, p. 5).

References

- Alberta Learning. (2003). *English Language Arts (Senior High)*. Alberta, Canada, 1- 66. Retrieved from <http://www.learnalberta.ca/ProgramOfStudy.aspx?lang=en&ProgramId=370511#>
- Alexander, R. J. (2008). *Towards dialogic teaching: Rethinking classroom talk*. Dialogos.
- Bauer, E. B. (1999). The promise of alternative literacy assessments in the classroom: A review of empirical studies. *Reading Research and Instruction: The Journal of the College Reading Association*, 38(2), 153-168. doi: 10.1080/19388079909558285
- Blackman, G. (2016). Can you hear me? Wait, are you listening to me? Poster presented at the Graduate Research Symposium, Werklund School of Education, University of Calgary.
- Cook-Sather, A. (2002). Authorizing students' perspectives: Toward trust, dialogue, and change in education. *Educational Researcher*, 31, 3-14.
- Crozier, S. E. & Cassell, C. M. (2016). Methodological considerations in the use of audio diaries in work psychology: Adding to the qualitative toolkit. *Journal of Occupational and Organizational Psychology*, 89(2), 396-419. doi:10.1111/joop.12132
- Day, M. & Thatcher, J. (2009). I'm really embarrassed that you're going to read this: Reflections on using diaries in qualitative research. *Qualitative Research in Psychology*, 6(4), 249-259. doi: 10.1080/14780880802070583
- Haneda, M. (2016). Dialogic learning and teaching across diverse contexts: Promises and challenges. *Language and Education*, 31(1), 1-5. doi:10.1080/09500782.2016.1230128
- Hewitt E. (2015). Building bridges: The use of reflective oral diaries as a qualitative research tool. *International Journal of Research & Method in Education*. doi: 10.1080/1743727X.2015.1114601

- Jacelon, C. S. & Imperio, K. (2005). Participant diaries as a source of data in research with older adults. *Qualitative Health Research*, 15(7), 991-997.
- Juzwik, M. M., Borsheim-Black, C., Caughlan, S. & Heintz, A. (2013). *Inspiring dialogue: Talking to learn in the English classroom*. New York, NY: Teachers College Press.
- Kalantzis, M., Cope, B. & Harvey, A. (2010). Assessing multiliteracies and the new basics. *Assessment in Education: Principles, Policy & Practice*, 10(1), 15-26. doi: 10.1080/09695940301692
- Kenten, C. (2010). Narrating oneself: Reflections on the use of solicited diaries with diary interviews. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 11(2), Art. 16, <http://nbn-resolving.de/urn:nbn:de:0114-fqs1002160> .
- Langer, J. A. (1991). *Literary understanding & literature instruction. (Report 2.11)*. Albany, NY: University at Albany, Center for the Learning and Teaching of Literature.
- Langer, J. A. (1992). Discussion as exploration: Literature and the horizon of possibilities. In G. E. Newell & R. K. Durst (Eds.), *Exploring texts: The role of discussion and writing in the teaching and learning of literature* (pp. 23-43). Norwood, MA: Christopher Gordon.
- Lang, J. M. (2016). *Small teaching: Everyday lessons from the science of learning*. San Francisco CA: Jossey-Bass.
- Lensmire, T. J. (1998). Rewriting student voice. *Journal of Curriculum Studies*, 30(3), 261-291. doi: 10.1080/002202798183611
- Moni, K. B., van, K. C. E. & Baker, C. D. (2002). Students' perceptions of literacy assessment. *Assessment in Education: Principles, Policy & Practice*, 9(3), 319-342. doi: 10.1080/0969594022000027654

- Nystrand, M. (1997). *Opening dialogue: Understanding the dynamics of language and learning in the English classroom*. New York: Teacher College Press.
- Sinclair, J. M. H. & Coulthard, R. M. (1975). *Towards an analysis of discourse: The English used by teachers and pupils*. London: OUP.
- Simpson, A. (2016). Designing pedagogic strategies for dialogic learning in higher education. *Technology, Pedagogy and Education*, 25(2), 135-151, doi: 10.1080/1475939X.2015.1038580
- Steinberg, S. R. (2015). Employing the bricolage as critical research in teaching English as a foreign language. In M. Vicars, S. R. Steinberg, T. McKenna, & M. Cacciattolo, (Eds.), *The Praxis of English Language Teaching and Learning (PELT): Beyond the Binaries: Researching Critically in EFL Classrooms* (pp. 1-19). Sense Publishers.
- Whitehead, D. (2007). Literacy assessment practices: Moving from standardised to ecologically valid assessments in secondary schools. *Language and Education*, 21(5), 434-452. doi: 10.2167/le801.0
- Wolfe, S. & Alexander, R. J. (2008). *Argumentation and dialogic teaching: Alternative pedagogies for a changing world*. London: Futurelab.
- Worth, N. (2009). Making use of audio diaries in research with young people: Examining narrative, participation and audience. *Sociological Research Online*, 14(4), 1–11. doi:10.5153/sro.1967
- Wyatt-Smith, C. M., & Cumming, J. J. (2010). Curriculum literacies: Expanding domains of assessment. *Assessment in Education: Principles, Policy & Practice*, 10(1), 47-59. doi: 10.1080/0969594032000085749

MAKING MEANING OF PERIODIC FUNCTIONS THROUGH BODY MOVEMENTS

Minerva Martínez Ortega¹, Armando Paulino Preciado Babb², and Hugo Rogelio Mejía Velasco¹

Cinvestav IPN¹ and University of Calgary²

We report high school students' meaning making process of the sinusoidal function when engaged in a dynamic activity based on body movements. Using a distance sensor connected to graphing software, students were asked to reproduce a sinusoidal function. We explain how technology facilitated students' understanding of this function and its parameters. We also report students' difficulties in attempting to generate this graph, and the implications for understanding periodic phenomena, commonly studied and applied in science and engineering.

Keywords: STEM; Sinusoidal Function; High school; Technology

RESEARCH PROBLEM

Trigonometric functions represent one of the most difficult topics in senior high school mathematics courses. These functions are essential for modelling and studying periodic phenomena in physics, biology, and chemistry and have important applications for science, engineering, and technology. Although scholars agreed that the initial stages in learning trigonometric functions present several difficulties (e, g. Blacket & Tall, 1991; Brown, 2006; Buendía-Abalos & Cordero-Osorio, 2005; Kendal & Stacey, 1996; Martínez-Ortega, Mejía-Velasco & Martínez, 2016; Moore, 2009; Weber, 2005), Moore (2010) noticed that mathematics education research on these types of functions are scarce. Within trigonometric functions, *sinusoidal functions* (i.e. variations of sine

and cosine) deserve special attention: with them, we can easily determine the other trigonometric functions. In this paper, we analyze and report students' process of meaning making when introduced to this type of function through a dynamic activity based on body movements.

The strategy consisted of generating a graph using a distance sensor connected to graphing software. While this approach has been commonly reported in the literature (e.g. Bazzini, 2002), we have found no reference for the particular case of trigonometric functions. We address the following research questions in this paper: (1) What meanings do the students make of the sinusoidal function when they generate and study graphics of uniform bodily movements? (2) In what manner does the use of digital tools influence the meanings of the sinusoidal functions?

Our goal is to report and analyze the arguments used by students to justify, explain, and verify conjectures when trying to generate a sinusoidal function using the distance sensor and their body movements.

THEORETICAL PERSPECTIVE

Contrary to the Platonist perspective that assumes mathematical objects are independent from humans, we followed an embodied cognition perspective (e.g. Bazzini, 2002), which places an emphasis on the bodily experiences when learning mathematics: The embodied experiences underpin the grounding metaphors that shape the individual's development of mathematical concepts. Moreno Armella (2014) also argued in favour of this perspective, claiming that it is more desirable for didactics to take an approach that considers the existence of mathematical objects closer to human activity because when students have to access mathematical objects, they do it only with their bodies and the symbolic models.

When approaching functions in a mathematics course, very often the teacher introduces a phenomenon that can be studied through a particular function. We reverse this process for pedagogical purposes: Students were asked to produce body movements that would result in a particular type of graph. In this process, the images generated on the screen "interplay with body experiences and reasoning schemas and are translated from bodily experience to mathematical concepts" (Bazzani, 2002, p. 268).

RESEARCH DESIGN

The activities, conducted in 3 sessions of 2 hours each, were led by the first author with a group of ten students in their first year of senior high school (equivalent to Grade 10 in Canada), who had not been introduced to sinusoidal functions before. For each session, an activity guide was designed, which included students' written responses and sketching of graphs. The activities were developed through collaborative learning, scientific debate and self-reflection, as described by Hitt and González-Martín (2014).

The purpose of the first session was for students to identify and link the way movement can be represented in a Cartesian graph. With the support of a movement sensor, the graph was produced in real time on the computer screen. Students were requested to walk toward the sensor and away from it. It was expected that participants would identify characteristics linked to the movement in the generated graphs. Then, students were asked to draft, with paper and pencil, the graph corresponding to the action of going from home to school. Later, students drafted the same movement, but this time for the whole week. In this last part of the activity, students were expected to start identifying characteristics of the periodic movement.

In the second session students were shown a sinusoidal-type graph and were required to make the necessary moves in front of the distance sensor to reproduce the graph. The goal was for students to identify that the graph corresponds to a periodic movement.

In the third session students were introduced to the parameters in the formal expression of the sinusoidal function $f(t) = A\sin(Bt + H) + V$. Students were expected to describe the effects of varying the parameters in the graph of the function.

The data for this qualitative study consisted of the products generated by participants—i.e. written responses and sketches of graphs—and the video recording of each session. Each video was split into small segments (one to three minutes). Selected segments were transcribed for further analysis. Only the first author had access to the raw data. Selected excerpts and graphs produced by students are included in this paper to showcase students' processes of meaning making, as well as some of their struggles to generate the sinusoidal function. Our choice for the examples was informed by feedback from a presentation to a broader audience (Martínez-Ortega, Mejía-Velasco & Martínez, 2016) and multiple discussions with the second author.

Findings

In the first session, students generated graphs corresponding to walking toward and away from the sensor: The independent variable corresponds to time and the dependent variable to the distance. These graphs corresponded to lines, as shown in Figures 1 and 2.

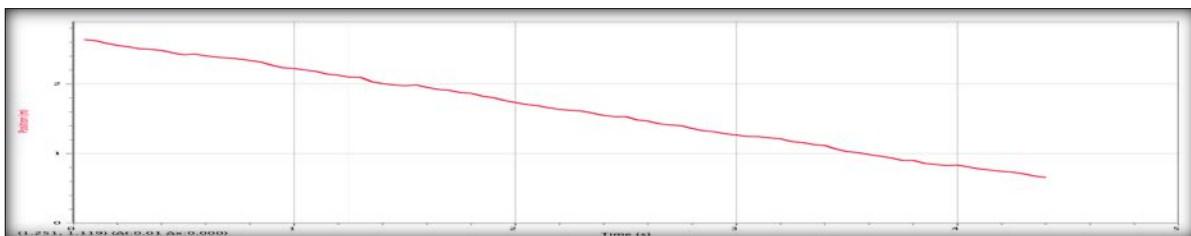


Figure 1: Graph generated by Alma when walking toward the sensor.

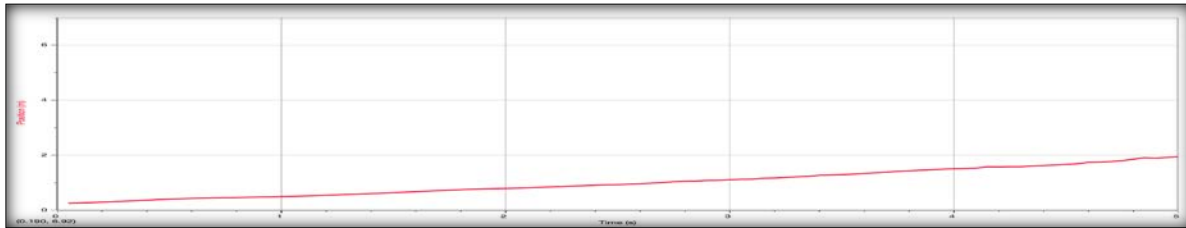


Figure 2: Graph generated by Kevin when walking away from the sensor.

Students did not immediately identify that the graphs represented distance as a function of time. It was necessary that students repeated the action of walking in front of the sensor to realize that when they approached the sensor, the graph was a line with a negative slope, whereas, when they walked away from it, the graph was a line with a positive slope. Then students were asked to sketch, using time and distance as variables, the graph corresponding to the action of going from their home ('casa' in Spanish) to school ('escuela' in Spanish) and then back to home after spending some time in classes at school. An example of this sketch was Alma's graph, which explicitly related the sketch with the previous activity. In this example, she set a new reference point, the school, as shown in Figure 3.

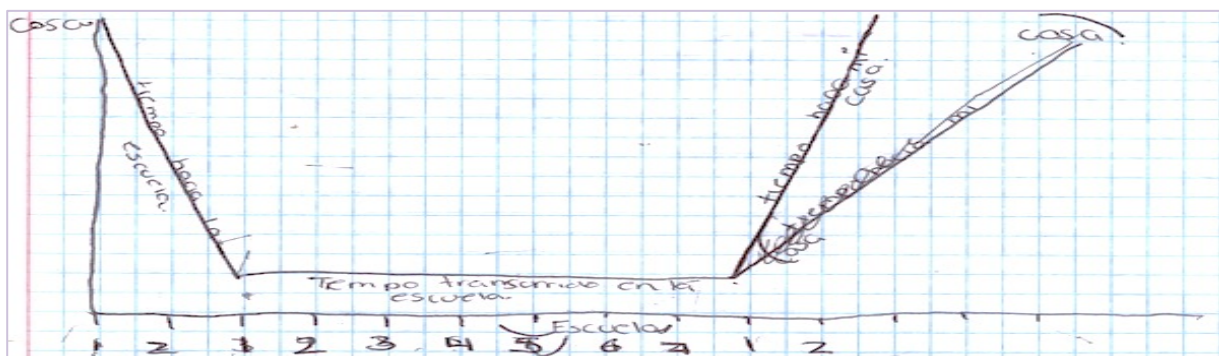


Figure 3: Graph generated by Alma for a whole trip from home to school to home.

According to Alma, she tried to make a symmetric graphic, she cancelled the first segment that represented back to home and made a similar segment of going to school (Figure 3).

In the second session Alma related the graph generated through the sensor with the action of going back and forth from home to school during one week. As she mentioned, "it is the same action" (Figure 4). In this activity, students started to identify characteristics of the periodic movement, which they referred to as "repetitive." For instance, Alma established that she takes two hours commuting from home to school and two hours returning home.

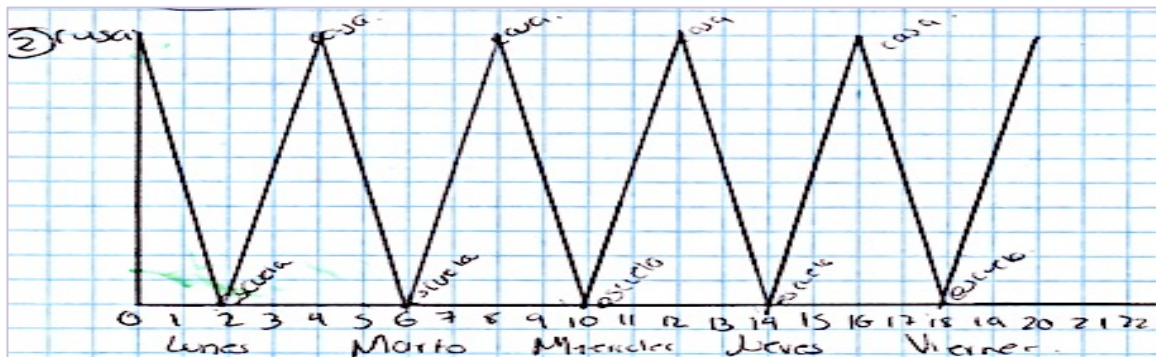


Figure 4: Graph generated from Alma after five trips.

Although there was evidence that students understood the relationship between time and distance in the graphs they generated, there were struggles when they attempted to generate the sinusoidal function in the second session. Students walked in front of the distance sensor in different manners; for instance, one of them walked rising their knees, or as some of them described, "walking as a drunk man." They also tried to relate the type of the graph with the speed they were walking.

After several attempts, Carlos thought about walking "making the same movement, that is going back and forth" (Carlos). This student, standing in front of the sensor, moved two steps toward the sensor and two steps backwards.

When asked by the researcher why did he think that the movement should be like that, Carlos answered: "Because if one gets closer (toward the sensor), it was going downwards (\backslash); as one gets farther (from the sensor), it was going upwards ($/$).". After making this movement, Carlos concluded that this type of graph is generated by periodic movements. He asked whether the required graph

could be generated moving the hand back and forth in front of the distance sensor and repeating this several times. After being invited to try, Carlos verified his conjecture in front of the sensor.

In the third session students were introduced to a formal expression for the sinusoidal function, and some students made explicit connections between some of the general parameters and associated movements. After introducing the sinusoidal function, the researcher discussed with the students some characteristics of this type of functions; the main feature stressed was its repetition (periodicity). Students identified the oscillations with the steps (forth and back); the period (P), time involved in a step; the amplitude (A), size of the step, vertical displacement (V), distance from the person to the sensor. Samantha commented that "the farther from the sensor, the higher the graph goes." The teacher explained the horizontal displacement (H) and introduced a mathematical expression for this type of function: $f(t) = A\sin(Bt + H) + V$

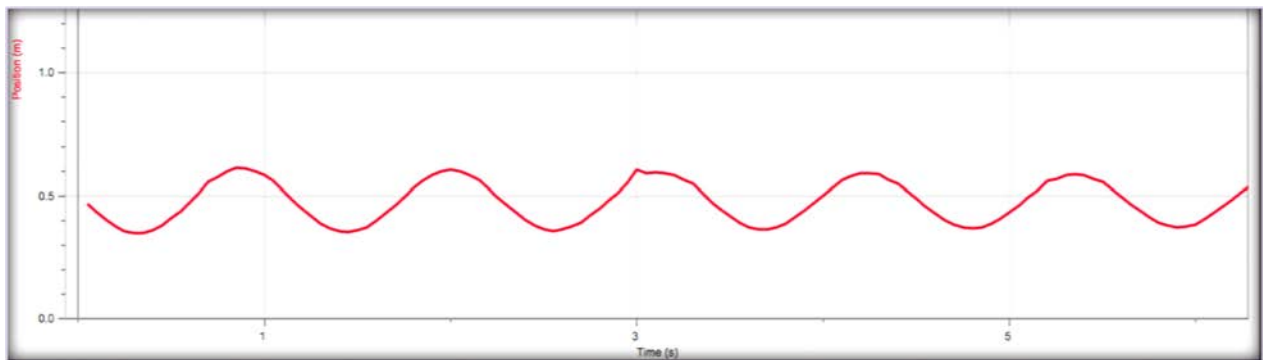


Figure 5: $f(t) = 0.12\sin(5.5t - 0.46) + 0.47$

The values for the parameters in the previous graph (Figure 5) were determined by two students (Samantha and Carlos); except for the horizontal displacement, Mariano calculated the values for the rest of the parameters; the other students only calculated the amplitude and vertical displacement.

CONCLUSION

In this paper we reported students' meaning, making processes when attempting to generate a sinusoidal function through their body movements. Very often, sinusoidal functions are used to model and study phenomena and teachers assume students interpret properly the connection between the graph of this function and the phenomena. However, we observed that even when students already understood the parameters and the effects of moving back and forth from the distance sensor, the connection to the periodic function represented difficulties. It was necessary to realise that the movement that was described by a sinusoidal function was periodic.

We believe that both the action of walking uniformly and the way the graph was generated supported students to make sense of the periodicity of sinusoidal function. The use of the sensor facilitated the generation, reproduction, and most importantly the discussion and analysis of the harmonic phenomena. The way in which the graphs were generated allowed students to identify and assign meaning to the signs and features that represent the parameters of sinusoidal functions.

References

- Bazzini, L. (2002). From grounding metaphor to technological devices: A call for legitimacy in school mathematics. *Educational Studies in Mathematics*, 47, 259-271.
- Blackett, N. & Tall, D. (1991). Gender and the versatile learning of trigonometric using computer software. In F. Furinghetti (Ed.), *Proceedings of the 15th Meeting of the International Group for the Psychology of Mathematics Education* (pp. 144-151). Assisi, Italy.
- Brown, S. (2006). The trigonometric connection: Students' understanding of sine and cosine. In J. M. Novotná (Ed.), *Proceedings 30th Conference of the International Group for the Psychology of Mathematics Education. 1* (pp. 228). Praga: PME.

- Buendía, G. & Cordero, F. (2005). Prediction and the periodic aspect as generators of knowledge in a social practice framework: A socioepistemological study. *Educational Studies in Mathematics* 58(3), 299-333.
- Hitt, F. & González-Martín, A. S. (2015). Covariation between variables in a modelling process: The ACODESA (collaborative learning, scientific debate and self-reflection) method. *Educational Studies in Mathematics* 88, 201-219.
- Kendal, M., & Stacey, K. (1996). Trigonometry: Comparing ratio and unit circle methods. In *Technology in Mathematics Education. Proceedings of the 19th Annual Conference of the Mathematics education Research group of Australasia* (pp. 322-329).
- Martínez-Ortega, M., Mejía-Velasco, H. R., & Martínez, M. A. (2016). The sinusoidal function and the harmonic phenomena. In M. B. Wood, E. E. Turner, M. Civil, & J. A. Eli (Eds.), *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 620-627). Tucson, AZ: The University of Arizona.
- Moore, K. C. (2009). An investigation into pre-calculus students' conceptions of angle measure. Paper presented at the Twelfth Annual Special Interest Group of the Mathematical Association of America on Research in Undergraduate Mathematics Education (SIGMAA on RUME) Conference, Raleigh, NC: North Carolina State University.
- Moore, K. C. (2010). *The role of quantitative reasoning in precalculus students learning central concepts of trigonometry* (Unpublished doctoral dissertation). Arizona State University, Tempe.
- Moreno-Armella, L. (2014). *Matemática Educativa: Del signo al píxel*. Bucaramanga: Universidad Industrial de Santander.

Weber, K. (2005). Students' understanding of trigonometric functions. *Mathematics Education Research Journal*, 17(3), 91-112.

USING VARIATION TO CRITIQUE AND ADAPT MATHEMATICAL TASKS

Martina Metz, Paulino Preciado-Babb, Soroush Sabbaghan, Brent Davis, and Alemu Ashebir

Werklund School of Education

We report on four key ideas we have found important in our work with teachers based on almost five years of research with the Math Minds Initiative. These ideas combine the Variation Theory of Learning with a strong focus on continuous assessment to inform the way teachers adapt task sequences offered in the resource used by project teachers. In doing so, we expect that teachers aim to better serve both struggling students and those who need extension as they develop coherent mathematical knowing. We elaborate on each one of these ideas, with examples from the Initiative in this paper.

Keywords: Variation Theory of Learning, continuous assessment, mastery learning

For almost five years, the Math Minds Initiative has centered on improving mathematics instruction at the elementary level in Calgary. Part of this work has focused on teacher professional learning, which is the focus of this paper. The initiative integrates research on formative assessment (Wiliam, 2011), intrinsic motivation (Pink 2011), mastery learning (Guskey, 2010) cognitive load (Clark, Kirschner, & Sweller, 2012), and variation theory (Marton, 2015), which we have integrated in a four-part framework to support the feedback we offer teachers (see Figure 1).

Here, what we call ribboning refers to an alternating pattern of tasks that draw attention to key ideas and assessment of each key idea. Ribboning draws on both variation theory and cognitive

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 169-178. Calgary, Canada: Werklund School of Education, University of Calgary.

load theory to effectively direct attention to key ideas without overwhelming working memory. Clear patterns of variation among ideas that may be held together in working memory makes it more likely that connections between those ideas may be discerned. Formative assessment with careful monitoring of student feedback and teaching that is responsive to that feedback are essential to ensure that intended distinctions are in fact made before we ask students to extend or connect them. In this paper, we focus primarily on variation, but it is important to emphasize how variation supports and is supported by the other elements in the protocol.

Ribboning	Monitoring	Adapting	Connecting
Use structured variation to draw attention to potentially novel discernments necessary to a concept.	Ensure every student is able and obligated to provide feedback to the teacher in response to each ribboned query.	Revise/devise tasks, explanations, and other engagements to fit with demonstrated understandings.	Move between “part” and “whole” when ribboning to ensure that learners do not lose sight of the concept(s) under study.

Figure 1: Math Minds Principles (adapted from Davis, 2016)

In previous work, we have described some of the challenges teachers face in (a) supporting struggling students and (b) offering meaningful extensions (*cf.* Preciado-Babb, Aljarrah, Sabbaghan, Metz, Pinchbeck, & Davis, 2016). We have also highlighted some of the difficulties they experience when creating their own patterns of variation (Metz, Preciado-Babb, Sabbaghan, Pinchbeck, Aljarrah, & Davis, 2016). We have since asked teachers to consider the following questions as they examine the patterns of variation offered in the resource used by all project

teachers: (a) What features of the concept are separated for attention? (b) Are the features we wish to draw attention to systematically varied? (c) Is variation set against a constant background? and (d) Are key ideas juxtaposed in a manner that highlights the desired pattern of variation?

Here, we highlight four ideas that have emerged as significant in our work with teachers and students around these questions. The first reiterates the importance of contrast: When *too many things* change or the *wrong things* change, students may not make intended distinctions. The second stresses that even tightly controlled variation may not be noticed if relevant items are not clearly *juxtaposed* and if students are not *invited* to notice what changes and what stays the same from example to example. In the third, we further distinguish between *parsing work into manageable chunks* and *using clear patterns of variation* to draw attention to key concepts within those chunks. Finally, in the fourth idea, we address concerns that tightly structured variation may allow students to merely extend patterns without understanding why they occur. In the following sections, we offer selected examples from our data set to exemplify each of these four ideas. Throughout, we maintain an emphasis on continuous assessment and adaptive response: None of the identified patterns should be taken as ideal or sufficient unto themselves. When tasks are organized such that each piece builds on understanding of the previous, assessing understanding at the end of a lesson or even at several intervals during a lesson is not enough.

ATTENDING TO DIFFERENCE: THE POWER OF CONTRAST

A subtle but powerful insight may be found in the distinction between systematic variation that varies the feature we want students to notice while holding other features constant (i.e., contrast) from systematic variation that varies everything else while holding the key idea constant (i.e., generalization). Marton (2015) noted that we tend intuitively toward the latter; i.e., when we want to help someone understand something, we offer many examples. But this only works if the idea

has already been discerned and we need only to broaden perception of what it may encompass. It does not work well for introducing new ideas. Appreciating this distinction can shift how we adapt explanations and tasks to support struggling learners.

In presenting rounding at Grade 5, the resource used by the teacher first uses a number line to prompt attention to whether various numbers are closer to 0 or 10, then 10 or 100. It then offers a common procedure that involves checking the digit after the one being rounded to; if 5 or up, round up; if less than 5, round down. Practice includes a collection of numbers to round to 10, a different collection to round to 100, and another to round to 1000. This pattern was unproblematic for some. One student, however, didn't make sense of this until asked to contrast *the same number* rounded to *different place values*, as in Figure 2. This student was particularly intrigued by the staircase pattern of zeroes that forms in the first set and by the fact that ten million rounded to zero. He was also interested in the third set, where all but the last case rounds to 2,000,000. What began as support for a struggling student went significantly beyond the original task of rounding to 1000.

	1	6	2	7	3	8	4
10							
100							
1000							
10,000							
100,000							
1,000,000							
10,000,000							

	1	9	6	9	7	9	8
10							
100							
1000							
10,000							
100,000							
1,000,000							
10,000,000							

	1	9	9	9	9	9	9
10							
100							
1000							
10,000							
100,000							
1,000,000							
10,000,000							

Figure 2: Using contrast to deepen understanding of rounding.

JUXTAPOSITION: THE IMPORTANCE OF *DIRECT* CONTRAST

Even when patterns of variation seem clear and teaching is responsive, however, there are times when patterns go unnoticed or unmarked. Marton (2015) did not directly address cognitive load (Clark, Kirschner, & Sweller, 2012). However, he stressed the importance of holding ideas

simultaneously in consciousness, which requires attention to working memory as well as careful consideration of what it is that needs to be held together: “[T]he experience of sameness and difference is not only a function of what there is to be experienced but of what things are experienced simultaneously” (Marton, 2015, p. 66).

Effective juxtaposition supports simultaneous experience, and there are various tools and strategies that can be used to support this. Mathematical representations often juxtapose ideas in ways that allow particular relationships to be discerned. Consider the number line, the intersection of number lines that form the axes of a Cartesian plane, or the plotting of a unit circle on a mere 2×2 portion of that plane: Each allows new ways to experience mathematical relationships. We have also observed pedagogical strategies that support the clear and uncluttered juxtaposition of ideas in time and space.

In the rounding example offered earlier (and in other examples that follow), notice that the sequences were presented on grid paper. While this helped keep work neat and organized, it also did something more powerful: It made tracking variation easier by making it easier to see what changed and what stayed the same from example to example. It was still important to *ask* “What changes? What stays the same?” and to explore “Why?” in response to the student excited to see emerging patterns such as the staircase pattern of zeroes in the first set of rounding tasks.

The resource used by Math Minds teachers includes a series of slides for each lesson. The simple act of laying those slides side by side can help prompt attention to significant contrasts between subsequent examples. In the original lesson highlighted in Figure 3, each of the three images representing 28 and the T-Table were presented on different slides.

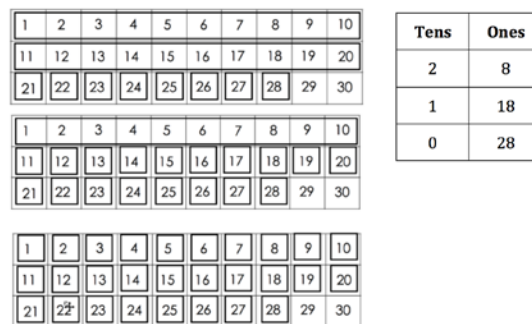


Figure 3: Representing 28 (Adapted from Mighton, Sabourin, & Klebanov, 2012, Slides 2-4).

After juxtaposing the images, the teacher asked “What is the *same* about the three charts on the smartboard?” Initial responses focused on the open 29 and 30 in each chart. Her next question prompted attention to difference: “Do they all look *exactly* the same way?” The students then noted the changing number of tens and ones blocks, which she recorded in the T-Table beside the images.

ATTENDING TO LIMITS ON WORKING MEMORY: PARSING WITHOUT FRAGMENTING

At times, demands on working memory (Clark, Kirschner, & Sweller, 2012) make it useful to separate parts of a more complex procedure such that they may be learned in manageable pieces and then put back together. While important, this alone does not draw attention to the mathematical ideas embedded in those steps. In the resource used by teachers in our study, long division at Grade 4 is parsed into steps designed to reduce load on working memory. Students first work with two-digit dividends and a one-digit divisor; the procedure is parsed into steps that are explained conceptually, then practiced for fluency before adding the next step. For some, this was sufficient. Others struggled to remember the steps; among those who did, some could not explain them. We then offered a practice sequence that systematically varied the divisor, as in Figure 4.

5	7	5		5	7	6		5	7	7		5	7	8		5	7	9		5	8	0		5	8	1		5	8	3		5	8	5

Figure 4: Systematic variation of practice for long division.

Because only one thing changed, students could now see (when prompted to look) how various parts of the algorithm changed (or not) each time the dividend went up by one (again, note the use of grid paper to allow easier tracking of changes from example to example); they could also see that the remainder went up by one each time. When asked why, they could more easily trace the cause of the changes. Further, because some of the requisite number facts were constant from question to question, less attention was diverted from understanding the algorithm. At $80/5$, the remainder cycles back to zero, which prompted further insights. It became clearer to students that the quotient is counting *groups* (alternatively, it could have been seen as representing an amount *per group*), while the remainder is counting *singles*; i.e., there were important opportunities for noticing that wouldn't have been there with more random practice. Significantly, it didn't take long before the students using these patterns started *looking* for connections. Again, what began as a support for a struggling student soon exposed a pattern that prompted deeper insights into division than the original task sequence.

HIGHLIGHTING CONNECTIONS: BRIDGING BIG IDEAS

Tightly structured sequences in which only one thing changes sometimes create predictable sequences that allow students to predict answers based on observed patterns rather than understanding of those patterns. However, it is easy to trivialize what to students may be important insights foundational for deeper understanding.

A Grade 5 class was trying to find all the ways to make 45 cents with dimes and nickels. They had been instructed to start with zero dimes and work their way up to 4 dimes, each time figuring out how many nickels would be needed to make up the balance and recording answers in a T-Table. Two students struggled to find the balance of nickels needed. To support them, they were asked to make marks for nickels, counting by fives to know when they had 45 cents. When asked, “How many nickels?” they at first wanted to count by fives again and had to be reminded that each mark was a nickel; they then counted nine sticks. Next, they were instructed to circle two nickels and to think of this as trading two nickels for a dime. They counted the total again, this time starting with 10 for the dime and adding five for each nickel: 10, 15, 20, 25, 30, 35, 40, 45. When asked how many nickels remained, both counted the remaining sticks and wrote the total in their T-Tables. They were then asked to make another dime, count the money to ensure the total was still 45 cents, and to count the remaining nickels. While this may seem like rote repetition of a procedure, after three repetitions, one of the students excitedly noted, “The nickels are going down by two every time!” and related this to the circled nickels. For him, this was a big insight. The other was excited to discover that the leftover stick at the end couldn’t be used to make a dime. The students needed help setting this up again for 75 cents, but they started using observed *patterns* in ways that they hadn’t done before; i.e., they could see more clearly that every time they added a dime, they had to take away two nickels. They then worked with quarters and nickels, nickels and pennies, and dimes and pennies.

IMPLICATIONS AND NEXT STEPS

By using clear patterns of variation coupled with prompts to attend to that variation, bridges as appropriate when perceptual jumps are too big, and breaks in patterns that push understanding beyond predictable patterns, we have asked teachers to move beyond what the resource often

describes (appropriately but insufficiently) in terms of scaffolding and attending to limits on working memory. Teachers in the initiative have relied heavily on the resource to define and sequence critical features for learning particular topics. However, they are assuming greater responsibility for what is set side by side in the moment-by-moment sequence of a lesson.

To date, much of our work with teachers has been on connections *within* lessons. Moving forward, we will further emphasize how careful attention to patterns of variation might support stronger connections over time—i.e., between lessons, units, and grades. Like scaffolding, review of material addressed in previous lessons is emphasized and supported by the resource. As with scaffolding, conceptualizing review in terms of using variation to carefully juxtapose the old and the new can support strong connections between key ideas. Contrast is most powerful when directly experienced and not reliant on memory of a lesson done last year, last week, or even earlier in a lesson. As doing so requires a broader awareness of what students are expected to understand over time, we will consider ways to support teachers who are often most familiar with a single grade or a small range of grades to look beyond the boundaries of their teaching assignments.

References

- Clark, R., Kirschner, P., & Sweller, J. (2012). The case for fully-guided instruction. *American Educator* 36(1), 6-11.
- Davis, B. (2016, November 28). Keynote speech presented at The Art and Science of Math Education, Carleton University, Ottawa, Ontario, Canada.
- Guskey, T. (2010). Lessons of mastery learning. *Educational Leadership* 68(2), 52-57.
- Marton, F. (2015). *Necessary conditions of learning*. New York, NY: Routledge.

- Metz, M., Preciado Babb, A. P., Sabbaghan, S., Pinchbeck, G., Aljarrah, A., & Davis, B. (2016). Teachers' awareness of variation. In M. Takeuchi, A.P. Preciado Babb, & J. Lock (Eds.), *Proceedings of the IDEAS 2016 Conference*, pp. 182-191. Calgary, Canada: Werklund School of Education, University of Calgary. <http://hdl.handle.net/1880/51222> .
- Mighton, J., Sabourin, S., & Klebanov, A. (2012). *Teachers' Guide 2:1 Number Sense 2-25 [Cdn. SmartBoard slides]*. Toronto, Canada: JUMP Math.
- Pink, D. (2011). *Drive: The surprising truth about what motivates us*. New York: Riverhead.
- Preciado-Babb, P., Aljarrah, A., Sabbaghan, S., Metz, M., Pinchbeck, G., Davis, B. (2016). Teachers' perceived difficulties for creating mathematical extensions at the border of students' discernments. In Wood, M. B., Turner, E. E., Civil, M., & Eli, J. A. (Eds.). *Proceedings of the 38th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 514-517). Tucson, AZ: The University of Arizona.
- Wiliam, D. (2011). *Embedded formative assessment*. Bloomington, IN: Solution Tree.

ATTENDING AND RESPONDING TO WHAT MATTERS: A PROTOCOL TO ENHANCE MATHEMATICS PEDAGOGY

Martina Metz, Paulino Preciado-Babb, Soroush Sabbaghan, Brent Davis, and Alemu Ashebir

Werklund School of Education, University of Calgary

For four years we have invested in improving mathematics teaching at the elementary level. By drawing from diverse research emphases in mathematics education and by considering the impact of lessons in terms of student engagement and performance, we have identified four key elements impacting learning in mathematics. Here, we describe the protocol currently used to structure feedback for teachers in the Math Minds Initiative. The key elements that comprise the protocol are: (1) effective variation, (2) continuous assessment, (3) responsive teaching, and (4) engagement.

Keywords: Variation Theory of Learning, continuous assessment, mastery learning, intrinsic motivation

THE PROTOCOL

As part of the Math Minds Initiative, we have used a design-based approach to develop an observation protocol that integrates data from classroom observations with research on formative assessment (Wiliam, 2011), intrinsic motivation (Pink 2011), mastery learning (Guskey, 2010) cognitive load (Clark, Kirschner, & Sweller, 2012), and variation theory (Marton, 2015). The protocol is based on classroom observations spanning four years of weekly, bi-weekly, or monthly observations of 10-15 teachers. Three researchers independently coded a set of 20 videos spanning

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 179-190. Calgary, Canada: Werklund School of Education, University of Calgary.

a year of practice with 7 teachers to begin refining and validating our descriptors. Here, we describe the various elements of the protocol: (1) effective variation, (2) visible learning, (3) responsive teaching, and (4) student engagement. We then offer a brief classroom illustration that uses the terms of the protocol to describe a two-part lesson in which one part of the lesson yielded higher levels of both success and engagement. Finally, we discuss the evolution of the protocol as we further refine how we draw attention to each of its key emphases.

Effective Variation

The international comparison of teaching styles in seven countries did not show a clear pattern of best teaching practices (Hiebert et al, 2003). Instead of focussing on teaching practises, Marton (2015) suggested attending to critical aspects that a learner must discern; this is a necessary condition for learning. We have used the Variation Theory of Learning (Marton, 2015) both as an analytical framework to interpret given lessons and to inform teachers' immediate responses to student feedback at various checkpoints during a lesson. We have found that effective variation respects the limits of working memory identified by Clark, Kirschner, and Sweller (2012), while further offering clear strategies for directing attention toward key ideas: *separation* of key aspects (through contrast), *generalization* (through induction), and *fusion* (through combination).

Because teachers in the project use a supplied resource, many aspects of variation are supported and partially constrained by what is offered in the teachers' guide, prepared slides, and student materials. Teachers, however, must be aware of the distinctions made in the resource so that they can effectively highlight them with students and so that they can effectively adapt the materials to support diverse student needs (*cf.* Metz, Preciado-Babb, Sabbaghan, & Davis, 2017); we discuss this further in the section on responsive teaching.

We have recently begun to use the term “ribboning” to describe the way key lesson elements are separated for attention; this phrase stems from work with teachers to colour-code video-taped recordings of their own lessons according to whether a selected moment involves instruction, assessment, or practice. In doing so, we have found that effective lessons typically resulted in narrow bands of colour that resemble ribbons. In other words, these lessons alternated frequently between drawing attention to important discernments and checking whether students made the intended discernments. This may be contrasted with lessons in which large chunks of information are clustered, either in large instructional chunks or in problems that involve multiple new ideas. For these and other reasons, we distinguish our work from discovery, direct, as well as somewhere-in-between approaches to teaching mathematics (*cf.* Metz, Preciado-Babb, Sabbaghan, Davis, Pinchbeck, & Aljarrah, 2016).

Visible Learning and Continuous Assessment

On one level, “visible learning” seems very simple: Make each child’s work visible such that the teacher may offer feedback. Doing so is also key to the forms of mastery learning described by Guskey (2010). Initially, however, we found that assessment during class more often took the form of sampling students, either through volunteered or invited response. Often, this did not provide a good indication of next steps required by those students whose responses were not observed.

“Making learning visible” also begs the question of what it is that needs to be made visible. As we discuss further in the section on variation, we have seen that what teachers ask students to engage in often combines multiple discernments that can become invisible to fluent users. These must be separated to make them visible to the student, which can also make them visible to the teacher (*cf.* Preciado-Babb, Metz, Sabbaghan, & Davis, 2016). Attending to ideas at this scale means assessment must occur frequently within a single lesson; checking in at the end of a lesson, series

of lessons, or unit is not sufficient. Doing so informs a form of deliberate practice that emphasizes aspects of performance that can be overlooked in the context of more complex tasks (Christodoulou, 2016).

Continuous assessment does more than provide fine-grained opportunities for feedback from teacher to student; each response also provides feedback from student to teacher, allowing the teacher to make appropriate decisions about next steps. In doing so, there is a strong emphasis on preventing misunderstanding rather than remediating: By starting at a level at which students are capable, they may continuously extend understanding.

In observing teachers, we found that even when teachers made learning visible, they sometimes proceeded without using feedback from students to inform the next steps of the lesson. For this reason, we separate visible learning from responsive teaching.

Responsive Teaching

Once all students have been assessed, teachers have the difficult task of deciding what to do next. If students were successful, what next step might press the boundaries of their understanding without overwhelming? If students were unsuccessful, might they return to a place of success, then proceed with a task that helps bridge the known and the unknown? Might the teacher offer a piece of instruction or ask a guiding question that helps address an apparent gap? Might a clearer pattern of variation help draw attention to a key idea that the student has not yet discerned?

Note the contrast this forms with common forms of remediation whereby a teacher supports students in completing multiple steps of complex tasks with which they are struggling (*cf.* Sabbaghan, Preciado-Babb, Metz, & Davis, 2015). If a student does require assistance, we emphasize the importance of following up with a similar task that the student may then complete

independently. One of the most poignant messages from the youngest participants was that they liked math best when they *didn't need help*. If only some students are successful, task extensions may be offered to those who are ready, thereby allowing the teacher to bring all students back to a place where they might continue together.

In each of these cases, the goal is for all students to discern key ideas then continuously extend their understanding (see also Preciado-Babb, Metz, Sabbaghan, & Davis, in press): nobody bored, nobody waiting for help.

Engagement

Engagement serves a different purpose than the first three items in our protocol: Effective variation, visible learning, and responsive teaching all point to teacher actions. Engagement, however, acts more as a means of “global monitoring” of the impact of the lesson on student engagement: Again, are all students given opportunities to both master and continuously extend their understanding? In so doing, each new challenge may be conceived of as an intrinsic reward (Pink, 2011).

CLASSROOM ILLUSTRATION

Here, we offer a brief example of how the protocol may be used to interpret what is happening in a first-grade classroom. The selected lesson was interesting in that it involved two parts, the first of which was highly successful in terms of student engagement and understanding and the second of which was less so. This allowed a clear contrast that involved the same teacher, same students, same day, and same topic—with dramatically different results.

In the first part of the lesson, the teacher gathered the students on the carpet. She asked them to identify a number pair that made ten. Someone suggested “3+7.” She wrote $3 + 7 = 10$ on a mini-

whiteboard, thus ensuring that everybody was starting with a correct equation. Underneath that, she wrote “ $3 + 8 = \underline{\quad}$,” thus offering a direct juxtaposition of the two number sentences:

$$3 + 7 = 10$$

$$3 + 8 = \underline{\quad}$$

She drew attention to what had changed and asked students what the new sum would be. She started with sums to ten and then moved to doubles; she also moved from adding one to one of the addends to subtracting one from one addend. Each time she offered a new question, she monitored the responses of all students and used their responses to gauge their readiness to move on. Each time she moved to something new, she told the students that since they were doing so well, she was going to give them a “stumper” and asked them to look closely to see what had changed. In other words, she carefully *ribboned* the pieces she wanted students to notice, assessing each child along the way, adapted her sequence according to the readiness of the students, and drew careful attention to important connections within the lesson and to previous lessons on doubles and making ten.

In the second part of the lesson, the teacher placed a set of laminated cards with equations of the form $a + b = \underline{\quad}$ on each of the tables in the classroom. Pairs of students were instructed to select a card and write the sum of the two addends. One partner was then to create a variation of the original on the back of the card; they could either add or subtract one from either of the addends. The other partner was to answer the new question. Then they were supposed to switch roles. It turned out that this was much more difficult than the opening set of tasks; most students understood that they could change one addend, but the seemingly simple act of transferring the equation to the back of the card required them to hold the entire equation in their memories; they could no longer see the contrast directly. This made it much more difficult for students to attend to the intended relationship between the two equations. Also, sometimes they did not answer the given question

correctly, which of course led to errors in the derived equation. In the initial lesson sequence, the teacher intentionally offered new variations as the students demonstrated their growing understanding; now the starting equations were more random and remained limited by the parameters to add or subtract one to each addend. Some students broke this rule and added more than one, but the receiving partner was not always ready for this extension, particularly since strong students were paired with weaker students. Assessment during this portion of the lesson was largely dependent on students checking one another; the teacher circulated and corrected the mistakes that she noticed, but she could not be with every group all the time. Part-way through this activity, she told students they could write the new equation on the same side as the original; this was helpful for some. However, those ready for a greater challenge were still left practicing more of the same with partners who were not ready to extend further. Perhaps *both* partners would have been ready for greater challenge had the initial approach been gradually extended, say, to include adding or subtracting more than one or to adjusting both addends at once.

The protocol has helped us draw attention to aspects of lessons that impact student understanding and engagement and has thus become a valuable tool to use with teachers, both for planning and feedback.

IMPLICATIONS AND NEXT STEPS

While observing lessons, we have noticed that it is possible for a teacher to use clear patterns of variation to parse and sequence content, to carefully assess all students, to adapt in response to student feedback, and to maintain strong engagement—all without adequately addressing broader connections within or between lessons. Although doing so is key to strong variation, we have been exploring the possibility of separating variation that is used to introduce new ideas and that which explicitly connects and integrates those ideas. Doing so points to an evolving relationship between

teacher and resource; while effective variation can and should be pre-planned to a certain degree, and a strong resource can do much to support this, there is much a teacher can do to draw attention to these connections. Furthermore, what defines effective variation must be based on adaptive response to student feedback, which often means teachers need to create their own examples, either to support struggling learners or to extend work beyond that which is offered.

In working with teachers with the protocol, we have begun to develop models for teaching and for teacher learning. Figure 1 presents an emerging framework that integrates key aspects of the observation protocol in a model that serves these ends. We also include an appendix that we have used with teachers to elaborate each section of the model.

Ribboning	Monitoring	Adapting	Connecting
Use structured variation to draw attention to potentially novel discernments necessary to a concept.	Ensure every student is able and obligated to provide feedback to the teacher in response to each ribboned query.	Revise/devise tasks, explanations, and other engagements to fit with demonstrated understandings.	Move between “part” and “whole” when ribboning to ensure that learners do not lose sight of the concept(s) under study.

Figure 1: Math Minds Principles (adapted from Davis, 2016)

Note that here, the protocol’s emphasis on engagement is included with adapting; i.e., if teachers effectively adapt their lessons in response to the needs of both high and low learners, they meet the protocol’s criteria for engagement. Effective variation is essential to each aspect of the model: The planned lesson and task sequence should incorporate clear patterns of variation (both to separate and re-connect), and adaptive response requires further attention to how variation is structured.

In summary, we have found that the ways concepts are broken down, extended and re-connected, the ways attention is drawn to key ideas, the ways each child is assessed, and the ways that information from those assessments are used to inform next steps in a lesson are critical to our

work. Moving forward, we plan to involve more observers external to the project in further validating and refining the criteria in our observation protocol. The key ideas of variation (including connections), monitoring, and response, however, have proven effective and stable.

References

- Christodoulou, D. (2016). *Making good progress? The future of assessment for learning*. Glasgow: Oxford University Press.
- Clark, R., Kirschner, P., & Sweller, J. (2012). The case for fully-guided instruction. *American Educator* 36(1), 6-11.
- Davis, B. (2016, November 28). Keynote speech presented at The Art and Science of Math Education, Carleton University, Ottawa, Ontario, Canada.
- Guskey, T. (2010). Lessons of mastery learning. *Educational Leadership* 68(2), 52-57.
- Hiebert, J., Gallimore, R., Garnier, H, Givvin, K.B., Hollingsworth, H., Jacobs, J., ... Stigler, J. (2003). *Teaching mathematics in seven countries: Results from the TIMSS 1999 video study*. Washington: National Center for Education Statistics.
- Marton, F. (2015). *Necessary conditions of learning*. New York, NY: Routledge.
- Metz, M., Preciado-Babb, A. P., Sabbaghan, S., Davis, B., Pinchbeck, G., & Aljarrah, A. (2016). Transcending traditional / reform dichotomies in mathematics education. In Wood, M. B., Turner, E. E., Civil, M., & Eli, J. A. (Eds.), *Proceedings of the 38th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, (pp. 1252-1258). Tucson, AZ: The University of Arizona.
- Metz, M., Preciado Babb, A. P., Sabbaghan, S., & Davis, B. (2017). Using variation to critique and adapt mathematical tasks. In A. P. Preciado-Babb, L. Yeworiew, & S. Sabbaghan (Eds.)

Selected Proceedings of the IDEAS 2017 Conference, (pp. 169-178). Calgary, Canada: Werklund School of Education.

Pink, D. (2011). *Drive: The surprising truth about what motivates us*. New York: Riverhead.

Preciado-Babb, A. P., Metz, M., Sabbaghan, S., & Davis, B. (Forthcoming). The role of continuous assessment and effective teacher response in engaging all students. To appear in R. Hunter, M. Civil, H. Eisenmann, N. Planas, & D. Wagner (Eds.), *Mathematical discourse that breaks barriers and creates space for marginalized learners*. Sense Publishers.

Preciado Babb, A. P., Metz, M., Sabbaghan, S., & Davis, B. (2016). Fine-Grained, Continuous Assessment for the Diverse Classroom: A Key Factor to Increase Performance in Mathematics. In *Proceedings of the American Education Research Association Annual Meeting 2016*.

Sabbaghan, S., Preciado Babb, A. P., Metz, M., & Davis, B. (2015). Dynamic responsive pedagogy: Implications of micro-level scaffolding. In A. P. Preciado Babb, Takeuchi, M., & Lock, J (Eds.) *Proceedings of the IDEAS 2015 Conference*, (pp. 198-207). Calgary, Canada: Werklund School of Education. <http://dspace.ucalgary.ca/handle/1880/50874> .

Wiliam, D. (2011). *Embedded formative assessment*. Bloomington, IN: Solution Tree.

Appendix A: Planning for Teaching

Ribboning

Identify critical features. Use contrast to separate and generalize each; ensure that each variation is posed as a question that can be assessed.

- Ensure fluency of requisite knowledge.
- Identify critical features that students need to discern.
- Start somewhere that allows all to engage, then build.
- Select a baseline all can reach, then refer to the rest as bonus.
- Provide clear explanations of what can't be figured out (terminology, background, etc.); do not let volunteer answers to questions substitute for teaching.
- Offer examples and non-examples ("yes – no – also").
- Change only one thing from example to example or task to task.
- Change what you want to draw attention to.
- Name and highlight what you want students to notice.
- Organize to make contrasts obvious; juxtapose to allow easy comparison.
- Avoid visual and auditory clutter (e.g. extraneous teacher talk, cluttered boards, cluttered space).
- Before moving from example to example or task to task, check *each child* for understanding.

Monitoring

Make learning visible by asking questions that highlight each new understanding; assess every child for every idea; use independent mastery as indicator of success.

- Monitor understanding of each key idea; no long segments of talk or practice without checking *each child* for understanding.
- Ask questions that allow the teacher to know whether students have made key discernments; e.g., plotting (1,1) on a Cartesian plane won't tell you whether a student discerns x from y .
- Allow time for all to respond; a few extra seconds can make a big difference.
- Attend first to the weakest students.
- Don't rely on self-reports; many won't respond honestly.
- Ensure frequent involvement of all (no lengthy discussions with single kids or long gaps between when any given child has an opportunity to respond / be assessed).
- Avoid overuse of single-child response like hands-up or one student at the board.
- Look for the sense in students' responses; these offer insight into what is needed; also, they may have offered the correct response to the question they thought you asked
- When helpful, gather, juxtapose, and compare/contrast diverse student responses.
- Make students feel like they're scaling mountains: e.g., "I don't think I can make questions any harder than that!" Don't say, "This will be easy."
- Get excited over new insights, even if they seem trivial.
- Aim for *independent mastery*. If a student needed help on a task, offer another.

Adapting

Decide whether next steps should step back (to address a newly identified critical feature or to strengthen patterns of variation for one that has already been identified), offer further practice (to allow independent mastery), or extend ideas for which students have demonstrated success; consider potential bonus questions for those who are ready to move on before others.

If you encounter difficulty, step back, then proceed with a smaller step or a clearer pattern of variation; do not attempt to walk students through tasks that require multiple new discernments.

- Contrast errors with correct responses to highlight the source of error.
- Fill in instructional gaps as needed.
- Continuously extend in clear increments.
- Allow enough practice for students to experience independent mastery.
- Move quickly.
- Include bonuses for all; have extra bonuses for quick finishers.

Connecting

Vary multiple critical features simultaneously (i.e., fuse); solve problems that combine multiple understandings that have been previously discerned; ask students to extend variation of particular features; ask students to manage variation by working systematically

- Ensure separated components are put back together. What is the big idea(s) students should take away from the lesson?
- Draw attention to connections (including logical relationships) between key lesson components and between lessons.
- After individual variables have been varied one at a time, vary more than one at a time.
- Ask students to generate bonus questions (within clear parameters); reflect on what makes them effective / ineffective.
- Ask students to solve problems that involve multiple ideas that have been previously discerned.
- Teach students to manage variation by working systematically and attending to the patterns and relationships that emerge as they do so.

IT'S NOT ABOUT IDEAS, IT'S ABOUT CONCEPTS: TEACHERS' EXPERIENCES DESIGNING ROBOTICS TASKS

Gabriela Alonso-Yanez, Kaitlin Duong, Caytlin Edge, Andrew MacLellan, Dominika Polakovic,
and Paola San Juan

University of Calgary

Research reports that use of robotics construction kits allow children to improve planning, reasoning, and problem-solving skills while also providing opportunities to engage in collaboration and teamwork. Incorporating robotics tasks in the classroom also provides a playful way for teachers to integrate engineering content, while also providing concrete applications of science and mathematics content. In this paper, two robotics tasks are described in detail and implications for STEM learning in the elementary classroom are discussed.

Keywords: Inquiry, STEM education, robotics, teachers' experiences, elementary classroom

ROBOTICS TASKS IN THE ELEMENTARY CLASSROOM

Educational robotics have been used mostly in the context of extracurricular activities and only recently been incorporated into formal settings. Research reports that use of robotics construction kits allow children to improve planning, reasoning, and problem-solving skills (Bers, Seddighin, & Sullivan, 2013; Sullivan & Heffernan, 2016) while also providing opportunities for students to engage in collaboration and teamwork (Lee, Sullivan, & Bers, 2013). Incorporating robotics tasks in the classroom also provides a fun way for teachers to integrate science, technology, engineering,

2017. In P. Preciado Babb, L. Yeworiew, & S. Sabbaghan (Eds.). *Selected Proceedings of the IDEAS Conference: Leading Educational Change*, pp. 191-200. Calgary, Canada: Werklund School of Education, University of Calgary.

and mathematics (STEM) content because it enables real-world applications of concepts relevant to the curriculum, along with providing concrete application of such disciplinary content (Nugent, Barker, Grandgenett & Adamchuk, 2010). While most literature on robotics in the classroom has focused on the experiences and opportunities for students to learn STEM content, little literature exists on elementary teacher learning and practice using robotics activities (Kim et al., 2015). Research suggests that not much attention has been paid to elementary teacher training on robotics and computational kits for STEM and thus we have a poor understanding of how teachers engage in, learn about, and use robotics for teaching in formal settings (Altin & Pedaste, 2013; Bers & Portsmore, 2005). Moreover, little research literature exists that offers concrete examples of how pre-service teachers design robotics tasks that are relevant to curriculum content for STEM in elementary classrooms (Becker & Park 2011). Understanding how pre-service teachers design robotics tasks is important as it offers insights into how teachers engage in the learning process of both STEM content and task design. Elementary teachers play a critical role in exposing and encouraging students to pursue STEM careers (Murphy & Mancini-Samuelson, 2012). Moreover, understanding the experiences of pre-service teachers in STEM robotics tasks has the potential to inform teacher education programs, which in turn better prepares pre-service teachers to design interdisciplinary opportunities for STEM learning in elementary classrooms.

The purpose of this paper is to describe the learning experiences of pre-service teachers as they analyze, synthesize, and critically evaluate information relevant to the design of a STEM robotics task. This process includes identifying and applying key STEM concepts that underpin the design of a robotics task for elementary students. We also consider the concomitant opportunity that using robotics tasks have as a tool to engage pre-service teachers in integrative learning and teaching of STEM content. This paper is relevant for the IDEAS Conference venue and audience because it

addresses a timely and important question: How do teachers design robotics tasks that facilitate learners understanding of STEM concepts?

In the following section, four of the authors (who are pre-service teachers) answer this question and describe their experiences designing, programming, and operating a robot in a simple educational programming environment where beginners can learn the basics of designing mechanical artifacts. The two cases presented here are examples of work undertaken during a Fall 2016 course in STEM education for elementary pre-service teachers. The examples were selected based on two criteria: relevance to the curriculum for elementary grades in the Alberta program of studies and expected usage in an elementary classroom focused on STEM content.

EXAMPLE 1: HEAVY LIFTING ROBOT

As pre-service teachers, the idea for our robotics design task was to solve an everyday practical problem within a shipment yard. To provide a real-world context to our task, we used the example of automated technology and robotics systems that are a significant aspect of many current industries. Robots that carry out welding, blasting, and heavy lifting are common in today's industrial world and help humans with dangerous tasks. In this context, we designed a robot that could efficiently move extremely heavy objects—which humans are unable to move—from one area to another. We identified two main concepts that were key to successfully designing, programming, and operating the robot: distance and movement. After building our robot, we undertook a trial and error testing phase where we identified the necessary parameters required to adjust distance and movement so that the robot could successfully carry out the transporting task.

When working with the concept of distance we identified four points of travel that our robot must meet to achieve its intended goal of picking up a shipment crate and safely bringing it to the warehouse. Using a 22" x 28" poster paper as our shipment yard, we placed the robot on one edge

of the poster paper, which became point A. We then determined the point at which the robot would need to make a right-hand turn, which became point B. The shipment crate was placed on the opposite edge of the poster paper, which became point C. The final destination of the robot would be point D, which was the location of the warehouse, placed opposite to point C. Once our four points were established, we mapped out each point of travel and measured the distance in inches. After the distance was determined, we moved onto the concept of movement.

To determine our robot's movement, we looked at the programming parameters available within the robotics kit-programming tool and decided to use direction, speed, and wheel rotation as our main movement parameters. We ran a series of testing trials to determine the distance our robot would move with one wheel rotation, the appropriate speed in which we would want our robot to move, and how to have our robot turn from one direction to another. We monitored various combinations of turning, speed, and wheel rotations to get the correct movement. Our final consideration was to determine the angles at which our forklift would need to lower and then pick up our shipment crate. Through many cycles of trial and error we determined that the angle required for the forklift was dependent on the height of the shipment crate, which could change depending on the shipment crate size. In addition, this part of the task not only required the movement of the forklift, but also careful movement towards the shipment crate for pickup. To ensure precision of our forward movement, we changed the movement parameter from wheel rotation to seconds of movement, allowing us to try smaller movements, which we learned was necessary for the careful pickup of the shipment. As this description shows, two key learning processes were salient for us, as pre-service teachers, to complete the task and consider what is important to teaching robotics: 1) manipulating simple mathematical calculations and parameters and, 2) engaging comfortably in trial and error phases to complete the task—using information we

knew and exploring alternatives when our assumptions did not provide the results we expected. From our experience in developing a robotics task, we learned that creating robotics tasks—such as building and programming the robot—allows students to explore and practice key concepts and scientific and mathematical skills in an authentic manner. Using their existing knowledge and thinking carefully about their assumptions, students learn to adjust and explore alternatives when their original thinking is challenged through trial and error phases. In relation to the programs of study for elementary classrooms in Alberta, we identified that our task allows students to learn and foster skills aligned with two subject areas: math and science, specifically Grade 3 Mathematics in the “Number” and “Space & Shape–Measurement” units; and Grade 4 Science in the “Wheels & Levers” and “Building Devices & Vehicles that move” units (Government of Alberta, 1995-2017).

EXAMPLE 2: FIRE AND RESCUE ROBOT

A successful robotics task will not only engage students in a fun activity; it also offers multiple avenues through which students can learn and creatively apply their knowledge to solve a problem by designing and using technology. From our experience, we anticipate that a good robotics task also creates an opportunity for more balanced responsibilities between the teacher and the students as they work together to solve problems or challenge-scenarios in the classroom. Our team started the design of the robotics task by identifying a topic that was both relevant and engaging for students. We chose to design a fire-rescue robot, with the challenge to move around objects to rescue people in the event of a fire. For the conceptual component of our task, we identified the concept of degrees as central for programming the robot. Two other central ideas relevant for our robotics task were programming loops and building simple machines (that is, choosing the right construction kit pieces to successfully build the robot), both concepts seen in the programs of study for Alberta education (Government of Alberta, 1995-2017). These concepts and ideas are also

connected with the Math, Science and Engineering frameworks of STEM. This is because students need to engage not only units of knowledge in an isolated manner, but also to apply concepts and ideas and see how STEM works in an interdisciplinary and connected manner—which this robotics task allows and offers learners a chance to do. Programming the robot is strongly connected with fostering skills students will need in the future, for learning engineering concepts. Here in our learning experiment, the use of degrees was required to properly program the robot motors to turn the robot in specific directions. We had to adjust the direction that the robot turned towards and also change the degree count to the appropriate number so that the robot would turn in the desired direction (Government of Alberta, 1995-2017). This allowed the robot to turn and successfully navigate through a burning house. We had to constantly revise our programming instructions, which was an additional learning experience that required us to think about the sequencing and timing of events and how those related to the actual programming of a robot. Similar experiences happened when we programmed the loops. We constantly had to modify the loop to make the program more efficient and effective, to help our robot navigate an environment without issues. We anticipate that students will learn about loops by programming their robot to move a particular number of times to reach a specific location or position. From our experience developing the robotics task, we learned that working collaboratively and coordinating our efforts are central to teaching robotics tasks for elementary school learners. These strategies allowed us to foster important competencies such as creativity, respect, and effective communication. We valued a concrete experience of an inquiry-based approach to learning, where we, as learners and designers of learning opportunities, were able to explore the materials in front of us and gain understanding of our environment through action.

PRE-SERVICE TEACHER EXPERIENCES DESIGNING ROBOTICS TASKS

The purpose of this paper was to describe the learning experiences of pre-service teachers when analyzing, synthesizing, and critically evaluating information relevant to the design of a STEM robotics task. Based on the accounts presented above, three central aspects of pre-service teachers' experiences appear relevant and consistent:

- 1) By engaging in the design of robotics tasks, pre-service teachers notice and recognize the centrality of key concepts and mathematical skills that effectively underpin the design for authentic tasks. Besides designing fun and engaging activities for students, pre-service teachers recognize the importance of focusing on the actual subject matter (content) of teaching concepts and skills central to STEM disciplines, as tools to design authentic tasks.
- 2) Both pre-service teacher teams described their experience engaging in a process of trial and error. This process is a form of problem solving where learners used their existing knowledge and assumptions to adjust and explore alternatives when their original thinking was challenged. Designing robotics tasks that place emphasis in trouble-shooting strategies is an important step in allowing students to challenge themselves and feel comfortable when facing problems within STEM learning tasks.
- 3) Collaborative work and effective communication were also identified by pre-service teachers as key skills that are fostered by designing and engaging robotics tasks. Valuing teamwork and collaborative strategies when designing robotics tasks is also an important learning process for pre-service teachers, which can potentially shape their approach to teaching STEM through interdisciplinary approaches to early years learners.

IMPLICATIONS FOR ELEMENTARY CLASSROOM

Robotics is increasingly being introduced in elementary schools as an authentic learning opportunity to incorporate STEM content. Many reports suggest that robotics tasks enhance skills and abilities to help schoolchildren solve complex problems while learning STEM sub-disciplines (Blanchard, Freiman, & Lirrete-Pitre, 2010). While robotics can be considered an innovative way to incorporate STEM content, using robotics kits is not enough. In our paper, we have described the process of designing relevant robotics tasks and we have emphasized the experiences of pre-service teachers. Designing effective robotics learning opportunities for students requires that teachers interrogate information and their own experiences as they pertain to engaging interdisciplinary activities through technology use. As designers of robotics tasks, pre-service teachers continually make connections among STEM concepts and apply and refine their own understanding of such concepts through trial and error. Our paper contributes to an emerging literature on the role of pre-service teachers' experiences in learning and designing STEM learning opportunities.

References

- Altin, H., & Pedaste, M. (2013). Learning approaches to applying robotics in science education. *Journal of Baltic Science Education*, 12(3), 365-377.
- Bers, M., Seddighin, S. & Sullivan, A. (2013). Ready for Robotics: Bringing together the T and E of STEM in early childhood teacher education. *Journal of Technology and Teacher Education*, 21(3), 355-377.

- Bers, M. U., & Portsmore, M. (2005). Teaching partnerships: Early childhood and engineering students teaching math and science through robotics. *Journal of Science Education and Technology*, 14(1), 59-73.
- Blanchard, S., Freiman, V., & Lirrete-Pitre, N. (2010). Strategies used by elementary school children solving robotics-based complex tasks: Innovative potential of technology. *Procedia-Social and Behavioral Sciences*, 2(2), 2851–2857.
- Government of Alberta. (1995-2017). *Programs of study*. Retrieved from <http://www.learnalberta.ca/ProgramsOfStudy.aspx?lang=en>
- Kim, C., Kim, D., Yuan, J., Hill, R. B., Doshi, P., & Thai, C. N. (2015). Robotics to promote elementary education pre-service teachers' STEM engagement, learning, and teaching. *Computers & Education*, 91, 14–31.
- Lee, K. T., Sullivan, A., & Bers, M. U. (2013). Collaboration by design: Using robotics to foster social interaction in kindergarten. *Computers in the Schools*, 30(3), 271–281.
- Murphy, T. P., & Mancini-Samuelson, G. J. (2012). Graduating STEM competent and confident teachers: The creation of a STEM certificate for elementary education majors. *Journal of College Science Teaching*, 42(2), 18.
- Nugent, G., Barker, B., Grandgenett, N., & Adamchuk, V. I. (2010). *Impact of robotics and geospatial technology interventions on youth STEM learning and attitudes*, 4, 391-408.
- Sullivan, F. R., & Heffernan, J. (2016). Robotic construction kits as computational manipulatives for learning in the STEM disciplines. *Journal of Research on Technology in Education*, 48(2), 105+. Retrieved from

<http://go.galegroup.com.ezproxy.lib.ucalgary.ca/ps/i.do?p=AONE&sw=w&u=ucalgary&v=2.1&it=r&id=GALE%7CA457975573&asid=02ba717e7d908034c21b196ff2d55d64>