Connecting Students to the 4th Industrial Revolution

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WORKSHOP DESCRIPTION

“What Are My Opportunities?”

This workshop will focus on helping students look toward the future so that they are ready for their next step.

Participants will be provided with an overview of emerging careers and exercises for learning creative decision-making skills needed when faced with revolutionary change and uncertain future possibilities.

We will take a look at the advantages and opportunities of an education in STEM and the Arts (STEAM).
AGENDA

- The Fourth Industrial Revolution and a list of other major changes impacting the future
- Connecting students to the emerging careers
- Exercises for creative decision-making skills that are needed when faced with revolutionary change and uncertain future possibilities.
- Resources for teachers/counsellors on planning for the future
- Advantages and opportunities of an education in STEM and the Arts (STEAM).
LEARNING OUTCOMES
* A FOCUS ON OPPORTUNITIES

- Understand the breadth of change in the next 10 years
- Learn strategies to help students navigate their educational and career journey for the future
- See a list of resources for students and teachers/counsellors for future planning
- Identify the advantages and opportunities for studies and work in STEM/STEAM
What are my Opportunities?

- Who am I?
- What is my plan for achieving my goals?
- Who do I want to become?
- Education and career/life planning
- What are my opportunities?
THE FOURTH INDUSTRIAL REVOLUTION AND RELATED INNOVATIONS
THINKING GLOBALLY

The world is changing...
are you preparing for it?
Theme “Mastering the Fourth Industrial Revolution”.
Addressed the staggering confluence of emerging technology breakthroughs, covering wide-ranging fields such as
- artificial intelligence (AI)
- robotics
- the internet of things (IoT)
- autonomous vehicles
- 3D printing
- nanotechnology
- biotechnology / genome / genetic engineering
- materials science
- energy storage
- quantum computing, and more
FOURTH INDUSTRIAL REVOLUTION

INDUSTRIAL REVOLUTION TIMELINE

First
Water and steam power is used to create mechanical production facilities.

Second
Electricity lets us create a division of labor and mass production.

Third
IT systems automate production lines further.

Fourth
IoT and cloud technology automate complex tasks.

1784: First mechanical loom
1800

1870: First assembly line
1900

1969: First programmable logic controller
2000

Today
THINKING ROBOTS
Schwab argues that we on the brink of a technological revolution unlike anything humankind has experienced before, and describes how this revolution that is unfolding today will fundamentally alter how we live and work.
KLAUS SCHWAB
THE FOURTH INDUSTRIAL REVOLUTION

- Previous industrial revolutions liberated humankind from animal power, made mass production possible and brought digital capabilities to billions of people.
- This Fourth Industrial Revolution is, however, fundamentally different. It is characterized by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human.
- Schwab calls for leaders and citizens to “together shape a future that works for all by putting people first, empowering them and constantly reminding ourselves that all of these new technologies are first and foremost tools made by people for people.”
**Converging Technologies**, a 2002 report exploring the potential for synergy among nano-, bio-, info- and cogno-technologies, has become a landmark in near-future technological speculation.
**The Watson Super Computer**

- **Watson** is a question answering computer system capable of answering questions posed in natural language, developed in IBM's DeepQA research project.
- In 2011, Watson competed on *Jeopardy!* against former winners Brad Rutter and Ken Jennings. Watson received the first place prize of $1 million.
Dr. Watson: How IBM’s supercomputer could improve health care

When machines can learn, many jobs we now consider safe from automation — such as insurance underwriters, financial analysts and even lawyers — will be threatened


In February 2013, IBM announced that Watson software system's first commercial application would be for utilization management decisions in lung cancer treatment at Memorial Sloan Kettering Cancer Center
**Watson Super Computers**

- Machine learning — lets software analyze historical data and generate rules that inform decision-making, even when tasks significantly vary.

- Dr. Watson churns through millions of case histories to learn what diagnosis is likely to be correct and what treatment would be the most effective.

- The system can almost instantly process medical textbooks, electronic medical records and the latest published research, illuminating obscure links among studies in seemingly unrelated specialties.

- Watson is becoming a standard diagnostic tool. Its ability to make sense of a universe of data is far beyond that of any person or team of experienced physicians.
SUPERCOMPUTER IMPACT ON HEALTH CARE

- Watson could also dramatically change the way medical services are delivered.
- Once a machine with diagnostic expertise and a proven track record can provide quality care, will it really be necessary for a physician to see every patient?
- We might want to create a new category of medical professional: people trained to examine patients and convey their symptoms to a system such as Watson.
  - These lower-paid practitioners could help manage the growing number of patients with chronic conditions such as obesity and diabetes, practicing medicine without going to medical school.
ARTIFICIAL INTELLIGENCE (AI)

- Artificial intelligence (AI) is intelligence exhibited by machines. In computer science, an ideal "intelligent" machine is a flexible rational agent that perceives its environment and takes actions that maximize its chance of success at some goal.

- Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".
AI RESEARCH

- The central problems (or goals) of AI research include reasoning, knowledge, planning, learning, natural language processing (communication), perception and the ability to move and manipulate objects.
- General intelligence is among the field's long-term goals.
- The AI field draws upon computer science, mathematics, psychology, linguistics, philosophy, neuroscience and artificial psychology.
CURRENT APPLICATIONS OF AI

- High-profile examples of AI include
  - autonomous vehicles (such as drones and self-driving cars)
  - medical diagnosis
  - creating art (such as poetry)
  - proving mathematical theorems
  - playing games (such as Chess or Go)
  - search engines (such as Google search)
  - online assistants understanding human speech (such as Siri)
  - image recognition in photographs
  - spam filtering
  - targeting online advertisements

- Social media sites overtaking TV as a source for news
  - Major publishers now use artificial intelligence (AI) technology to post stories more effectively and generate higher volumes of traffic.
Self-driving truck makes 190-km beer run

Uber-owned startup, Otto Motors, partners with Anheuser-Busch InBev for first-of-its-kind test

MIKE ISAAC
THE NEW YORK TIMES

SAN FRANCISCO—The futurists of Silicon Valley may not have seen this one coming. The first commercial delivery made by a self-driving truck was 2,000 cases of Budweiser beer.

On Tuesday, Otto, the Uber-owned self-driving vehicle operation, announced the completion of its first commercial delivery, having delivered its beer load from Fort Collins, Colo., to Colorado Springs, a roughly 190-kilometre trip on Interstate 25.

In recent years, Uber has predicted a future in which you can ride in a self-driving car that will take you where you want to go, no driver necessary.

A driver was in the cabin of the truck at all times to monitor its progress and take over if necessary. The driver never had to intervene, Otto said.
Singularity

- The technological singularity (also, simply, the singularity) is the hypothesis that the invention of artificial superintelligence will abruptly trigger runaway technological growth, resulting in unfathomable changes to human civilization.

- Transhumanists support the emergence and convergence of technologies including nanotechnology, biotechnology, information technology and cognitive science (NBIC), as well as hypothetical future technologies like simulated reality, artificial intelligence, superintelligence, 3D bioprinting, mind uploading, chemical brain preservation and cryonics.

- Kurzweil's book *The Singularity is Near* and Michio Kaku's book *Physics of the Future* outline various human enhancement technologies and give insight on how these technologies may impact the human race.
NANOTECHNOLOGY

- Nanotechnology deals with the very small—the art and science of manipulating and rearranging individual molecules to create useful materials, devices, and systems.
- Within a decade, nanotechnology should account for 1 trillion worth of products in the United States alone.
- It will create anywhere from 800,000 to 2 million new jobs.
- It will have huge effects on many industries, including manufacturing, health care, energy, agriculture, communications, transportation, and electronics.

- Jack Uldrich, 2012, Investing In Nanotechnology: Think Small. Win Big
- Some of his other books: Green Investing, Foresight 20/20, Jump the Curve, ...
NANOTECHNOLOGY

Some current applications in development:

- New material, graphene, speeds up recharging of electric car from 4 hrs to 30 sec
- Nanosensors detect cancer cells
- Nanocapsules are sent directly to cancer cells to kill them only
- Nanoparticles used to administer gene therapy
- Implanted medical devices detect, prevent and treat diseases
- Nanowire-based solar cells double light absorption and double electrical output
- New nanomaterials facilitate catalytic reaction between hydrogen and oxygen producing electricity used for cars, homes, ...
NANOFACtORIES

- Taking nanotechnology from an idea to reality means being able to make some very, very fine and small-scaled tools.
- Nanotools have to be assembled at the molecular level in order to be tiny enough to perform work at the nano level, and often, the work of nanotechnology is so specialized that the tools need to be modeled and made specifically for each job.
- Handling the tools involves careful and minute planning because of their delicate balance and scale.
- In generations to come, those skilled in molecular nanotechnology will be in high demand in the workforce.
CONNECTING STUDENTS TO EMERGING CAREERS
How are you preparing for this changing world?
“FUTURE LOOKING” IN EXPLORING OPPORTUNITIES

- What students look at and have some knowledge and experience is based on what has been and is.
- Future job prospects are largely based on seeing the occupations in their current form.
- Being “future looking” is considering fields of work from a future perspective—
  - What might be in 5 – 10 – 20 years from now
  - Getting engaged in creating things and services that are new, different, innovative, a stretch of the imagination, …
CHALLENGES TO “FUTURE THINKING”

- Decision-makers are too often caught in traditional, linear (and non-disruptive) thinking.
- Too absorbed by immediate concerns to think strategically about the forces of disruption and innovation shaping our future.
- The Fourth IR is not only changing the “what” and the “how” of doing things but also “who” we are.
STRATEGIES

- Work together to better understand the emerging trends
- Shared understanding is particularly critical if we are to shape a collective future that reflects common objectives and values.
- We must have a comprehensive and globally shared view of how technology is changing our lives and those of future generations, and how it is reshaping the economic, social, cultural and human context in which we live.
Education: Unlearn

- Unlearn the belief: Go to university, study anything, get a well-paying job. This was a safe bet before—not any more. Many people achieve great success going to college, apprenticeship/trades, workplace and entrepreneurship
- What’s possible—what we don’t know may be more important than what we know at this time;
- Imagination is more important than knowledge
Top Skills for the Future

Top 10 skills

**in 2020**
1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

**in 2015**
1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity

Source: Future of Jobs Report, World Economic Forum
SOME STRATEGIES

Inquiry: What are your opportunities in your field of interest from the perspective of what may be happening in 5 or 10 years from now?
  - What is or will be changing?
  - What might you look for and learn to be at the start up of innovations?

Encouraging subject teachers to present information on new developments in related occupations and impact on careers, e.g.
  - chemistry—nanotechnology
  - physics—quantum physics and blockchain tech
  - computer studies—IoT, big data, ...
  - social sciences, literature—artificial intelligence, ...
STRATEGIES

- Collaborate with librarians in having displays, books, and other resources on future developments
  - Encourage teachers to create a research assignment on future trends related to their subject
  - Assign research on future trends in
    - Guidance courses, especially Career Studies, Designing Your Future, Advanced Learning Strategies: Skills for Success after Secondary School, and
    - Co-operative education programs
    - Specialist high skills majors
STRATEGIES

- Facilitating opportunities for students to attend programs about innovation and new developments, e.g.,
  - The Quantum Cryptography School for Young Students (QCSYS)
    - 8-day camp at the Institute for Quantum Computing (IQC) that gives 40 students in Grades 10 to 12 hands-on experience in the this cutting-edge field. August 11-18, 2017. U of Waterloo. Appl. Deadline Friday, March 24, 2017
  - Investigate! Invent! Innovate!
  - Destination Imagination
**INVESTIGATE! INVENT! INNOVATE!**

- Program by The Learning Partnership in Canada
  - For grade 7 & 8 students
  - Integrated into the science & technology curriculum
- Resources for teachers and students
- Students in groups identify a need or wish, design solutions, build/develop, demonstrate and market
- The Invention Convention—Demonstrate their inventions to the public
INVESTIGATE! INVENT! INNOVATE!
INVESTIGATE! INVENT! INNOVATE!
STRATEGIES

Identifying programs at colleges and universities that are future looking, e.g.

- Nanotechnology Engineering at the University of Waterloo is a multi-disciplinary engineering field, which draws from and benefits areas such as materials science and engineering, chemistry, physics, biology, and medicine.

- Waterloo's Nanotechnology Engineering programs are offered collaboratively through the Department of Chemical Engineering and the Department of Electrical and Computer Engineering in the Faculty of Engineering, and the Chemistry Department in the Faculty of Science.
EXERCISES FOR CREATIVE DECISION-MAKING
CAREER CRAFTING THE DECADE AFTER HIGH SCHOOL
by CATHY CAMPBELL & PEGGY DUTTON
Career Myth

The way it is *supposed* to be

1. finish high school
2. choose a post-secondary program
3. finish the program
4. get a job
5. work
6. retire
POST MODERN CAREER PATH

The way it is for most

- finish high school
- finish program
- take a year off
- go back & finish or start a program
- change & finish or start a program
- change jobs
- go back to school
- work part-time
- retire
- change occupations
- take a full-time job
STRATEGIES IN CAREER CRAFTING

Finding Satisfying Work: Which Strategies Are You Using?

External Influences
- Financial and emotional support

Internal Influences
- Tolerance for ambiguity
- Resistance skills
- Knowing what you want
- Self awareness
- Exposure to a range of options
- Information and guidance

Committing
I've found a place that fits

Navigating
I'm heading toward something

Mesages
- Employment opportunities
  - Labour market
  - Education credentials
  - Family responsibilities

Settling
This is good enough for now

Exploring
I'm trying something out

Drifting
I'm doing whatever comes up
Career Crafting Techniques
Chapter Six – Key Messages

- Know it will be a journey
  - Figuring out what you want takes time
  - Your journey is unique
  - The journey is often uncomfortable

- Actively look for what sparks your interest

- Develop a “Shopping List” and “Explore List” to guide your journey
**Key Messages**

- Experiment with Intent
- Create your own “Lucky Breaks”
  - Knowing what you want and networking open you up to more opportunities
- Take another step and learn from it
  - Action and reflection (too often people do not learn from their experiences)
- Plan with a pencil
- Do what you love somewhere in your life

“...we as career professionals and young people themselves need to acknowledge that uncertainty and change are inherent parts of most young adults’ career journeys”
Learn to Plan and Plan to Learn

- **Learn to Plan:**
  - Setting goals, designing action strategies, projecting probable outcomes. = a good beginning

- **Plan to Learn:**
  - Discover new goals, revise former action strategies, visualize other possible outcomes
Positive Uncertainty

- Philosophy for creative decision making
- Decision making
  - Using what you know and believe
  - To choose what to do
  - To get what you want
  - BUT outcomes are uncertain because the future is unpredictable – BIG CHALLENGE
- Positive uncertainty is a “point of view” guide that acknowledges this uncertainty and suggests you be positive about it
**Proactive Creativity**

- Being positive about uncertainty increases possibilities and produces the opportunity for **proactive creativity**.
- Decision makers often focus on **preferred** and **probable** futures.
- Decision makers seldom consider all the alternatives and consequences (**limited rationality**).
- Wise decision makers consider as many **possible** futures as they can to increase possibilities.
- Humans have **unlimited creativity**.
- Best to combine **limited rationality** with **unlimited creativity** to be proactive and to get best results.
Looking at POSSIBILITIES
Paradoxical Principles

1. Be focused and flexible about what you want
   - Use goals to guide, not govern
2. Be aware and wary of what you know
   - Clarify your wants with an eye on changes in self and the world
3. Be realistic and optimistic about what you believe
   - Realize that your beliefs determine both your reality and your behavior
4. Be practical and magical about what you do
   - Holistic--use your head and your heart in deciding
RESOURCES FOR COUNSELLORS/TEACHERS
Stories and opportunities of combining (mashing) ICT with most fields of work

Any student can mash up tech with their passions to embark on a dream career!
The CareerMash Tech Career Resource Kit for Guidance Counsellors and Teachers

CareerMash: Who, What and Why
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David Ticoll, Special Advisor to ITAC Talent, is the author of the CareerMash Tech Career Resource Kit for Guidance Counselors and Teachers. Members of the ITAC Talent team contributed editorial support and production work to this project.
Career Moves: Skills for the Journey
CLASSROOM RESOURCE FROM PERIMETER!!

30 minute video featuring interviews with 8 people from diverse backgrounds

A full suite of 11 modifiable classroom lesson plans/activities
Explore the video interviews by choosing the keywords and people that interest you. Then click "GO".
Career Moves: Skills for the Journey

- Teacher’s Kit produced by the Perimeter Institute for Theoretical Physics, Waterloo ON
- For Career Studies and Career Education
- Activity 6: Thinking Globally
  - 5 Areas of change and growing needs
    - Demographics
    - Globalization
    - Technology
    - Infrastructure
    - Environment
- Free kit available from
  www.perimeterinstitute.ca
FUTURE WORK 2.0, LABOUR MARKET TRENDS AND OPPORTUNITIES

- Future Work 2.0, ONESTEP's new LMI tool intended to provide youth through adults exploring career and work options with a realistic sense of the labour market and employment drivers
- Eight short video segments on a DVD encourage group discussion and participant engagement
- The facilitator's manual includes handouts, activities, case studies and additional resources to reinforce and enrich participant learning
FUTURE WORK 2.0 DVD Menu

FUTURE WORK 2.0
Introduction

Trend 1
SELF-MANAGED CAREERS

Trend 2
GLOBALIZATION

Trend 3
DEMOGRAPHICS

Trend 4
SOCIAL & LIFESTYLE

Trend 5
SKILLS DEMAND

Trend 6
TECHNOLOGY

Trend 7
APPRENTICESHIPS & TRADES

Conclusion
STEM & ARTS (STEAM)

• Advantages for education and work
WHY SHOULD STUDENTS TAKE STEM COURSES?

Better job opportunities

- Occupations unique to primary industry
- Occupations in art, culture, recreation and sport
- Occupations unique to processing, manufacturing and utilities
- Health occupations
- Management occupations
- Natural and applied sciences and related occupations
- Occupations in social science, education, government service and religion
- Trades, transport and equipment operators and related occupations
- Business, finance and administrative occupations
- Sales and service occupations

Percentage change in number of people employed in each category from 2001 to 2011
Why should students take STEM courses?
Better wages

Median Wages vs. Median STEM Wages

Source: Bureau of Labor Statistics
WHY SHOULD STUDENTS TAKE STEM COURSES?

BETTER WAGES

Top 10 Salary Potential (from payscale.com)
Why should students take STEM courses?
Understand their world

- Climate change
- Nanotechnology
- Biotechnology
Probability of computerization and robotics across sectors.

**HIGH**
Transportation and material moving, Production, Farming, Fishing and Forestry, Office and Administrative Support, Sales and retail

**MEDIUM HIGH**
Construction and extraction

**MEDIUM**
Installation, Maintenance and Repair, Service

**LOW**
Healthcare practitioners, Education, Legal, Community Service, Arts and Media, Computer, Engineering and Science, Management, Business and Financial
FILM PRODUCTION & SOUND RECORDING (TORONTO)

PRODUCTION SPENDING IN TORONTO 2011

- Major Productions: $957.82 million (84.9%)
- Commercials: $97.68 million (8.6%)
- Music Videos: $1.15 million (0.1%)
- Animation: $72.0 million (6.4%)

Source: City of Toronto, Economic Development Committee
Toronto, known as “Hollywood North”, is the third largest film and television production centre in North America, after Los Angeles and New York.

- In television series production the average annual growth for the past six years was 23.6%, and
- $1.13 billion was spent on film and television productions shot in Toronto in 2011.
- In 2011, the Toronto Film and Television Office issued 3,694 location filming permits for 1,303 projects, totalling 5,424 days of shooting.
- Over 70 film festivals in over 20 languages are held in Toronto each year.
- The Toronto International Film Festival (TIFF)® is the second most significant festival in the world after Cannes.
According to the City of Toronto, the film and television production sector is comprised of production,
financial, business and professional service companies, suppliers, unions and guilds. The sector employs a total of 25,000 full-time workers. In 2011, more than 2,000 members of Toronto’s IATSE Local 873 (which includes professional carpenters, hair and makeup artists, art directors, and sound technicians) were involved in various aspects of the movie remake of Total Recall. During peak shooting, the movie employed 500 to 600 workers per day, for a total of 45,000 days worked and $25 million in wages paid to union members.
Technological changes, outsourcing and digitization are impacting jobs in the film sector, leading to a workforce that is increasingly becoming highly skilled and well-educated.

The fastest-growing occupations in the film industry include: independent artists, musicians, graphic designers, producers, directors, film-makers.

There are occupations in cultural careers, such as communications, audio and video recording, film and video, motion picture and broadcasting, which are also experiencing growth.

There is a huge demand for entrepreneurial skills training and development to help creative artists to find sources of funding, making sales, marketing, and promotion.
Wrap Up

- Q & A
- Comments
- Career Moves (Giveaway)
- My contact information
- Association of Career Educators (ACE) website
TO GET A COPY OF THE PPT

- Send me an e-mail and I will send it to you in an attachment

- My contact information
  - Emil.Boychuk@gmail.com
  - Career Life Energy Consulting
  - 416-476-8790

- Association of Career Educators (co-chair)
  - www.aceofontario.ca
  - Website has videos and Power Points of workshops presented by the Association members
ACE

- The Association of Career Educators (ACE) provide workshops for parents and students
- We provide personal education and career counselling
- Our Association is a forum for all interested in promoting, supporting and delivering career development programs and services especially for youth
- Please visit www.aceofontario.ca for more information
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