An Engineering and Design Approach to Building More Equitable Science Curricula: Challenges, Opportunities, and Cautions

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Purpose & Background

The purpose of this case study is to explore the efficacy of applying the k2i academy’s Inclusive Design Framework (IDF) to the development of resources for Ontario’s new grade 9 curriculum. As an act of self-reflection, this case study focuses on the process of curriculum development: was this approach more inclusive of diverse perspectives? Does the resulting curriculum resource have the potential to create a more equitable and inclusive version of grade 9 science? The IDF considers Critical Theory, Anti-Oppression Theory, and Anti-Racism Education while designing at the individual, instructional, and institutional level across the educational system.

Case Study Methodology

This case is bounded by the beginning of the development of the activities (fall 2020) and when the first part of the resource was made available to teachers in fall 2022. The focus is on the process of curriculum development, although the product was analyzed in order to assess the efficacy of that process.

Data Sources
- Notes and observations from curriculum designers (L. Cole and V. Ironside)
- Iterations of the resource
- Comments from collaborators

Data Analysis

After documenting the process by which k2i academy designed the curriculum resource, we noted the characteristics and social categories of the educators who were consulted throughout. We also tracked the suggestions and edits (via google docs) and mapped how suggestions and edits were ultimately integrated into the finished resource. Finally, we asked ourselves how social position and demographic factors may have affected the process.

Findings

The k2i academy utilized an inclusive design approach to teacher resource development. Figure 2 illustrates the process and highlights some of the considerations used to create the Grade 9 De-streamed Science Teacher Resource.

1. **ICCI ACADEMY INCLUSIVE DESIGN FRAMEWORK**
   - developed with literature review on inclusive design in education
   - includes the integration of the k2i operational framework from lessons learned in the development and implementation of the Bringing STEM to Life: Work Integrated Learning programs

2. **LIVING DOCUMENT**
   - is continuously evolving as educators access, use, and provide feedback
   - always connects back to the back of the class inclusive design framework

3. **CULTIVATING RELATIONSHIPS**
   - through collaborative development of classroom activities
   - by engaging with youth to learn about their interests and types of problems they were most interested in solving

4. **LISTENING & RESPONDING**
   - to teacher feedback by collaboratively developing a teacher resource
   - create first draft of resource and open share the draft with all collaborators
   - Continuous enhancements through iterative design and integrating feedback from teachers and other educational experts

5. **INSTRUCTIONAL & DESIGNING**
   - for the digital online resource was developed with an Instructional and Learning Designer
   - considerations are many to ensure the responsibility of the resource, ability to engage with content in an interactive way, ease of navigation, and ability to download materials for customized use by the teacher

6. **SUGGESTIONS AND EDITS**
   - from google docs and direct feedback from teachers

Collaborators

Jane Goodyear, Dean, Lassonde School of Engineering, York University; Michelle Tsui-Woods, Associate Director of Operations and Development, k2i academy; Bryan Bellefeuille, W.C. Eaket Secondary School; Salvatore Paneduro, Director, Lassonde Education Innovation Studio; Taneer Bhimani, Instructional and Learning Designer, Lassonde Education Innovation Studio; Sairam Chinnam, Senior eLearning Developer; Toronto District School Board; York Region District School Board; Peel District School Board; Algoma District School Board; Famine Briscoe; Tram Nguyen Pham; Claire Zuliani; Jeff Harris; Alvine Beloe; Sutnder Brar; Sarah Barnett; Darren Hoog; Vidya Shah, Sayema Chowdhury, Jocelyn Shy; Brian Beauchamp; Dian Baker; Martyn Beckett; Andrew McConnell; Dr. Vidya Shah; Sayema Chowdhury; Jocelyn Shy; Brian Beauchamp; Dian Baker; Martyn Beckett; Andrew McConnell; Dr. Jean-Jacques Rousseau; Moses Velasco; Chris Stewart; Andrew Hann; Sean Clark; Margarette Fleming; Jason Trinh; Dr. Mogian A. Jadidi; Dr. Molade Osibodu; Dr. Lorraine Otoide; Jane Kennedy; Sultan Ran; Laura Godfrey; Carolyn T[...]

Conclusion

We found that IDF resulted in a more inclusive curriculum development process but external forces impeded its efficacy. Ongoing reflective practice by the k2i academy team and all its collaborators enabled us to shift, adapt, and change to respond to challenges while also suggesting new emerging practices and innovative programs; however this work was done in an environment where there is an expectation of finished products and finalized plans. Additionally, we note that creating equitable and inclusive curriculum is a deeply cultural practice and, therefore, simply translating English resources into French does not necessarily create resources that are true to Francophone cultures. Recognizing that the goal of creating more equitable and inclusive grade 9 science courses depends on multiple factors, we believe that the curriculum developed through IDF can form a strong foundation to those efforts.

References

[Provide a list of references that support the claims and findings presented in the text.]