Technological Practices in Education: Design-Based Learning (EDCP 471 301)

Date: September 2018

Course Description:
This course focuses on Design-Based Learning (DBL) and related practices, including creative and critical problem-solving, creative collaboration & competition, model making, and innovative computation. Design-based learning (DBL) refers to learning by designing artifacts and systems, and resolving problems and projects. The course is specifically oriented toward the 'D' in the new ADST (Applied Design, Skills, and Technologies) curriculum of British Columbia. The course addresses the creative thinking and critical thinking emphases in the BC Ministry's new Cross-Curricular Competencies.

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Valued Ends of the Course:
My intention is to help you develop a background and a depth of expertise for understanding and practicing DBL.

COURSE OBJECTIVES
Upon completion of this course, the student should have developed:
1. A deep understanding of DBL.
2. A discernment of effective DBL activities and challenges, including the preparation of design briefs, for fostering critical, creative and innovative thinking.

Participation, Texts, Readings & Activities
Participation is interdependent with **preparation** for each class, which involves;
> *Reading, Listening, Watching* (videos and articles, comments & questions, etc.),
> *Writing* and *Speaking* (discussing, corresponding with peers, chat, personalizing lessons, etc.). In addition, participation in-class involves,
> *Designing* and *testing* (resolving challenges, manipulating materials, coding, etc.) and
> *Critiquing* (providing critical design feedback and suggestions to peers)
> *Expressing* in polished and unpolished, **creative**, **unique**, and informative ways.

ASSESSMENT AND MARKS / ASSIGNMENTS (see details below):

Assignment	Due Date:	Percentage
1. Class participation	Ongoing	30%
2. Design Brief	10 October 2018	25%
3. DBL Unit Packet (Groups of 2)	9 November 2018	45%

COURSE OUTLINE: EDCP 471

Week 1: Introduction: Coursework expectations (Sept. 5)	
Guiding Questions	1. What is Design-Based Learning? 2. How do we address the D in ADST?
Activities	• Reinterpret the *Three Little Pigs* o Thinking outside the box
Readings / Resources	1. BC's new curriculum: https://curriculum.gov.bc.ca 2. *Defining Cross-Curricular Competencies* http://www.bced.gov.bc.ca/irp/docs/def_xcurr_comps.pdf

Week 2: DBL @ Design Briefs (Sept. 10, 12)	
Guiding Questions	1. What reasons might we have for redesigning ordinary, everyday things? 2. What are design briefs? 3. How do we search patents and patent applications?
Activities	• Design a Clothespin (Clothes Peg) o Problematizing ordinary and everyday designs • Working in groups: Design Briefs
Readings / Resources	1. Perkins, D. N. (1984). Creativity by design. *Educational Leadership, 42*(1), 18-25. http://www.ascd.org/ASCD/pdf/journals/ed_lead/el_198409_perkins.pdf 2. BC's new curriculum: https://curriculum.gov.bc.ca 3. Core Competencies https://curriculum.gov.bc.ca/competencies) 4. Canadian IP Office http://www.ic.gc.ca/opic-cipo/cpd/eng/search/basic.html 5. US PTO https://www.uspto.gov/patents-application-process/search-patents

Week 3: DBL @ Design Briefs (Sept. 17, 19)	
Guiding Questions	1. How do we nurture design thinking? 2. Why do we connect DBL to math and science? (i.e., the T&E connected to the S&M in STEM or to the arts or environment in STEAM & STEEM)

Activities	• Design a Critter (Sept. 17-19)
	   o Competing with existing designs (e.g., wind-up toys)
	   o Basic mechanics, materials, and how thing work

Readings / Resources	1. Brown, T. (2008, June). Design thinking. *Harvard Business Review, 86*, 85-92. 2. Song, P. et al. (2017). Computational design of wind-up toys. *ACM Transactions on Graphics, 36*(6), 1-13. 3. BC's new curriculum: https://curriculum.gov.bc.ca 4. (Core Competencies) https://curriculum.gov.bc.ca/competencies)

Week 4: DBL @ Creative Teachers (Sept. 24, 26)	
Guiding Questions	1. Are you a creative teacher? An innovative teacher? 2. What is creativity? Innovation?
Activities	• Design a piece of Transformer Furniture
Readings / Resources	1. Esquivel, G. B. (1995). Teacher behaviors that foster creativity. *Educational Psychology Review, 7*(2), 185-202. 2. Walker, R. J. (2008). Twelve characteristics of an effective teacher. *Educational*

Horizons, 87(1), 61-68.
3. BC's new curriculum: https://curriculum.gov.bc.ca
4. (Core Competencies) https://curriculum.gov.bc.ca/competencies)
5. Petrina, S. (2007). *Advanced teaching methods* (Chapter 6)

Week 5: DBL @ EthnoComputing & Cultural Robotics (Oct. 1, 3)

Guiding Questions	1. How can we help students develop cultural sensitivity and cultural responsiveness? 2. What are the primary problems of indigenous cultural appropriation?
Activities	• Design a hitchbot
Readings / Resources	1. Cole, P. & O'Riley, P. (2015). In(di)geneity in design and technology education. In. K. Stables & S. Keirl (Eds.), *Environment, ethics and cultures* (pp. 67–85). Rotterdam, NL: Sense. 2. Saadatian, E. (2013). Towards the definition of cultural robotics. In *Proceedings of the International conference on culture and computing* (pp. 167-168). 3. Eglash, R. & Bennett, A. (2009). Teaching with hidden capital: Agency in children's computational explorations of cornrow hairstyles. *Children, Youth and Environments, 19*(1), 58-73.

Week 6.1: Thanksgiving Holiday – NO CLASSES (Oct. 8)

Week 6.2: DBL @ *Feng Shui* (Oct. 10)

Guiding Questions	1. What does crafting and designing with *feng shui* entail?
Activities	• Design a Logo or Symbol
Readings / Resources	1. Chen, G. M. (2007). The impact of *feng shui* on Chinese communication. *China Media Research, 3*(4), 102-109.. 2. Flowers, J. (1998). Problem solving in technology education: A Taoist perspective. *Journal of Technology Education 10*(1), 20-26.
Assignment Due	• Design Brief (present your design brief: 4 min.)

Week 7: DBL @ Craftivism (Oct. 15, 17)

Guiding Questions	1. What is the place and role of crafts in schools? 2. Why is it important to teach crafts?
Activities	• Craftivism and Crafts day (bring something that you crafted)
Readings / Resources	1. DeNicola, A. O. & Wilkinson-Weber, C. M. (2016). Designs on craft: Negotiating artisanal knowledge and identity in India. In C. M. Wilkinson-Weber& A. O. DeNicola (Eds.), *Critical craft: Technology, globalization, and capitalism* (pp. 79-98). New York, NY: Bloomsbury.
Oct. 19	*BCTEA Conference: Surrey, Fraser Heights – Friday, Oct 19*

Week 8: DBL @ Animatronics & Mechatronics (Oct. 22, 24)

Guiding Questions	1. What are some components of a curriculum in animatronics? 2. How can we integrate the disciplines in STEAM?
Activities	• Design a Fright Prop: Frightening Animatronics & Mechatronics
Readings / Resources	1. Sirinterlikci, A. & Mativo, A. (2005). A cross-disciplinary study via animatronics. In *Proceedings of the 2005 American Society for Engineering Education Annual Conference & Exposition*. Washington, DC: American Society for Engineering Education.

Week 9: DBL @ PT4CY (Oct. 29, 31)

Guiding Questions	1. To what degree are children and youth conversant with philosophical questions and concepts? 2. How can we teach the philosophy of design and technology?
Activities	•
Readings / Resources	1. Petrina, S. (forthcoming). Philosophy of technology for children and youth. In D. Barlex & P. J. Williams (Eds.), *An international perspective on pedagogy for technology education in secondary schools* (pp. 1-11). Dordrecht, NL: Springer. 2. Petrina, S. (2007). Chapter 5: Creativity and Ingenuity, Design, and Problem-Solving. In *Advanced teaching methods for the technology classroom* (pp. 123-152). Hershey, PA: Information Science Publishing.

Week 10: DBL @ Climate Change (Nov. 5, 7)

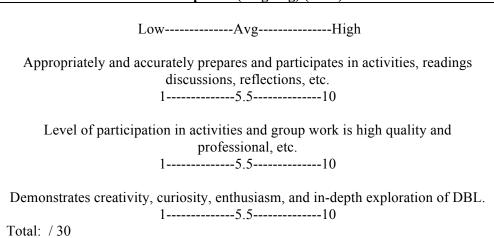|	
Guiding Questions	1. How do I green ADST and technology education? 2. How do I green creative problem-solving? 3. How can ecodesign and ecotechnology education become the norm?
Activities	• Unit packet presentations (5 minutes) • Ecodesign brief: Climate Literacy • Ecodesign brief: Biomimicry
Readings / Resources	1. TBA
Assignment Due	**Unit Packet** (groups of 2)

Week 11: Remembrance Day – NO CLASSES (Nov. 12)
Week 11 & 12: 2-week School-Based Practicum Experience (Nov. 13 -23)

Week 13: DBL + Experiential Learning (Nov. 26, 28)

Guiding Questions	1. How do I make sense of my experience? 2. What was learned on practicum? 3. Why are changes in the schools' ADST programs needed?
Activities	• TBA
Readings / Resources	N/A

Week 14: DBL @ (Dec. 3, 5)	
Guiding Questions	TBA
Activities	• TBA
Readings / Resources	N/A

Design-Based Learning: Assessment

Participation (Ongoing) (30%)

Low--------------Avg---------------High

Appropriately and accurately prepares and participates in activities, readings discussions, reflections, etc.
1--------------5.5--------------10

Level of participation in activities and group work is high quality and professional, etc.
1--------------5.5--------------10

Demonstrates creativity, curiosity, enthusiasm, and in-depth exploration of DBL.
1--------------5.5--------------10

Total: / 30

Design Brief [DUE: 10 Oct 2018] (25%)
Use the Design Brief format given for this assignment. The Design Brief must be for a specific grade range (e.g., 6-8, 8-10), must involve a D&T challenge, and must be planned as part of a larger unit on Creative Problem-Solving or DBL. The design challenge can be either dynamic or static in nature. The Design Brief must be comprehensive enough to be self-sufficient. Create a unique design challenge OR rethink & redesign an existing challenge. **(Chapters 5 and 9)**

Unit Packet [DUE: 9 Nov 2018] (45%) (Groups of 2)
Prepare a DBL unit packet (e.g., Creative Problem-Solving) for a specific grade range (e.g., 6-8, 8-10) for a two week duration. The intention of a unit is to allow for depth while at the same time breadth in different areas. The key to a unit is planning. The most effective units entail a great amount of planning. Remember, the scale of curriculum increases as one moves from lesson plans and demonstrations to activities and projects and ultimately to units and courses. Units can be anywhere from 3 days to 3 weeks. They should involve a variety of activities, where some activities extend over more than one day. A unit plan is actually a collection of resources fro the teacher and students. A unit plan allows the teacher to proceed with confidence and foresight. The unit packet format (10 pages) provided below is comprehensive and recommended for planning:

1. Introduction to the Unit	
a. Unit Theme	The theme of your unit
b. Rationale for the Unit	Explain the value of the unit
c. Resources used in the unit	List all resources needed for the unit
d. Standards	Please refer to the *Standards for Technological Literacy* and BC performance standards

e. Motivational Activities	
2. Big Ideas	These represent the major concepts that will be taught. It is expected that from each Big Idea, several specific objectives could be pulled out. The BIs will cover the entire unit whether it is 3 design challenges or 10.
3. Competencies and Descriptions	Please refer to the BC curriculum core competencies for each of the activities. These come from the Big Ideas and represent the competencies that would be included on all of the lesson plans for the unit. They are more specific than the Big Ideas. Competencies should be assessable (Short-term or immediate objectives).
4. Introductory Activity	The main methods for teaching each BI while not as detailed as the instructional procedures in a lesson plan, they should contain key information. Example: Discussion questions should be included, design challenges should be spotlighted, example resolutions should be presented, role play scenarios should be explained, etc.
5. Developmental Activities	Activities necessary to resolving the design briefs, including special safety activities.
6. Three to Five Design Briefs	
7. Adaptations for Diversity	How will you adapt your classroom facility and content for students with diverse learning needs?
8. Daily Calendar	Scheduling activities and design challenges
9. Unit Evaluation/Culminating Activity	Evaluation activities and procedures
10. Bibliography / Resources	
11. Appendix	
a. Special Considerations	If any
b. Letter to the Parents	If necessary

Essential Characteristics of a Unit

1. It has wholeness and coherence across activities, modules, projects, lessons, etc.
2. It transcends subject matter boundary lines and provides for the integration of subjects.
3. It contains short and long-range objectives and learning experiences.
4. It provides a wide range of methods adaptable to learning styles.
5. It draws from current information as contrasted with textbooks containing information that may be dated.
6. It promotes cooperation, democratic planning and a wide range of insights. It is unified.

A unit is an intentionally designed, integrating, thematic organization of curriculum and knowledge through combinations of activities, demonstrations, discussions, modules, problems, and projects. An ADST unit is a thematic organization of design challenges, tools, machines, information and software, instruments and processes, and technologies. Units typically mean that existing activities or technical skills are "contextualized," or cast into a larger frameworks to provide unity.

Operational Definition of Letter Grade Categories
(EDCP, Revised, June 1996)

Letter Grade	Percent Range	Sample Description
A+	90-100	**Work of outstanding quality.** Demonstrates excellent comprehension of the subject and use of existing
A	85-89	literature and research. Consistently applies a high level of critical scrutiny to texts and discussions. Frequently articulates innovative ideas based on a
A-	80-84	broad background. Shows a high degree of personal engagement with the topic. Consistently integrates broad orientations towards curriculum with particular lesson objectives and instruction and assessment strategies.
B+	76-79	**Work of good quality with no major weaknesses**. Demonstrates good comprehension of the subject. Is able on occasion to
B	72-75	articulate original critical insights. Good use of existing knowledge in the subject. Shows personal involvement in the work. Understands the
B-	68-71	relationships among broad curriculum orientations, lesson objectives and instruction and assessment strategies.
C+	64-67	**Adequate work.** Fair comprehension of the subject. Shows few original critical
C	60-63	insights. Background knowledge may have significant deficits. Minimal personal involvement in the work. Inconsistently integrates broad
C-	55-59	curriculum orientations, lesson objectives and instruction and assessment strategies.
D	50-54	**Minimally adequate work, barely at a passing level.** Serious flaws or deficits in understanding. Unable to integrate broad curriculum orientations, lesson objectives and instruction and assessment strategies.
F (0-49)		**Failing work.** Inadequate for successful completion of the course or submitted beyond final date of acceptance.

Design Brief and Unit Assessment

Format: Use formats provided. Criteria for marking:
- Content: (Format, Comprehensiveness, Substance, Depth of Knowledge, Graphic layout and Appropriateness)
- Creativity: (Creativity in strategy, Presentation, Coherence)
- Originality

Component / Level	Redo (1-2)	Average (3)	High (4-5)	Total /45
Professional Quality ✓ Presentation of Content ✓ DeskTop Publishing ✓ Images + Text	• Quality is compromised • Materials look unprofessional	• Quality is OK • Attempt to meet Standard	• Extremely professional • High standard of quality for materials	**10**
Format ✓ See formats	• Format is incomplete • Certain aspects are missing	• Format is generally complete • Most aspects of format are OK	• All aspects of format are outstanding • Format is clear and thorough	**10**
Content ✓ Relevance ✓ Comprehensiveness ✓ Progressiveness	• Content is sparse • Content is inappropriate for Grade level	• Content is adequate • Content is conventional	• Content is very relevant and thorough • Content is fresh and exciting	**15**
Resources ✓ Applicability ✓ Relevance ✓ Volume	• Few resources • Inappropriate resources	• Resources are somewhat thoughtful • Adequate volume of resources	• Resources are extremely thoughtful • Large volume of resources	**10**