Integrated Learning: The New Future of Education and Society?

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In this paper, I will relate an example interdisciplinary STEM project from my teaching experience with 21st century goals and suggest ways that helping students to know themselves and fostering civic responsibility can be integrated into STEM teaching practices. For the purposes of this paper, the term 21st century goals is taken to have the same meaning as 21st century skills, as this seemed to be the more commonly used phrase in the literature.

The rationale for selecting the example is based on the 2015 Borthwick and Cross article from the module readings, in which they describe how a TASC (Thinking Activity in a Social Context) wheel was used in an elementary school context. In a 2014 study of seventh graders, Awwad, Asha and Jado found that using the TASC wheel significantly improved self-directed learning, an important 21st century skill. Moreover, the social context aspect of the framework could potentially be connected with civic engagement. The TASC Problem-solving Wheel was developed by Belle Wallace in 2000 and is shown in Figure 1 below.

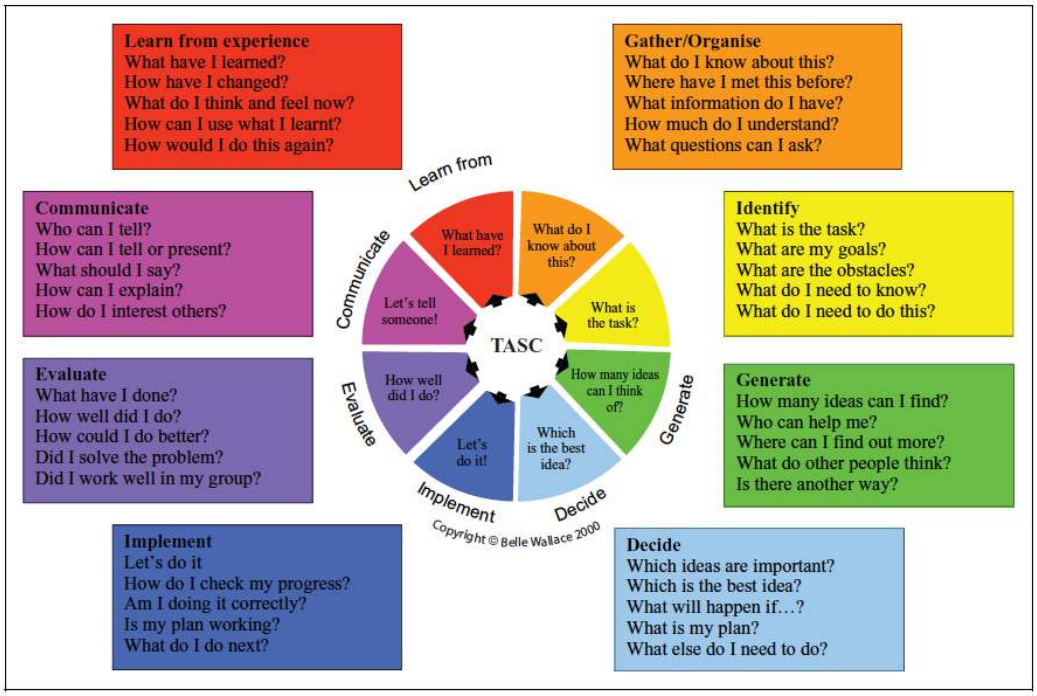

Figure 1. The TASC Problem-solving Wheel (Wallace, Bernadelli, Molyneux & Farrel, 2012).

The wheel reminded me of a tool that our Grade 6 teaching team developed to help students focus their efforts during an interdisciplinary science and design project. The project briefing challenged students to design a method of transporting a highly needed resource from one part of the world to another, with the aim of reducing inequality. Students were asked to choose one of the UN Sustainable Development Goals (United Nations Department of Economic and Social Affairs, n.d.) listed in Figure 2 below as the context for their project.

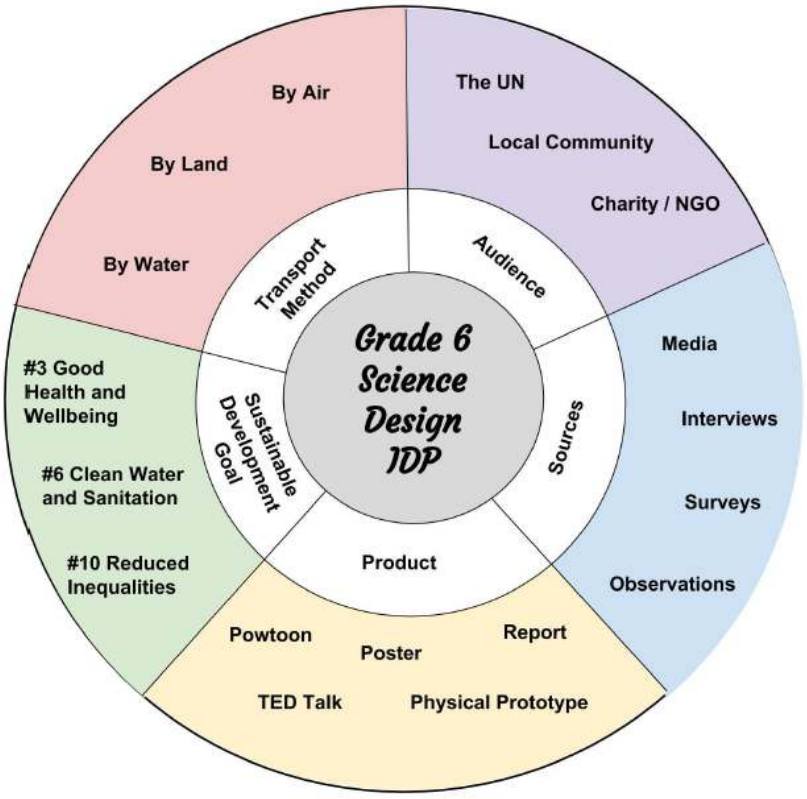

Figure 2. "IDP" (Interdisciplinary Project) Wheel, courtesy of the Grade 6 teaching team at International School Ho Chi Minh City.

Connecting to 21st Century Skills

At the end of the project, students were asked to reflect on the development of their research, creative thinking and communication skills. These are examples of skills that the International Baccalaureate Organisation (IBO) refers to as "Approaches to Learning" (ATL)

skills, which should be embedded throughout all teaching and learning at IBO schools at age-appropriate levels. While an official list of ATL skills is not available in the public domain, examples of the term's use can be found on the IBO's public website, for example, in their 2015 news release about increased use of ATL skills in the Diploma Programme (Grade 11 and 12). Lance King, the author of the ATL framework, also delivers 21st century skills workshops at non-IBO schools around the world (The Art of Learning, 2019), and thus ATL skills and 21st century skills (in an educational context) can be seen as equivalents (example frameworks for both can be downloaded from The Art of Learning website for comparison). Similar lists of 21st century skills developed for other age groups can also be found in the literature. For example, the Framework for 21st Century Learning published by Battelle for Kids (2019) refers to the 4C's of Critical Thinking, Communication, Collaboration and Creativity. The Essential Learning Outcomes listed in *College Learning for the New Global Century*, a 2007 report by the Association of American Colleges and Universities, include critical and creative thinking, written and oral communication, and teamwork and problem solving (p. 12).

Helping students to know themselves

While no explicit tool was used for the purpose of helping students to know themselves in the interdisciplinary STEM project described above, I have seen various surveys used for this purpose in schools that I have worked at. Perhaps the project could be modified to include such a survey at or near the beginning, to inform the placement of students in teams. An obvious choice might be to use one of the various learning style surveys available online; however, learning style theories in education are controversial (Weinstein, 2019). Perhaps a more useful instrument would be the VIA Character Strengths Survey, which is supported by a large body of scientific research (VIA Institute on Character, 2020) and offers both an adult and youth version.

A limitation of this tool is that it is not suitable for children below 10 years of age; however, an early childhood (ages 3-6) version of the survey developed by Shoshani in 2019 and designed for use by parents could possibly be adapted for use by early childhood and lower primary educators, perhaps in oral rather than written form and with increasing weighting placed on student self-assessment rather than teacher judgement as students mature.

Fostering Civic Responsibility through STEM projects

In *Fostering Civic Responsibility through Service Learning* (2000), Degelman lists several "Essential Civic Competencies and Skills" that are similar to 21st century skills, such as cooperative learning, research and media literacy (a component of critical thinking) (p. 8). Thus, we can say that there is some overlap between 21st century skills and the skills required for civic engagement. The social context of a STEM-focused TASC wheel project can often be linked to civic engagement, as seen in the example mentioned in the Borthwick and Cross (2015) article, in which primary students were tasked with designing a way of harvesting rain in order to reduce the school's water usage. In the middle school resource transport project described earlier, the UN Sustainable Development Goals provide a context for civic engagement. Service Learning projects, many of which are inspired by STEM coursework, can also promote civic engagement at the high school level in the IB Diploma Programme's compulsory CAS (Creativity Activity Service) component (International Baccalaureate Organisation, n.d.). At the college level, SENCER (Science Education for New Civic Engagements and Responsibilities, 2020) develops and provides resources for teaching university and college STEM subjects through the lens of complex unsolved problems that are currently affecting society, much in the same way that the modules in this subject are structured.

Conclusion

Civic engagement and social context can be introduced into integrated STEM activities for almost any age group via the UN Sustainable Development Goals, as long as the task complexity is matched to the students' ability levels. Integrated STEM projects placed in a social context can be useful for developing 21st century skills and civic responsibility. It is possible that conducting activities that help students understand their unique strengths prior to placing students in project groups will improve collaboration skills, due to students being made aware of complementary strengths within their group.

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