WeDo and WeCan: Lego Robotics in Kindergarten

A Canvas for Planning a Learning Situation

Implementation Date: 4th term
Timeline: 4 weeks
Clientele: Kindergarten
Domain/Subject(s): Interdisciplinary

AIMS OF THE LEARNING SITUATION

- To expose students to working in teams
- To encourage following step by step procedures
- To expose children to child friendly technology
- To develop problem solving techniques
- To expose children to creating image-based story lines
- To have students construct and program their own robots

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ROBOTICS COMPLEX TASK

A more detailed description of the Robotics complex task, a list of the materials required, and all the resources you need to implement Robotics in a Kindergarten class are available free of charge on the LEARN web site, in the Kindergarten Curriculum section:

- WeDo vocabulary for the pieces
- WeDo list of sounds
- WeDo vocabulary for the programming icons
- WeDo instructions/plans to build the robots
- WeDo programming challenges
- Large pictos of the programming icons
- Links to the QEP for the complex task
- Pictures for the Robot/Not Robot Activity
- And more.

http://www.learnquebec.ca/en/content/curriculum_elem/kinder/robotics/

Also required ($$):

- WeDo Robotics Kit
- WeDo Software

IMAGE SOURCE: LEGO, WEDO ROBOTICS

Links to the Kindergarten Curriculum

To see the links to the QEP specific for the Complex task, go to www.learnquebec.ca/en/content/curriculum_elem/kinder/robotics/QEP.html

In this LES description, we focused on Competencies 4, 5 and 6. However the context is so rich as to allow other competencies to be targeted and observed. In the following description, we have highlighted privileged moments or activities when other competencies could be observed in action.

For a simple presentation of how competencies manifest themselves in the Kindergarten class, get the ***Kindergarten Development Profile (KDP****), a series of 6 documents that provide a spectrum of what a kindergarten student could look like across the six areas of competency.*
http://www.learnquebec.ca/kindergarten-development-profile

Competency 4: To communicate using the resources of language

Key Features: To show interest in communication
- Manifestations/Essential Knowledges: To start and maintain a conversation. To adhere to the subject of a conversation. To imitate reading and writing behaviours. To show interest in information and communication technologies

Key Features: To understand a message
- Manifestations/Essential Knowledges: To express his/her understanding of the information received. To explore the concepts, conventions and symbols of written language and the computer environment

Key Features: To produce a message
- Manifestations/Essential Knowledges: To organize his/her ideas. To use appropriate vocabulary. To explore the sound aspect of language through wordplay

Competency 5: To construct his/her understanding of the world

Key Features: To show interest and curiosity concerning the arts, history, geography, mathematics, science and technology
- Manifestations/Essential Knowledges: To experiment and use tools, materials and strategies in these subject areas. To make connections with his/her everyday life

Key Features: To exercise thinking in a variety of contexts
- Manifestations/Essential Knowledges: To observe, explore and manipulate. To ask questions and make associations with ideas. To make and test predictions.

Key Features: To organize information
- Manifestations/Essential Knowledges: To express what he/she knows. To seek, select and exchange information

Key Features: to describe his/her learning
- Manifestations/Essential Knowledges: To describe his/her methods. To apply his/her learnings

Competency 6: To complete an activity or project *(This is an overarching competency even if not detailed at every stage*)

Key Features: To become involved in the project or activity, drawing on his/her resources.
- Manifestations/Essential Knowledges: To show interest. To speak of what he/she knows and research information in order to carry out the activity or project

Key Features: To show tenacity in carrying out the project or activity
- Manifestations/Essential Knowledges: To finish the activity or project

Key Features: To transmit the results of the project
- Manifestations/Essential Knowledges: To explain what he/she learned and how he/she will be able to use these new learning

Key Features: To show satisfaction with the project or activity
- Manifestations/Essential Knowledges: To present his/her projects

DEVELOPMENT OF THE COMPLEX TASK
THROUGH THE LEARNING PROCESS

Complex Task:

While working in small groups, children build robots and program program them to move in varying speeds and directions using WeDo robotics materials. Using the skills they acquire, they will be challenged to create very short stories in which they program robot actions to coincide with story content.

Evaluation Criteria of the Task:

Through a variety of observation strategies at different moments throughout, the teacher can assess each student's participation, processes, strategies, behaviours and attitudes as well as the student's own reflection/description of his/her learning.
(See QEP links for the task at **www.learnquebec.ca/en/content/curriculum_elem/kinder/robotics/QEP.html)**

Suggested Hook (Present the learning situation)

1. Read the book Robots by Jan Pienkowski. Children act out what robots do while following directions.
2. Play Rorry the Robot animation from http://www.xtranormal.com/profile/2381501/ or create one using http://www.xtranormal.com.
3. Draw what a robot looks like and share it with the class

Learning Process

- General description of the activities and the materials used. For details on the Robotics Complex Task, go to **www.learnquebec.ca/en/content/curriculum_elem/kinder/robotics/**
- Each learning activity must follow the development of one or more competencies. Some of the task should focus on the end evaluation of the complex task.

Center/Activities **Circle**	Materials	Competency – Evaluation	SMARTBoard usage (if any)
Purpose: • Establish a supportive envrionment • Collect general knowledge (Think, Pair, Share) • Introduce concepts • Build knowledge • Transfer knowledge • Make connections • Develop questioning techniques/skills Activities: • Compare robot duties like "I'm a nanobot and I can go inside your body" • Where do we see robots? • Name famous robots (R2D2, C3PO, etc) • Sharing robot books from home and library • Guest speaker • Sorting robots/non robots • How does a robot move? • Name the Lego pieces – vocabulary development	• Models of robots • Books • Show and tell support from home • Invite a guest speaker • Robot/non robot images (LEARN) • WeDo vocabulary (LEARN)	C5 • Shows interest and curiosity: listens • Organises information C4 • Understands the message o Pays attention to the message • Produces oral messages o Organises his/her ideas o Uses appropriate vocabulary o Uses ICT Other competencies C2 • Expresses opinions • Expresses ideas to the group C3 • Listens to others	• Sorting Robot/non robot Notebook File

Dramatic Play	Materials	Competency – Evaluation	SMARTBoard usage (if any)
Purpose: • Develop self confidence • Exhibit general knowledge • Explore concepts • Build knowledge • Transfer knowledge: manipulating the props • To explore symbolic play • Make connections Activities: • Make a robot center • Robot sock puppet show • Robot mime show • Robot charades	• Old socks • Felt • Pipe cleaners • Sparkles • Lego for props • Puppet theatre	C5 • Makes connections with everyday life C4 • Understands the message o Pays attention to the message • Produces oral messages (sentences, vocabulary, organisation of ideas, etc) Other competencies C3 • Participates in the group o Observes the group rules of conduct o Works in a project team • Cooperates with others o Shares play materials, ideas and strategies	

Construction

Purpose:
- Exhibit general knowledge
- Explore concepts and discovery learning
- Build knowledge
- Transfer knowledge: manipulating the building materials
- Encourage fine motor skills
- Make connections

Activities:
- Build the WeDo animals (See LEARN for strategies)
- Free build of own robot

Materials

- WeDo robotics kits ($$)
- WeDo building instructions (LEARN)
- Assigned secured classroom space
- Other Lego

Competency – Evaluation

C4
- Produces oral messages
  - Organises his/her ideas
  - Uses appropriate vocabulary
  - Uses ICT
- Understands the message
- Pays attention to the message

Other competencies
C1
- Broaden his/her repertoire of actions.
  - Experiments with gross and fine motor movements.

C3
- Adjusts his/her actions to the demands of the environment.
  - Situates in the physical environment and experiments with sequences of actions.
  - Uses tools and materials for an explicit purpose.

SMARTBoard usage (if any)

- Learn to name pieces with a "pieces" activity (See LEARN for examples)

Technology

Purposes:
- Exhibit general knowledge
- Explore concepts
- Build knowledge
- Transfer knowledge
- Confident engagement
- Explore and manipulate
- Make predictions
- Develop self-confidence

Activities:
- Program WeDo robots
- Tackles a variety of programming challenges
- Integrate SMARTboards with various activities

Materials

- Computers with WeDo software
- WeDo robotics kits ($$)
- WeDo programming challenges (LEARN)
- WeDo large programming pictos (plasticized (LEARN)
- WeDo list of sounds (LEARN)
- Assigned secured classroom space

Competency – Evaluation

C4
- Demonstrates understanding of written communication
- Produces written messages (programming)

C6
- Shows tenacity in carrying out the project or activity.
- Transmits the results of the project.
- Shows satisfaction with the project or activity.

Other competencies
C1
- Executes fine motor movement (Mouse and keyboard)
- Uses ICT

Strategies: emotional & social
- Controlling his/her impulses
- Paying attention
- Managing stress
- Maintaining concentration
- Finding ways to overcome difficulties and resolve conflicts

SMARTBoard usage (if any)

- Demonstrte how the WeDo programming interface works
- Collective programming of the first robot built
- Create programming sentences with programming icons on the board before entering the program in the computer

Math

Purpose:

- Exhibit general knowledge
- Make predictions
- Explore concepts
- Build knowledge
- Transfer knowledge: manipulating the materials
- Make connections
- Share talent and strategies
- Develop problem solving and mathematic challenges

Activities:

- Program robots to move in varying directions and speeds
- Number stories
- Compare sizes or robots in terms of height
- Associating a numeral with a sound
- Use strategies to solve challenges
- Incorporate various games to develop math vocabulary (the most, the least…..)
- Sorting/Classifying:Sorting the pieces
- Counting
- Recognizing numerals

Materials

- Computers with WeDo software
- WeDo robotics kits ($$)
- WeDo programming challenges (LEARN)
- WeDo large programming pictos (plasticized (LEARN)
- WeDo list of sounds (LEARN)
- Assigned secured classroom space

Competency – Evaluation

C5

- Exercises thinking in a variety of contexts
  - o Observes, explores, manipulates
  - o Predicts, anticipates
  - o Organizes, creates patterns
- Describe processes and strategies

Learnings related to cognitive development: Mathematics

- counting games (e.g. counting the number of pieces)
- association and comparison games (e.g. –comparing the length of two objects)
- grouping and sorting games (e.g. sorting objects by colour or size)
- estimation games (e.g. estimating length, quantity)
- measurement games (e.g. measuring objects)

SMARTBoard usage (if any)

- Create programming sentences with programming icons on the board before entering the program in the computer
- Children explain their program challenges and solutions

Social Studies

Purpose:

- Supportive environment
- Meaningful activities
- Share knowledge and talents
- Make links to real life

Activities:

- Children find where robots are used in daily life (ie: home, work, space, medical, etc)
- Illustrate the different types of robots
- Discussion/conversation while sorting robot/non robot (vending machines, car wash, toys)
- Link to actual robots (Canada Arm, etc…)

Materials

- News clippings
- Non-fiction books
- Meaningful posts on the internet
- YouTube
- Chart paper for “did you know” facts

Competency – Evaluation

C4

- Understands the message
  - o Pays attention to the message
- Produces oral messages
  - o Organises his/her ideas
  - o Uses appropriate vocabulary

Other competencies
C2
C3

- Expresses opinions
- Expresses ideas to the group
- Listens to others

SMARTBoard usage (if any)

Arts & Crafts	Materials	Competency – Evaluation	SMARTBoard usage (if any)
Purposes: • Exhibit general knowledge • Explore concepts • Build knowledge • Transfer knowledge • Active participation in manipulating the materials • Share talents, creations and strategies • Develop self-confidence • Present projects • Encourage fine motor skills • Discovery learning Activities: • Create a robot quilt • Create stand-up robots • Drawing robots	• Markers • Paint • Crayons • Paper • Recyclables • Misc collage materials • Coloured pencils • Wax crayons	C6 • Draws on his/her reseouces o Asks for help o Selects materials needed • Transmits the results of the project o Describes the methods used o Explains strategies and resources used • Expresses satisfaction o Explains what was learned o Expresses strengths and difficulties Other competencies C1 • Executes fine motor movement (pencils, crayons, colouring, printing, etc) C2 • Shows autonomy o Takes initiative and shows autonomy C3 • Participates in a group	

Gross Motor Development	Materials	Competency – Evaluation	SMARTBoard usage (if any)
Purposes: • Supportive environment • Meaningful activities • Exhibit general knowledge • Explore concepts • Build knowledge • Transfer knowledge: active participation and using fine and gross muscle skills Activities: □ Mimicing robot behaviour □ Walking different speeds and directions □ Games using the “Mother may I?” and “red light/green light” formula □ Direct the robot – give students directions to move as a robot	• Outdoor/indoor space • Coloured ribbons to place on shoulder of “robot” (See LEARN for description of the game)	Other competencies C1 • Broadens repertoire of actions o Experiments with gross motor movements • Adjusts actions to the demands of the environment o Controls movement in environment (moves with words or music, avoids obstacles • Recognises factors of well-being o Respects safety rules Essential Knowledges: Motor and Psychomotor Strategies • Using movement and rhythm to communicate • Situating oneself in space and time in relation to objects	

Language Development	**Materials**	**Competency – Evaluation**		**SMARTBoard usage (if any)**
Purposes: • Exhibit general knowledge • Explore concepts • Build knowledge • Transfer knowledge • Explore various forms of writing • Oral expression • Imitate reading and writing behaviour • Develop listening behaviours • Provide a supportive balanced literacy environment • Make predictions and outcomes • Share talents, creations and strategies • Recognize strengths and weaknesses • Developing appropriate vocabulary and terminology Activities: • Read image instructions to build the robots • Create a complex command sentence using WeDo icons • Create a robotic follow-up story on the SMARTBoard • Create “What is a robot?” story wall • Shared writing activity on “What we have leaned?” • Using vocabulary to play • If I was a robot what would I do? • If I had a robot, what would I ask it to do? • Create a class book with the programming sentences • Reflect on learning: What do I know now I didn’t know before?	• Computers with WeDo software • WeDo robotics kits ($$) • WeDo programming challenges (LEARN) • WeDo large programming pictos (plasticized (LEARN) • WeDo list of sounds (LEARN) • Chart paper • Use of SMARTBoard including projectors and computer • Various writing tools	C6 C4 Learning related to language development	• Expresses satisfaction o Explains what was learned o Expresses strengths and difficulties • Demonstrates understanding of the message • Produces messages, oral and written (programming) o Organises ideas o Uses ICT • Imitation of reading behaviour (e.g. holding a book right side up, moving from left to right); • Recognition of writing in the environment • Use of appropriate pronouns and tenses in speech • Recognition of some letters of the alphabet and some words in writing	• Create a follow-up story

Suggested Books/Reading

Fiction

- *Funny Faces* Rusty Robot by Jo Rigg ISBN-13: 978-0312498917
- *Hello Robots* by Bob Staake ISBN-10: 0670059056
- *Little Robots: Ragged Bears* by Michael Brownlow ISBN-13: 978-1929927050
- *Me and My Robot* (All Aboard Reading) by Tracey West ISBN-13: 978-0448428956
- *My Robot* (Green Light Readers Level 2) by Eve Bunting and Dagmar Fehlau ISBN-13: 978-0448428956
- *Nova's Ark*: David Kirk's Nova the Robot by David Kirk ISBN-13: 978-0448438160
- *Nova's Ark*: Twinkle Twinkle, Little Hedgehog: David Kirk's Nova the Robot ISBN-13: 978-0448438184
- *R. Robot Saves Lunch* by R. Nicholas Kuszyk ISBN-13: 978-0399247576
- *Ricky Ricotta's Mighty Robot Collection* (Books 1-4) by Dav Pilkey and Martin Ontiveros ISBN-13: 978-0439435222
- *Robot by Jan Pienkowski* ISBN: 0-440-07459-2
- *Robot Dreams* Sara Varon ISBN-10: 1596431083
- *Robot Rampage* (Backyardigans Ready-to-Read) by Jodie Shepherd ISBN-13: 978-1416990130
- *Robot Zot!* Jon Scieszka ISBN-10: 1416963944
- *Robot Riot!* (Schooling Around) by Andy Griffiths ISBN-13: 978-0439926201
- *The Robot and the Bluebird* by David Lucas ISBN-13: 978-0374363307
- *The Trouble with Sisters and Robots* by Steve Gritton ISBN-13: 978-0807580905

Non Fiction

- *Robot* (DK Eyewitness Books) by Roger Francis Bridgman ISBN-13: 978-0756602543
- *Robots* by Clive Gifford and Frank Picini ISBN-13: 978-1416964148
- *Robotics* (Life in the Future) by Mark Beyer ISBN-13: 978-0516240077
- *Military Robots* (High Interest Books) by Steve White ISBN-13: 978-0531187081
- *How to Draw Robots and Aliens* (Kid Kits) by Janet Cook, Judy Tatchell, Kuo Kang Chen, and Mary Forster ISBN-13: 978-1601301864
- *Robots!: Draw Your Own Androids*, Cyborgs & Fighting Bots by Jay Stephens ISBN-13: 978-1579909376

Resources and Reference Tools

Organisations, partners, books, web sites, CD Roms, etc.

- LEARN Kindergarten Curriculum area: Robotics - http://www.learnquebec.ca/en/content/curriculum_elem/kinder/robotics/
- Hello, Robots by Bob Staake. http://www.bobstaake.com/hellorobots/page1.shtml
- DVD - Robots: From Everyday to Out of This World Editors of YES Mag (Author)
- DVD - Little Robots: Big Adventures Starring: Jimmy Hibbert, Hayley Carmichael
- Build a Robot Puzzle and Spinner Game by eeBoo

Songs:

- Aiken Drum (modified to reflect this curriculum unit
- Slipper Sam
- Play the song "Baby Elephant Walk" by Henry Mancini. Have the children move to the music like they are robots
- I'm a Color Robot - http://www.youtube.com/watch?v=9I_0sb9ZReI
- Sam the Robot Man by Movement Songs Children Love – Themes & Variation ISBN : 1-894096-40-1

My Learning Stories: Integration and Plans for Next Time

As the project unfolds in class, keep notes for yourself in the form of a series of **personal learning stories** which answer the following questions:

- What am I doing? What are the children doing?
- Why is it important or relevant?
- How am I doing it or implementing it?
- How has my practice evolved … my reflection on my practice at this time.