

# TEACHING 21<sup>ST</sup> CENTURY COMPETENCIES: LESSONS FROM CRESCENT GIRLS' SCHOOL IN SINGAPORE

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## ABSTRACT

This paper presents case studies of two teachers at Crescent Girl's School (an all-girls high school in Singapore) who implemented strategies learned through a teacher professional development program called 21<sup>st</sup> Century Learning Design (21CLD). Policymakers often state requirements for teachers to focus on 21<sup>st</sup> century (21C) competencies without providing them with the necessary pedagogical support and training needed to support students in developing these competencies. 21CLD fills this gap by offering concrete rubrics, definitions and examples in six "dimensions" that each relate to a 21C competency—collaboration, real-world problem-solving and innovation, knowledge construction, use of information and communication technologies (ICT) for learning, skilled communication, and self-regulation—to support teachers as they build these ideas into their lessons. In this paper we provide evidence of the influence of 21CLD on two teachers' instructional practice. The first case study describes a science teacher's experience using the 21CLD frame to revise a lesson to focus more deeply on developing students' collaboration skills. The second case study highlights a mathematics teacher's experience with developing and implementing a new mathematics lesson to develop students' real world problem-solving skills. These case studies highlight the valuable role that 21CLD has played in enhancing teachers' instructional practice by providing a common language and understanding of 21C competencies, and supporting a vibrant and dynamic professional learning community.

## KEYWORDS

Teacher professional development, 21st century competencies, collaboration, problem-solving.

## 1. INTRODUCTION

Policymakers and educators value teaching 21<sup>st</sup> century (21C) competencies, such as collaboration and problem-solving, to develop a workforce ready for the 21<sup>st</sup> Century. However, many educators face the same challenge as the Crescent Girls' School (Crescent) in Singapore: how to translate broad instructional standards into classroom actions. *Specifically, how can teachers design classroom activities to support students in developing 21C competencies?*

In collaboration with SRI International, a non-profit research firm based in California, USA, Crescent adopted 21<sup>st</sup> Century Learning Design (21CLD), a teacher professional development program that examines learning activities developed by teachers through a lens of the opportunities they provide students to develop 21C competencies (Shear, et al. 2013). Based on decades of research in the learning sciences (Bransford, Brown & Cocking 2000; Sawyer 2006), the program offers concrete rubrics, definitions and examples in six dimensions: collaboration, real-world problem-solving and innovation, knowledge construction, use of information and communication technologies (ICT) for learning, skilled communication, and self-regulation. The method grew out of a multi-year global research program called Innovative Teaching and Learning (ITL) Research that used the analysis of learning activities and student work as a source of evidence in its rigorous investigation of innovative teaching and learning across 7 countries (Shear, Gallagher & Patel 2011). In ITL Research, the process of analysis provided valuable instructional insights to the teachers who were applying the dimensions, and the active collaborative format was a compelling alternative to traditional lecture-based professional development; this prompted the method's transition from research to instructional practice improvement (Shear, et al. 2013).

This case study describes the school-wide adoption of the 21CLD program, teachers' exploration of dimensions for collaboration and for real-world problem-solving and innovation, and its influence on two teachers' instructional practice at Crescent. It provides preliminary qualitative evidence of a successful attempt to bridge the gap between policy expectations and teachers' capacity to meet those expectations. Although we present preliminary descriptions of a limited set of cases, the results suggest the potential of such a professional development program and the need for broader research that examines 21CLD's influence on teacher and student outcomes.

## 2. CRESCENT'S EXPERIENCE WITH 21CLD

Crescent is an all-girls high school in Singapore serving 9<sup>th</sup> through 12<sup>th</sup> grade students. Crescent has a relatively long history working with 21C competencies. In 2007, a 21C competencies committee was formed to explore the theories and practice of 21C competency development. Crescent conducted a series of staff engagement and professional development workshops to co-construct a 21C competency framework. In the initial years, the focus was on the rationale for 21C competency development and the specific competencies that the school would like to develop. After converging on a total of 10 21C competencies (e.g., oral communication, collaboration, critical thinking, global awareness), subsequent years focused on the assessment of these competencies. Staff jointly developed rubrics to assess these competencies, and teachers of subject areas, which most naturally aligned to the specific competencies owned the task of assessing those competencies. For example, the Mathematics and Science departments owned critical thinking and problem solving, while the Humanities department owned Global Awareness. Each department was responsible for the design and deployment of performance tasks, which assessed these competencies, and teachers graded students on each 21C competency at the end of the academic year.

Upon review of these approaches in December 2011, and in response to findings from the ITL Research, Crescent decided to shift its focus to pedagogical practice and the design of learning activities necessary to develop 21C competencies. If the learning of 21C competencies was not taken into account in the design of learning activities, it would be challenging to see these competencies emerge from students upon assessment.

To this end, in collaboration with SRI International, Crescent adopted 21CLD as a framework for teacher professional development in the area of 21C pedagogies and learning design.

### 2.1 The 21CLD Workshop

The purpose of the 21CLD Workshop is to provide teachers with practical strategies for supporting students to develop 21C competencies. To meet this goal, teachers of all four grade levels and all academic subjects at Crescent participated in a 3-day workshop facilitated by SRI International in 2012 (82 teachers across all four grades). Consistent with 21CLD's frame of broad dimensions that are applicable across academic disciplines, Crescent's teachers collaborated in interdepartmental and multi-grade-level groups as they explored definitions of collaboration, knowledge construction, the use of ICT for learning, and real-world problem-solving and innovation, and applied them to a global collection of learning activities that served as strong and weak exemplars of the defining elements of each dimension. Each dimension seeks to answer a list of key questions:

- **Collaboration.** Are students required to share responsibility and make substantive decisions with other people? Is their work interdependent?
- **Knowledge Construction.** Are students required to construct and apply knowledge? Is that knowledge interdisciplinary?
- **Real-world Problem-solving and Innovation.** Does the learning activity require solving authentic, real-world problems? Are students' solutions implemented in the real world?
- **Use of ICT for Learning.** Are students passive consumers of ICT, active users, or designers of an ICT product for an authentic audience?

The workshop led teachers through four phases of exploration: learning the big ideas (the main constructs of each dimension), applying the rubrics to strong and weak exemplars of classroom lessons, strengthening the opportunities embedded in the learning activity, and considering the teaching strategies that will facilitate successful enactment. Each phase required not only grappling with the conceptual definitions and developing

a shared vocabulary, but also examining learning activities that instantiate these important constructs. When learning the big ideas for collaboration, teachers considered contrasting classroom activities to see if they require students not only to work together (a common interpretation of “collaboration”), but whether they are executing deeper collaboration competencies by taking shared responsibility for the work, and making substantive decisions about the content, process or product of their work. The rubric for real-world problem-solving and innovation considered whether the focus of the task is to address a defined problem, if the problem represents an authentic need that exists outside the academic context, and if students are required to enact their ideas or solutions outside the classroom. The workshop thus provided teachers with a common vocabulary for talking about 21C competencies, concrete rubrics that define deepening levels of 21C competencies, and a shared skillset for examining classroom artifacts in terms of the opportunities they provide for developing 21C competencies and creating new ones that afford such opportunities.

Following the workshop, Crescent launched several activities to enable teachers’ continued engagement with 21CLD and its integration into the classroom. A 21CLD task force was responsible for developing and implementing pilot lessons focused on 21CLD dimensions. Teachers worked collaboratively to implement at least one lesson unit in their respective subject areas. The 21C competencies committee undertook the task of coordination across academic disciplines to track the deployment of 21CLD approaches. At the level of the middle management team (consisting of Heads of Department and individual Subject Heads), the discourse incorporated the language of 21CLD. The Heads of Department and Subject Heads subsequently took these conversations into dedicated professional development periods. The intent of these follow-up structures and processes was to keep the conversations around 21CLD fresh and relevant, and to maintain the momentum built during the 21CLD workshop. In November 2012, each department’s instructional practices were peer reviewed through microteaching sessions and shared across staff.

The following sections describe the experiences of two teachers—one in a science classroom and one in a mathematics classroom—as they implemented a 21CLD dimension in classrooms.

## 2.2 Collaboration in a Science Classroom

Aimed at creating a more dynamic and student-centered learning experience for students to develop 21C competencies, chemistry teachers designed a series of lessons for 9<sup>th</sup> grade students on the topic of “Metals”. This lesson unit was first designed and implemented in 2011 with the use of self-directed and collaborative learning strategies. After participating in the 21CLD workshop in June 2012, the team of chemistry teachers re-examined and refined the learning activities then executed the second iteration in 2013.

In the 2011 lesson, collaborative learning occurred when students participated in teacher-facilitated summaries of concepts or solved problems in small groups. At the end of the process, to allow for extension of knowledge, the students completed group projects wherein they applied the knowledge attained from the lesson packages and suggested a suitable material for the construction of an overhead pedestrian bridge.

Prior to the 21CLD workshop, teachers focused primarily on creating opportunities that allow the students to work in groups and engage in some form of sharing and discussion with peers. It was assumed that with such activities, collaborative skills would naturally develop in students. At that point, they had no means of measuring the quality of collaboration.

The 21CLD learning activities rubrics served as a tool for the teachers to measure the quality of collaboration involved during the activities and provided a common language for discussions. For example, they realised that requiring students to solve problems in a group, although a form of collaboration, allowed only a lower level of collaboration. Deeper levels of collaboration require students to make substantive decisions that go beyond the simple application of prior knowledge, and to produce interdependent work where the contribution of each student is necessary.

Therefore, to increase the level of collaboration between the students, teachers refined the original learning activities and implemented these in 2013. For example, rather than requiring students to simply discuss and apply their learning from the earlier lesson to solve questions selected from past year practice papers, teachers redesigned the discussion questions such that they guided students in constructing key understandings of the concepts covered in that particular lesson package. At the end of each discussion activity, the groups had to use key understandings to make decisions or decide on factors that would lead them towards making their choice in a suitable material for the construction of the overhead pedestrian bridge. Through participating in these activities, the members engaged in discussions to make substantive

decisions that eventually led them towards their final project. Students had to negotiate and manage differences in opinions amongst their peers to reach a consensus as each decision played a part in shaping their project. Furthermore, to enforce individual accountability, cooperative strategies such as the 'Jigsaw' method were employed to ensure each team member completed her work and played an essential role in contributing her 'area of expertise' to the discussion appropriately.

Preliminary observations of student interactions during the learning activities indicated a high level of engagement. As the lessons were designed to facilitate shared decision-making and students had to negotiate differences to arrive at shared substantive decisions, it was also observed that the group discussions proceeded at greater depth, with students bringing in key and relevant concepts to support their points in the discussions.

### **2.3 Real-world Problem-Solving in a Math Classroom**

While the science classroom example presented a case of how the 21CLD framework was used to review and refine an existing lesson unit, the following mathematics' classroom example illustrates how teachers use 21CLD to design a new lesson unit.

In a 7th grade math lesson on ratio and rate, students worked in pairs to plan for an overseas trip to attend a concert. They researched hotels, air and ground transportation, concert tickets, and exchange rates. They conducted a comparative evaluation of the different options and used their knowledge of currency exchange rates to propose a justifiable budget in Singapore Dollars.

The design of this lesson focused on learning outcomes for building students' real world problem-solving competencies. The teachers designed the problem situation in a way that would elicit many possible solutions. In addition, to achieve real world problem-solving according to 21CLD frame, the authenticity of the problem situation was key. Students were given an authentic set of variables and constraints from which they could work. They found information from real sources, and they were required to work within such parameters to 'solve' their problem by designing a detailed travel plan they could actually implement.

During the lessons, the teacher observed students taking greater ownership of their learning. The authenticity of the problem context resonated with them, and the problem was presented with sufficient openness for students to make decisions about their own pathways to address the issues. Students appeared to relish the challenge and were very engaged and self-directed throughout the lessons.

The 21CLD framework transformed the mathematics teachers' approach to learning activity design. Previously, the design of learning activities was done co-operatively- teachers were assigned different sections or topics to design for, with little perceived need for discourse. 21CLD provided a common language for collaborative discourse. The framework became the basis for team discussions on the choice and design of learning activities. Using this framework, the team was able to design a 21C lesson activity that was poised to provide opportunities for students to hone their 21C competencies. Furthermore, the framework provided a common understanding of what constituted a certain level of competency in the learning activity.

### **2.4 Findings**

The introduction of 21CLD gave the teachers a common set of standards that guided the lesson design process more effectively. With the rubrics, teachers found that discussions on lesson design were more focused, as they had a common language and an instrument to converge on when clarifications were required. This was in direct contrast to what happened previously, when teachers would have different interpretations of the learning activities and ascribe to varying design considerations. The 21CLD rubrics served as a tool to allow the teachers to reach a common understanding and decide the suitability of the activities whenever conflicts arose during discussions. Both cases highlight the value of 21CLD in resolving professional conflicts and differences in the co-design of lessons, and in establishing a set of standards and clear articulations for the effective design of lessons that develop 21C competencies. Furthermore, the teachers were able to make a conscious effort to think more from students' perspectives and assess the quality of the activities planned in developing the desired student outcome.

Hargreaves and Shirley (2009) describe lively learning communities as one of the key principles for teacher professionalism. Changing the conversation in an organization can have profound impact on its culture and day-to-day work of its people (Kegan & Lahey 2001). Having a common language and precision

regarding meaning of that language are crucial to the culture essential to effective schools (DuFour, DuFour, & Eaker 2008). With the use of 21CLD, significant changes have been observed in the daily professional discourse of teachers at Crescent. A definite shift in the culture has been facilitated as teachers acquired a common language with which to engage in professional conversations. The precision of the 21CLD language enables teachers to collaborate and engage with common clarity on the intended student outcomes and goals.

Although findings from these case studies suggest promising results, this initial research is limited. Findings are descriptive and based solely on self-reports of two volunteer teachers, so further work is required to establish the impact of this approach on teachers and students. In particular, future research at Crescent is expected to examine student outcomes as evidenced in student work and measured through performance assessments that determine whether the opportunities provided by the teachers produce the 21C competencies they seek to develop.

### 3. CONCLUSION

The 21CLD approach evolved from the research-based structural analysis of classroom artifacts into a professional development program aimed at translating the 21C rhetoric into actionable teacher practices. The workshop provides participants with a shared vocabulary and common understanding of important dimensions that are greatly valued in education while also enabling teachers to refine their teaching practice for developing students' 21C competencies. This case study at Crescent Girls' School in Singapore provides promising evidence of the changes resulting from 21CLD and suggests the need for further investigation into the influence of 21CLD on teachers and students. In other settings around the world, 21CLD has also been extended to other uses that deserve more rigorous research: for example, it has shown initial promise as an enabler for teacher pre-service training and a useful frame to inform policy conversations.

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