"e-NABLING" Learning: 3D Printing in Kinesiology and School Maker Culture

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Introduction

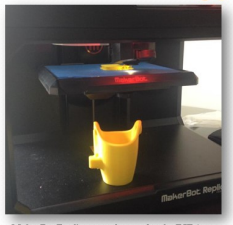
Cardinal Léger Catholic Secondary School uses 3D printing and open source code to support practical, hands-on learning in Kinesiology. An initiative of the Physical Education Department, students print prosthetic limbs as part of a "3D Mechanical Hand Maker movement," partnering with Enabling the Future—a global network of volunteers committed to providing a "helping hand."

This venture has resulted in the creation of a Makerspace in the Léger Learning Commons, which facilitates ongoing learning.

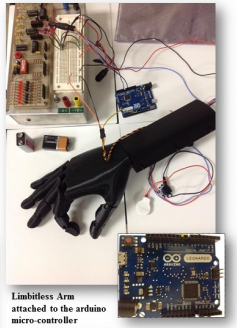
Enabling The Future

E-NABLE is a global network of volunteers with 3D printing capabilities, who commit their time and knowledge to help provide 3D printed prosthetics to people around the world in need. The e-NABLE community is diverse, made up of "teachers, students, engineers, medical professionals, tinkerers…designers, coders, and makers"… who all contribute their unique expertise. The goal of e-NABLE is to provide hands to underserved populations around the world, who may not have access to traditional prosthetic devices. They can cost upward of $6,000. Through e-NABLE, volunteers are matched with recipients and along with the help of a strong online community, they are able to print a fully customized prosthetic for that recipient.

The Kinesiology Project To Date



MakerBot Replicator and parts for the RIT Arm



Limbitless Arm attached to the arduino micro-controller

2014/15 school year:

- Students visited the Brampton Public library for an introduction to 3D printing by Sheridan College, printing parts for a Raptor Hand prosthesis
- Further printing was done by Thingsmiths, an affordable retail 3D printing company
- The Learning Commons and school administration saw a need to support this initiative and purchased a MakerBot Replicator 3D printer
- Faculty and students tested and troubleshooted initial 3D printing at Léger (learning curve for both teachers and students)
- Students printed and assembled a *Rochester Institute of Technology* 3D prosthetic limb to certain specifications
- Through Enabling the Future, a customized printed prosthesis was provided to a local child recipient

GOAL of 2015/2016 School Year:

Taking the project one step further this year, students will print a "Limbitless" myo-electric arm and learn to program arduino mirco-controllers which enables limb mobility through a connection to muscles in the arm. The end-goal is to provide the child recipient with this bionic option.

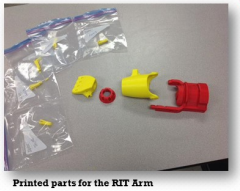
- So far students interested in 3D printing have formed a small club (5 people), learning along with their teacher and in preparation for the Kinesiology class in second semester. They are currently testing and troubleshooting printing for the Limbitless Arm.

Benefits To Learning

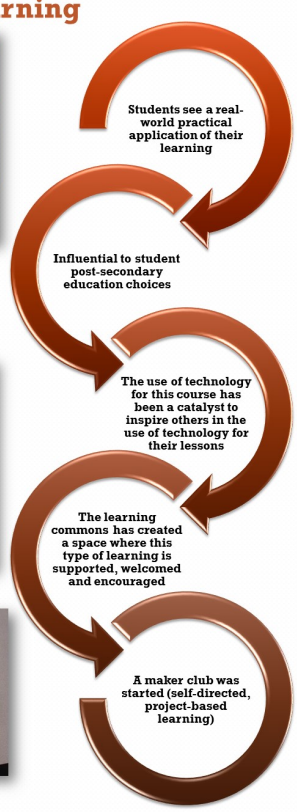
Physical education teacher guides students in the assembly of The Raptor Hand

Watch how the Limbitless Arm is controlled

Another team of students collaborate to assemble a Raptor Hand



Printed parts for the RIT Arm

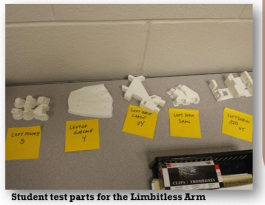


A Growing Maker Culture

The creation of a small Makerspace and resulting culture at Cardinal Léger Catholic Secondary School is the fortunate consequence of the Learning Commons responding to a need to support ongoing staff and student learning within the realm of physical education and the school's unique partnership with Enable the Future. While students enrolled in the Kinesiology class were first to use the Makerspace, learning and innovation has not stopped there.

This curricular collaboration has since inspired other initiatives and as a result the Makerspace at Léger and teacher interest in using the 3D printer for innovative assignments is slowly growing to support other departments' and students' use of technology in education.

A small but growing Makerspace in the Learning Commons



Student test parts for the Limbitless Arm

The Future

"We shape our tools, and thereafter they shape us." – John Culkin

With educators and students alike having access to these types of technologies and spaces to explore, there is an increased opportunity for educators to create timely lessons with (real-world) practical applications, in turn influencing pedagogy and for students to feel engaged and to be innovators.

By adding to the Makerspace, the Léger Learning Commons hopes to inspire others in the use of educational technology and collaborative projects that take curriculum to the next level, while keeping the school library relevant, exciting and the place to be!

References

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Acknowledgements

I would like to recognize and thank Léger educators I. Mesich, H. Mesich and the administration team.

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