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LE PROF

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DE LA SCIENCE
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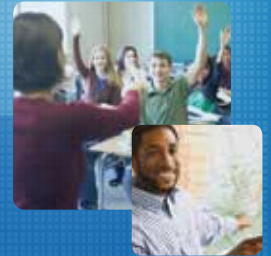
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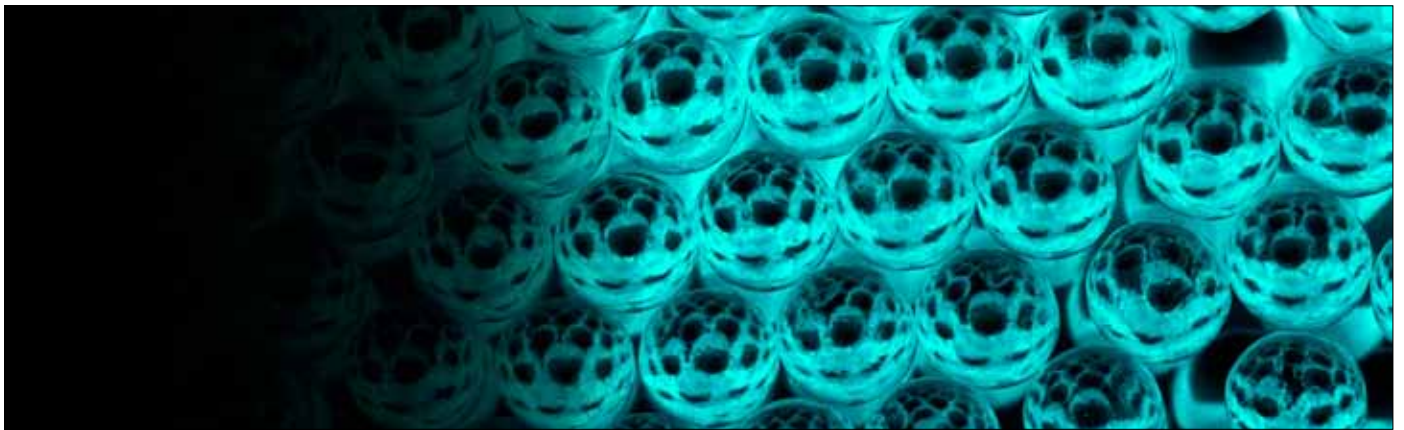
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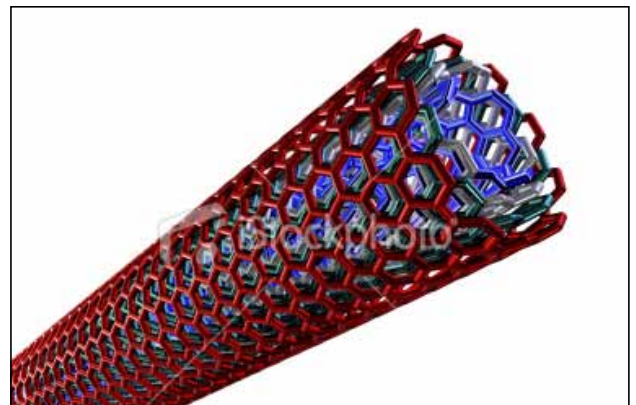
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NOTES

Whether you're in the rural villages of Congo or a researcher at MIT, there is a natural inclination to continuously push technology and adapt it to our every need – simple or complex.

I recently watched a documentary that followed scientists en route to study a volcano in the heart of the Congo jungles. As part of their journey, they travelled through towns so impoverished that locals ride bicycles made from scrap pieces of wood. The wheels are curiously not smooth, rather rough and jagged, but the bikes still manage to take its riders to their chosen destinations.

On the more complex side, I also came across a technology blog that showed scientists of a different kind demonstrate robots capable of “showing emotion.” It was rather frightening but still incredibly fascinating. I had to watch it again.

The different facets of technology truly span the globe and newer technologies are increasingly reaching our classrooms. Often, educators are an afterthought to the building of new technologies and there is considerable lag time between development and implementation. To be on top of the technology game, we must play a part in its development.

Every spring, TEACH Magazine dedicates an issue to technology. This time around we show you how to take control of the technology game. Lead by example. Become involved in the early stages of any technological revolution and prove the importance of educational development of new technologies.

Our feature story will open your eyes to the wide world of nanotechnology and how such tiny science can have a big impact in classrooms. In his Futures column, Richard Worzel explores the idea of humans competing with robots for jobs.

We also have a new Technology Supplement. As you peruse the content, we hope you find some new and exciting educational innovations. Last, don't miss your chance to bring new technology to the classroom. Enter our latest contest; TEACH Rewards Teachers! Visit www.teachmag.com to win design, music editing, and video editing software from our sponsors, MAGIX.

Qu'on soit habitant d'un village rural du Congo ou chercheur au MIT, l'être humain cherche continuellement à faire évoluer la technologie afin qu'elle réponde à nos besoins de tous les jours, simples ou complexes.

J'ai récemment regardé un documentaire où on suivait des scientifiques en route pour étudier un volcan au cœur de la jungle congolaise. Leur excursion les a emmenés dans des villages tellement pauvres que les résidents locaux se fabriquaient des bicyclettes à l'aide de vieux morceaux de bois. Les roues étaient tout sauf lisses, ce qui n'empêchait cependant en rien les gens de se rendre à destination.

Sur une note plus complexe cette fois, je suis tombée dernièrement sur un blogue technologique où on voyait divers scientifiques faisant la démonstration de robots capables d'« exprimer des émotions ». J'en ai eu des frissons, mais je demeurais tout de même fascinée par la chose. Et je n'ai pu m'empêcher de réécouter la vidéo.

La technologie se répand sous toutes ses facettes comme une traînée de poudre, et nos classes n'y échappent pas. Souvent, le milieu de l'éducation est le laissé pour compte dans le monde des technologies, et beaucoup de temps s'écoule avant que les découvertes ne parviennent jusqu'à nous. Pour prendre la place qui nous revient, il faut contribuer à la mise au point de ces technologies.

Chaque printemps, TEACH-LE PROF réserve un numéro à la technologie. Dans celui que vous avez entre les mains, nous vous montrons justement comment prendre notre place. Il faut donner l'exemple. Participer aux balbutiements des révolutions technologiques à nos portes. Montrer l'importance des nouvelles technologies en éducation.

Notre article en vedette vous ouvre la porte du monde de la nanotechnologie et vous montre en quoi une science aussi minuscule peut avoir de grandes répercussions dans nos classes. Aussi, Richard Worzel traite, dans la rubrique *Le futur*, de la rivalité entre les robots et les humains au travail.

Nous avons aussi un nouveau supplément technologique. Nous espérons que vous trouverez dans le numéro des innovations intéressantes pour l'éducation. D'ailleurs, pourquoi ne pas tenter votre chance de mettre en place de nouvelles technologies en classe en participant à notre concours *Des enseignants choyés!* Visitez le www.teachmag.com et vous pourriez remporter des logiciels d'infographie, de montage musical et de montage vidéo de notre commanditaire, MAGIX.

Lisa Tran
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Richard Worzel, C.F.A.

Competing with Robots

If you do any reading about the future of technology—it will blow your mind. Not only is the pace of change accelerating, but the rate of acceleration is increasing. One commentator, professional investor, John Mauldin, says that we are entering an era of “perpetual future shock.” I see an incredible panoply of changes coming in a wide range of fields, everything from biotechnology, nanotechnology, genetics, bioengineering, medical research, materials science, the Internet, and many other areas. But the area that will shock us most will be computer intelligences and the rise of everyday robots.

New inventions take time to be absorbed into the marketplace and our lives. We do not just throw away a brand new, flat-screen TV just because a 3-D version appears. (Or at least, most of us do not.) It also takes time for companies to move something from a prototype in the laboratory to a floor model at a price that consumers will buy. Despite this, the changes of the next ten years will make the changes of the last ten – or even the last twenty-five – seem tame in comparison. This is Ray Kurzweil’s Law of Accelerating Returns that he illustrates from a 2001 essay:

“In the nineteenth century, we saw more technological change than in the nine centuries preceding it. Then in the first twenty years of the twentieth century, we saw more advancement than in all of the nineteenth century. Now, paradigm shifts occur in only a few years time. The World Wide Web did not exist in anything like its present form just a few years ago; it didn’t exist at all a decade ago.”

Kurzweil has been described as “Edison’s rightful heir;” and is a very successful, and very rich, inventor. Yet, while people often dismiss him as a wild-eyed wacko, he has made an awful lot of money by being right more often than the vast majority. If he is right, and if the signs I am seeing right now are correct, we will see the emergence of everyday robots within the next ten years.

This will not happen in the home at first, in part because a machine sophisticated enough to be very useful around the home, even without the computer to guide it, would cost about the same as a new car. But in the workplace, replacing a worker for the

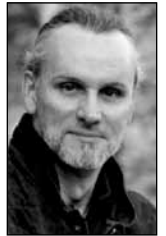
price of a new car is a good deal. Not only can machines work 24 hours a day, 365 days a year (except for maintenance and repair), but you only have to buy them once. You have to pay workers every year or they become very unhappy. Therefore, I expect to see robots, computer intelligences, and automation moving into the workplace in a big way.

It will start with routine, fairly simple work that does not require judgment. This has already happened in the manufacturing industries, but it is happening in clerical work as well: computers processing information are replacing humans. As just one simple example, people who prepare tax returns are widely being replaced by tax-prepara-

“Creativity means doing new things and doing old things in new ways. Eventually, computers and robots will be able to do many, most, or all of the things that humans do. But humans are unpredictable and creativity is the constructive harnessing of that unpredictability. Therefore, one way of competing is to do things that no one has thought to program a computer to do. Of course, once it becomes clear that this is valuable, some bright spark will come along and figure out how to get a computer to do it, but until then, it is all ours...”

tion software that is increasingly sophisticated and routine wills are being created by software rather than lawyers.

So far, such developments rely on “dumb” computers that simply do what they are programmed to do by humans in combination with humans deciding what goes in the appropriate blanks. This will change over the next ten years as more and more sophisticated software, such as genetic pro-



gramming are combined with computers that are, say, 1,000 times faster than today's computers to create computers that seem to be human-intelligent.

Human-intelligent computers mean that humans, both adults and children have their work cut out for them if they want to compete and thereby stay employed. (And, by the way, yes, I do know that there is more to education than vocational training.) So how can we compete? I think the answer lies in three words: creativity, flexibility, and humanity; it is these three things that our education system needs to aim towards, not facts and information.

Creativity means doing new things and doing old things in new ways. Eventually, computers and robots will be able to do many, most, or all of the things that humans do. But humans are unpredictable and creativity is the constructive harnessing of that unpredictability. Therefore, one way of competing is to do things that no one has thought to program a computer to do.

Of course, once it becomes clear that this is valuable, some bright spark will come along and figure out how to get a computer to do it, but until then, it is all ours.

Included in this is the creation of art and artifacts. I am not sure whether we will eventually reach the stage of having computers or robots create paintings, sculptures, or symphonies for us. I tend to think we will not value them as highly as human works, but I could be wrong. But regardless, works created by humans will still be important and valued – at different levels, depending on the artist, as has always been the case, but valued nonetheless.

Flexibility means being able to jump in the deep end, figure out what is going on and then making something work. This is particularly true with the process of entrepreneurship, the creation of a new business. I have written two books on this subject, and I can tell you that at some stage in every successful, major entrepreneur's career, they are faced with some kind of completely in-

surmountable challenge – which they then find a way to surmount. This is one illustration of flexibility.

As for humanity, another way of putting this is that the rise of automation will put greater emphasis on the so-called soft skills: things like teamwork, empathy, leadership, understanding, and genius. Being able to assemble a team of people, and lead them through incredible adversity, has happened over and over in human history, and is one of humanity's defining traits. Being a team player that people want to work with is always and everywhere a career-enhancing trait. Understanding new circumstances and having empathy for people and their situations are both critical skills in a world where routine things will be handled by automation. (As one simple example, I deal with a particular satellite TV provider, not because they have the best prices or equipment, but because every time I call their service people, I come away vastly impressed, and wondering why all the service groups I deal with can't be that good.)

And genius is why we live lives of historic luxury instead of living in caves and blinking uncomprehendingly at the stars as we scratch at our fleas. It is the uniquely human trait that has made everything else possible.

So I have three challenges for you. First, check for yourself whether I am right or wrong about the upcoming changes in the next ten years and then think about what that will do to the workplace. Form your own opinions. Second, is the education system changing fast enough to cope with the changes ahead of us? And third: look at our education system and ask yourself: will it equip today's students adequately for tomorrow's world? And, if you decide I am right about the future and you do not do not believe our education system is up to the task ahead, I have a fourth challenge for you: What kind of education system do we need and how do we get there?

Richard Worzel is Canada's leading futurist, and speaks to more than 20,000 people a year. He volunteers his time to speak to high school students for free. Contact him at futurist@future-search.com.

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Par Richard Worzel

Nos rivaux les robots



Peut-être avez-vous déjà senti cette sensation d'être dépassé en lisant sur l'avenir de la technologie. Non seulement les changements s'accélèrent, mais l'accélération elle-même s'accélère! Commentateur et inventeur professionnel, John Mauldin affirme que nous sommes à l'aube d'une ère de révolution technologique continue. J'entrevois une marée de changements dans beaucoup de domaines, notamment la biotechnologie, la nanotechnologie, la génétique, la bio-ingénierie, la recherche médicale, la science des matériaux et Internet. Mais le domaine qui évoluera le plus sera certes celui de l'intelligence artificielle et de la mise au point de robots qui intégreront notre quotidien.

Les inventions ne prennent leur place sur le marché et dans nos vies que relativement lentement. Il ne suffit pas de lancer un nouveau téléviseur à écran plat parce qu'une version en trois dimensions a vu le jour (ou, du moins, la plupart d'entre nous ne le font pas). Les entreprises doivent d'abord valider leur prototype et créer un produit abordable pour les consommateurs. Malgré tout, les changements survenus au cours des dix dernières années (et même des vingt-cinq dernières années) ne se compareront même pas à ce qui nous attend pour les prochains dix ans. C'est la « loi des progrès accélérés » qu'illustre Ray Kurzweil dans un essai publié en 2001 (*Law of Accelerating Returns*) :

« Au cours du dix-neuvième siècle, nous avons été témoins de plus de développements technologiques qu'au cours des neuf siècles qui l'ont précédé. Dans les vingt premières années du vingtième siècle, nous avons constaté plus de progrès que dans tout le dix-neuvième siècle. Maintenant, le même modèle se réplique sur une échelle de quelques années seulement. La Toile ne ressemblait en rien à ce qu'on voit aujourd'hui il y a seulement quelques années; elle n'existait même pas il y a une dizaine d'années. » [traduction libre]

Kurzweil est perçu comme l'héritier légitime

d'Edison : c'est un inventeur prospère, très riche. On le considère bien souvent comme un pur cinglé, mais tout son argent, c'est en ayant raison plus souvent que la majorité qu'il l'a obtenu. Si ses prévisions sont fondées et que je comprends bien les signes actuels, les robots feront leur arrivée dans notre vie quotidienne d'ici une dizaine d'années.

« Quand on parle de créativité, on parle aussi d'arts. Je ne suis pas convaincu que les ordinateurs et les robots pourront un jour créer des peintures, des sculptures ou des symphonies à notre place. J'aurais tendance à croire que les œuvres créées par des ordinateurs n'auront pas la même valeur à nos yeux que les œuvres créées par des humains, mais je me trompe peut-être. Peu importe, le travail des artistes aura toujours la cote (qu'on aime ou pas un artiste). »

La vie domestique ne sera pas perturbée tout de suite : en effet, une machine à la fine pointe qui peut être efficace dans les tâches ménagères sans ordinateur pour la guider coûterait sensiblement aussi cher qu'une voiture. Mais pour les entreprises, le remplacement d'un employé au prix d'une voiture, voilà qui est très rentable! Non seulement les machines peuvent travailler 24 heures sur 24 et 365 jours par année (sauf pour entretien et réparation), mais il ne faut les acheter qu'une seule fois!

Les employés, eux, demandent à être payés chaque année ou sinon ils se fâchent. Les robots, l'intelligence artificielle et l'automatisation semblent donc la voie de l'avenir au travail.

Les tâches routinières seront les premières touchées, celles qui n'exigent pas de jugement. On en a déjà des applications dans le secteur manufacturier et aussi dans le travail de bureau : les ordinateurs qui traitent les données remplacent effectivement les humains. Les personnes qui préparent des déclarations de revenus en constituent un bon exemple, car elles se font semer de plus en plus par des logiciels qu'on ne cesse de perfectionner. Il en va de même pour les testaments de routine, créés par des logiciels plutôt que par des avocats.

Pour l'instant, les ordinateurs mis au point ne font qu'accomplir bêtement ce que les humains programment, et ce sont les humains qui déterminent ce qu'il faut inscrire dans les bonnes cases. Les dix prochaines années seront le théâtre de grands changements : les logiciels, notamment ceux de programmation génétique, seront perfectionnés et fonctionneront sur des ordinateurs près de 1 000 fois plus rapides que ceux d'aujourd'hui. Nous aurons des ordinateurs aussi intelligents que l'humain.

Ces ordinateurs aussi intelligents que l'humain entraîneront une rivalité entre, d'un côté, l'ordinateur, et, d'un autre côté, les adultes et les enfants, car ces derniers ne voudront pas perdre leur emploi (oui, je sais, l'éducation ne fait pas que former de simples employés). Comment peut-on donc faire concurrence aux ordinateurs? La réponse se divise en trois volets : créativité, flexibilité, humanité. C'est ce qu'il faut privilégier dans notre système d'éducation au lieu des faits et des connaissances.

Tout d'abord, la créativité consiste à produire de nouvelles choses et à trouver de nouvelles manières de faire les choses. Tôt ou tard, les ordinateurs et les robots pourront faire tout ou presque tout ce que les humains peuvent faire. Mais une chose diffère : les humains sont imprévisibles, une caractéristique que met en relief la créativité. Pour battre les ordinateurs, il faut donc faire ce que personne n'a jamais pensé programmer dans les ordinateurs. Par contre, il est

clair qu'une fois qu'on aura découvert l'importance de la créativité, certains esprits allumés chercheront à mettre au point des ordinateurs capables de créer. Mais d'ici là, c'est notre département.

Quand on parle de créativité, on parle aussi d'arts. Je ne suis pas convaincu que les ordinateurs et les robots pourront un jour créer des peintures, des sculptures ou des symphonies à notre place. J'aurais tendance à croire que les œuvres créées par des ordinateurs n'auront pas la même valeur à nos yeux que les œuvres créées par des humains, mais je me trompe peut-être. Peu importe, le travail des artistes aura toujours la cote (qu'on aime ou pas un artiste).

Ensuite, on parle de flexibilité quand on peut s'immerger dans ce qu'on fait, bien comprendre de quoi il en retourne et trouver des solutions adéquates. L'entrepreneuriat, c'est-à-dire la création d'entreprises, en est un exemple. J'ai écrit deux livres sur le sujet et je peux vous certifier que tout bon entrepreneur se bute un jour ou l'autre à des difficultés insurmontables qu'il parvient néanmoins à surmonter. Voilà une belle démonstration de flexibilité!

Enfin, l'humanité équivaut en quelque sorte à ces compétences générales que sont le travail d'équipe, l'empathie, la capacité de chef, la compréhension et le génie qui nous distinguent des ordinateurs. L'histoire de l'humanité recèle d'équipes formées et dirigées de main habile malgré l'adversité, une capacité caractéristique de notre espèce. Savoir bien travailler en équipe a toujours été un excellent moyen de progresser sur le plan professionnel. Il faut comprendre comment les situations évoluent et avoir de l'empathie pour les autres et ce qu'ils vivent si on veut se démarquer des robots qui effectueront les tâches routinières. Par exemple, je fais moi-même affaire avec un câblodistributeur par satellite non parce qu'il a les meilleurs prix ou le meilleur équipement, mais parce que je suis impressionné de la qualité du service à la clientèle. J'en suis même à me demander pourquoi les autres services à la clientèle à qui j'ai affaire ne les imitent pas.

Le génie, c'est la raison pour laquelle nous vivons dans des maisons plutôt que dans des caves, que nous comprenons la nature qui nous entoure, que nous prenons soin de notre corps. C'est cette particularité de l'humain qui est à l'origine de tout le reste.

J'ai, pour finir, trois défis pour vous. D'abord, vérifiez si j'ai raison ou si j'ai tort concernant les changements à venir au cours des dix prochaines années et songez aux répercussions de ces changements sur le milieu professionnel. Faites-vous votre propre opinion. Deuxièmement, demandez-vous si le système d'éducation s'adapte assez vite aux changements qui vont survenir. Et troisièmement, demandez-vous si notre système d'éducation en général prépare adéquatement les élèves. Si vous concluez que j'ai raison sur l'avenir et que vous ne croyez pas que le système d'éducation soit à la hauteur, j'ai alors une quatrième question pour vous : de quel type de système avons-nous besoin et comment le mettre en place?

Richard Worzel, le plus grand futurologue au Canada, donne des conférences à plus de 20 000 personnes par année. Il accorde gratuitement de son temps pour parler aux élèves du secondaire. Vous pouvez communiquer avec lui à futurist@futuresearch.com.

SchoolTube

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SchoolTube provides students and educators with a safe and free media sharing website. All student created uploads must be approved before they can be shared. The SchoolTube platform allows students to upload media into a “holding area” that keeps the media inactive. An email is sent to a moderator or registered teacher informing them that the media is available to be viewed for approval. Only after the media has been approved by the moderator is it available for viewing on the site.

Students can search for and organize their own videos according to channels or categories. Some of the many categories include academics and education, green and environment, health and wellness, and autos and videos. They can safely and easily share media from school, about school, or about any topic that interests them. They also have the opportunity to win prizes by entering video competitions directly on the website.

For educators, SchoolTube can help them design different class projects including, digital storytelling, video yearbooks, broadcast journalism, virtual tours (field trips), demonstrations, current events, blogs, and presentations. Teachers can also use SchoolTube to share teacher approved media or integrate technology into their lessons.

The website features a “Tech Corner” where teachers can share and view how other teachers around the world are using SchoolTube to integrate technology into their classrooms. Educators can also download a SchoolTube TechTool Kit to help them get started. Also, teachers can access resources or submit questions to SchoolTube’s “Tech Experts” who provide educational technology guidance. SchoolTube also offers additional resources, including, how to register for an account, how to create a SchoolTube channel, and how to unblock SchoolTube. It also provides its media standards and explains the U.S. Children’s Online Privacy and Protection Act. Technical articles include a step-by-step guide to moderation and video compression basics.

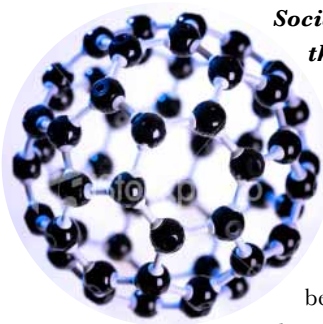
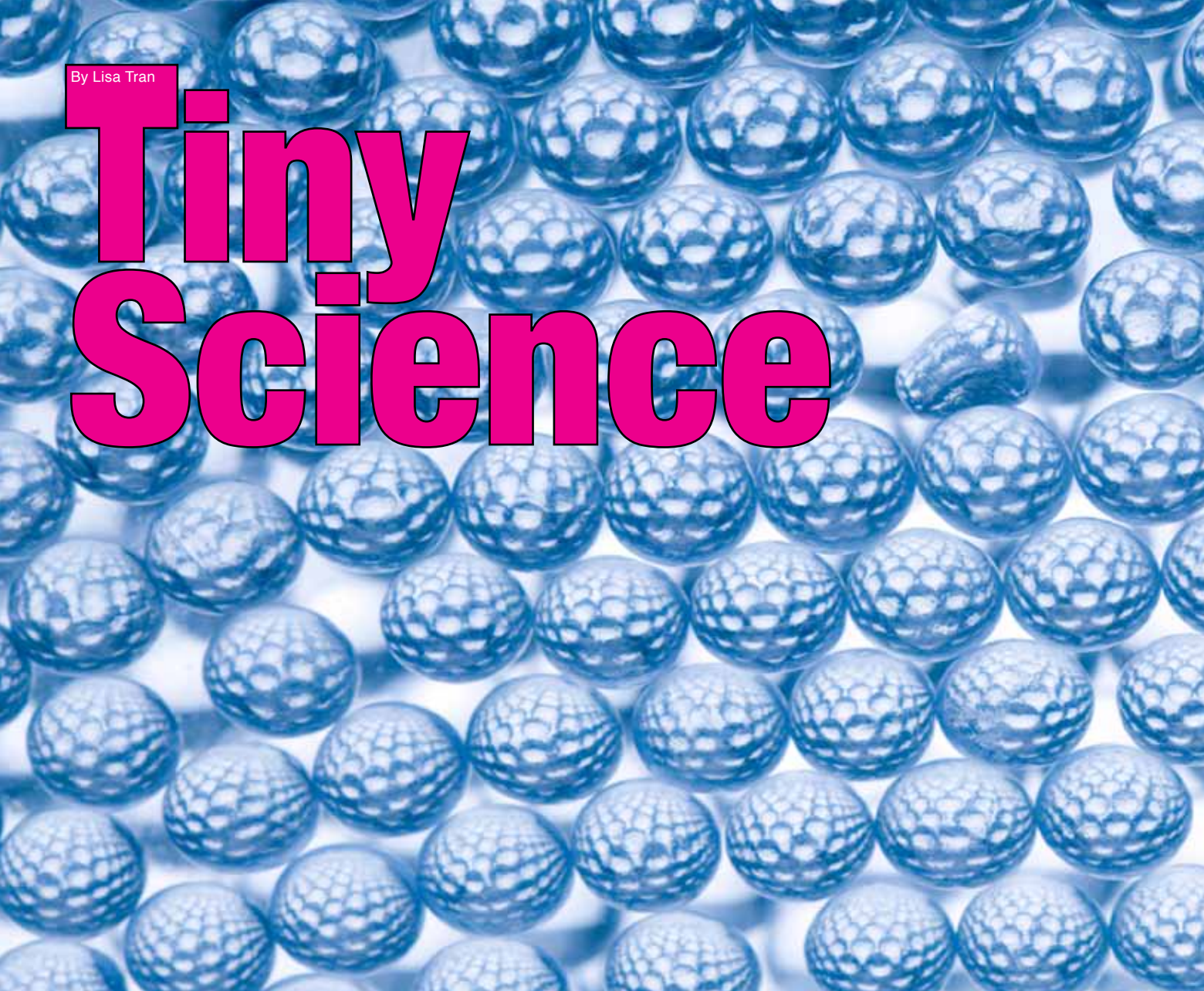
Last, SchoolTube provides video lesson plans for teachers in the beginner, intermediate, and advanced levels. As well, there are lesson plans for music videos, history, science, and teaching copyright to students.

TeacherTube is a free online community for sharing instructional videos. It is an educationally focused, safe venue for teachers, schools, and home learners. The site provides anytime, anywhere professional development with teachers teaching teachers. As well, teachers can post videos designed for students to learn a concept or skill.

Members are encouraged to upload educationally relevant videos and make constructive comments. The rating system is used to rank videos and show appreciation of the value for teachers and learners. Users also have the ability to flag videos they deem inappropriate. TeacherTube staff review flagged sites and will remove any questionable posts. Users also have the option to upload and view documentaries, photos and audio files. All media is organized into additional categories such as, featured, recently added, most viewed, most discussed, top-rated, and most favoured. Users can subscribe to RSS feeds of their preferred media and share media with the main bookmarking and social networking tools. TeacherTube lets users participate in a community of groups, bulletins and forums. There is also a blog section for users to discuss educational topics.

By Lisa Tran

Tiny Science



Society is embarking on a journey through the Nano Age.

Teaching nanotechnology to students provides them with a passport to a world where nanotechnology is becoming the dominant science.

The Nano World sounds like one that exists only in the imaginations of the best sci-fi writers. It is a world with self-cleaning windows and materials that are

“harder than diamonds” and “stronger than steel at a fraction of the weight.” But this world is very real and at the helm of our tour is Deb Newberry, a nuclear physicist and nanotechnologist at the Dakota County Technical College in Rosemount, Minnesota.

In Newberry’s co-authored book, *The Next Big Thing Is Really Small: How Nanotechnology Will Change the Future of Your Business*, she describes nanotechnology as “the art and science of manipulating and rearranging individual atoms and molecules to create useful materials, devices, and systems.”

Nanotechnology or, nanoscience, is so-called because atoms and molecules are minuscule—mere nanometres in width where one nanometre equals one billionth of a metre. To better grasp the nanoscale, we can begin by comparing a single strand of human hair with gold atoms. A human hair is approximately 7000nm wide while two and a half gold atoms make up one tiny nanometre. Atoms are small. And as its name suggests, nanoscience *is* tiny science.

The responsible, diligent scientist does not rely on mere observation. In fact, nanoscientists have successfully replicated the atomic structures of some of the Earth’s hardest and enduring materials and modified them to engineer ones that are stronger and more resilient. Many analysts outside of the scientific realm have applauded nanoscience for its remarkable potential. Venture capitalist, Steve Jurvetson of Draper, Fisher and Jurvetson believes that “nanotechnology is the next great technology wave, the nexus of scientific innovation that revolutionizes most industries and indirectly affects the fabric of society. Historians will look back on the upcoming epoch with no less portent than the Industrial Revolution.”

As for the rest of society, we are affected by nanotechnology be-



cause decades of experimentation in laboratories have materialized swiftly into everyday products displayed on store shelves. Take for example, sporting equipment. In a sport like tennis, a stronger racket will propel the ball further, but strong building materials are exceptionally heavy. A tennis player would never use a racket comprised of the strongest steel unless the object of the game was to move as slowly as possible while carrying the heavy, but sturdy racket. Using nanotechnology however, scientists can fabricate new rackets that are stronger yet lighter than traditional ones with super materials such as carbon nanotubes.

Keeping with the sports theme, nanoscientists have also created “super balls”—bouncier tennis balls. The fibres of the balls are shrunk down to nanometres and added to the outer coatings. The fibres are so incredibly small that they are woven more tightly together than regular fibres. The new tennis balls now have fewer crevices for air to flow out, retaining their bounce for a longer period of time.

Many nanotechnology applications have been innovatively incorporated into the design of cosmetics. Zinc oxide is the secret

ingredient in sunscreen that protects skin from the sun’s UV rays. Zinc oxide particles are white, but when they are reduced to nanometres, they appear transparent. We can now buy sunscreen that “isn’t the white you see on lifeguards, but still protects exactly the same,” chuckles Newberry.

Surprisingly, even the quality of food can improve with the assistance of nanotechnology. “I sure remember the early days of low-fat yogurt when it had this strange, watery texture,” recalls Newberry. “Fat is an emulsifier, it gives food its smooth consistency,” so less fat means a coarser texture. To solve this food conundrum, manufacturers are now shrinking the fat particles in low-fat products. The foods remain low in fat, but the new texture is finer because the fat becomes virtually invisible. Delicious *and* nutritious.

Nanotechnology comprises a continuum of development in the prestigious laboratories and in the industrious manufacturers. “The new discoveries are actually being implemented in products and manufacturing and that’s where there will be a whole new category of jobs: in manufacturing, testing, and quality assurance,” says Newberry. Dean Hart of NanoInk, a nanotechnology company,

states that the National Science Society estimates two million nanotechnologists will be needed by the year 2015. “Currently, there are only about 20,000 in the world. The need for more specialists in a short amount of time is overwhelming,” but we can start training future nanotechnologists by teaching the science to today’s eager students.

In most fields of science, traditional hands-on research has been reserved for pure research institutes. Nanoscience differs in that students can conduct their own research and contribute to the growing body of knowledge through their experiments. Students interested in nanotechnology can, potentially, translate their passion into a specific career. Nanoscience students can begin specializing as early as the high school level. Most important for educators, nanoscience can incite students to become interested in STEM (science, technology, engineering, and math) and remain interested in it.

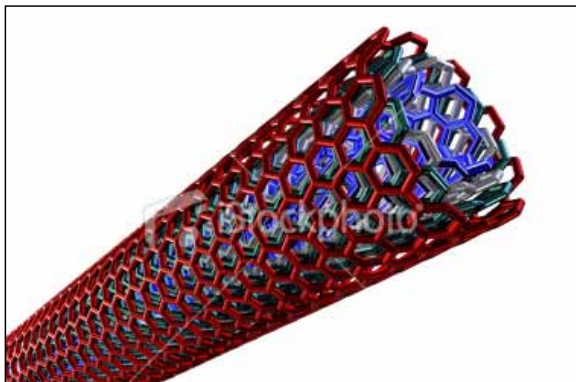
Teaching nanoscience may be a daunting task, but it certainly does not require developing an entirely new course, just yet. Newberry suggests that “nanotechnology concepts can be applied to lesson plans by adding another step of discussion or making small modifications.” She has experience teaching nanotechnology to young people as part of an annual summer camp for high school students at the Dakota County Technical College.

Incorporating nanotechnology into the science curriculum can be relatively simple as exemplified by the following examples:

Chemistry: If you are already conducting a lab that involves boiling and mixing to make precipitates, you do not have to add another experiment, rather, another step. You can substitute the regular chemicals with others just as easy to obtain. Students can then take a solution that already has gold in it, separate the gold atoms, and group them together. And in the process they will be creating gold nanoatoms. They will end up with a red solution and when salt is added, the solution turns grey because you are changing the particle size. “Students would then create gold nano particles instead of that white stuff that falls to the bottom of a test tube,” says Newberry. “They can then use the microscopes to measure and observe the gold atoms.” It is not alchemy, but students will still be making gold!

Physics: When students are studying velocity, the classic example they look at is the case of water flowing out of a garden hose. They are asked to calculate the water’s velocity and determine where it will fall. Teachers can add another step and ask student’s to observe the fluid flow if a straw was attached to the garden hose. In doing so, teachers can introduce students to the idea of fluid flowing through capillary tubes. “It’s not nanosized atoms, but it’s pretty darn close,” explains Newberry and has their minds thinking about fluid flow at microscopic levels.

Participation and hands-on opportunities are paramount in a stu-



dent’s learning and comprehension of the sciences. They are stimulated and challenged when they learn through action. Nanotechnology is perfect for classrooms because the core of its practice revolves around plenty of hands-on modules—easier said than done. Fortunately, those in the nanotechnology sector are committed to promoting the science to a broad cross-section of society including educators.

A nanofabrication machine, an important tool in nanoscience, typically requires a clean room for operation,

that “can easily cost \$80-100 million to build and maintain. Who can afford that?” laments Hart. “We need to find a way to place tools in the classroom,” which is precisely why NanoInk has developed the NanoProfessor Suite. It is a suite of equipment and curriculum designed for high school and does not require a clean room. Everything you need to begin teaching nanoscience comes in the package. The NanoProfessor arrives with three pieces of equipment: The NLP 2000, a desktop nanofabrication machine; an Atomic Force Microscope that images solid material; and a Fluorescence Microscope that images biologic material like DNA, viruses, and bacteria. Also included is a supporting in-depth textbook; all the materials necessary to conduct labs; teaching aides including assessments, rubrics, guides, and lecture presentations; notes; and most importantly, training for the equipment, curriculum, and labs. The only thing missing is you.

Nanotechnology’s progress has been hindered by the lack of sophisticated equipment, but soon after new machines were developed, scientists immediately plunged into their specialties. Although nanoscience is still in its research phase, its applications have already stretched across consumer and manufacturing sectors and soon will appear in school boards. Nanotechnology is changing the face of science, the way we live, and the world in which we live. We are now able to improve machines and materials by making them stronger, faster, more efficient, and smaller. No industry will be unaltered. And for the first time, teachers are not an afterthought in the development of a new technology. As nanotechnology revolutionizes our society, nanoscientists do not want to leave educators behind in the Dark Ages. With the proper resources we can lead our students through the journey of this new realm of scientific inquiry and secure their spots on the ride through the Nano Age.

For more information, check out these links:

Dakota County Technical College www.dctc.edu

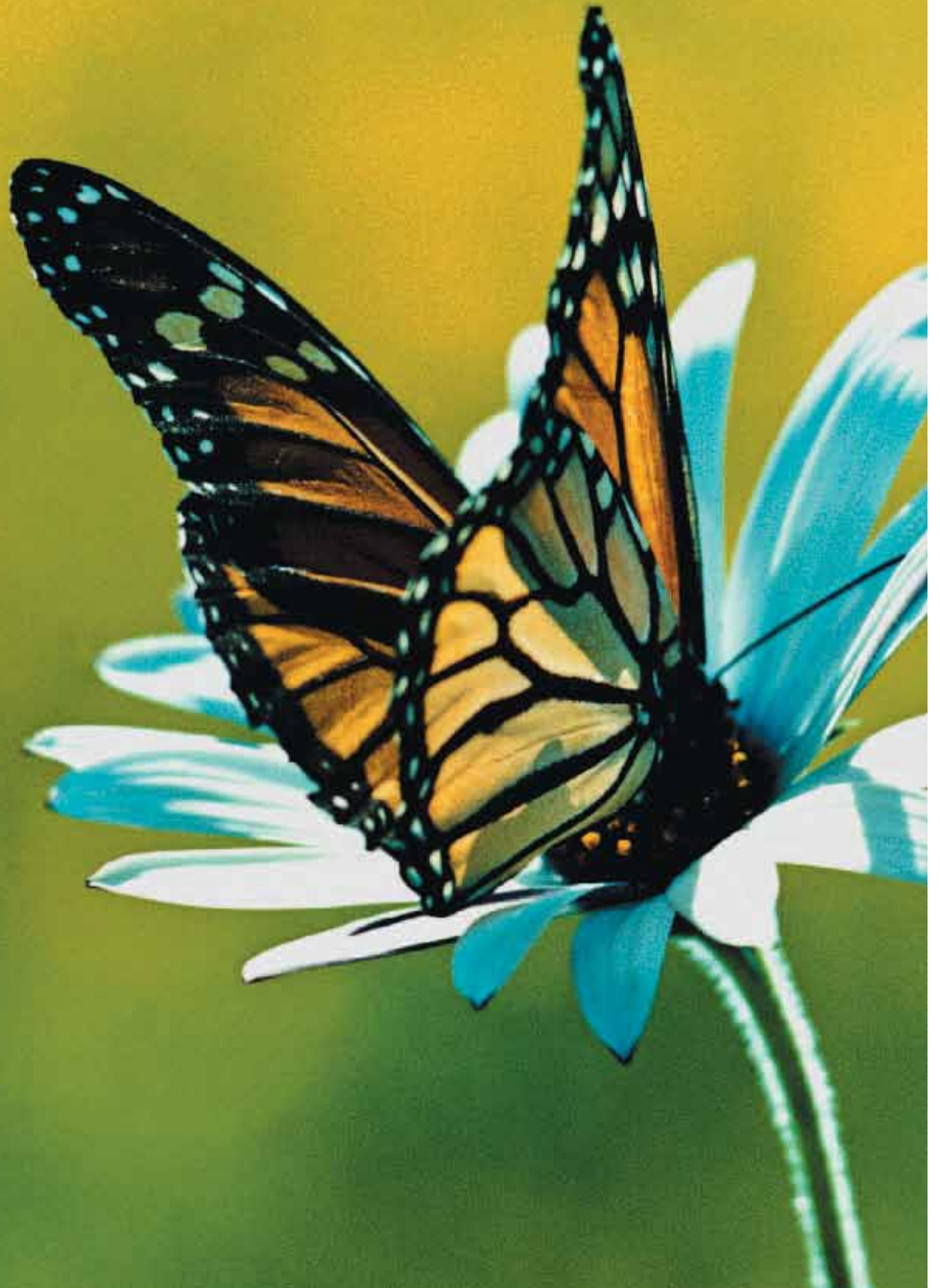
NanoProfessor www.nanoprofessor.net

NanoInk www.nanoink.net

We share the sky

We share the future

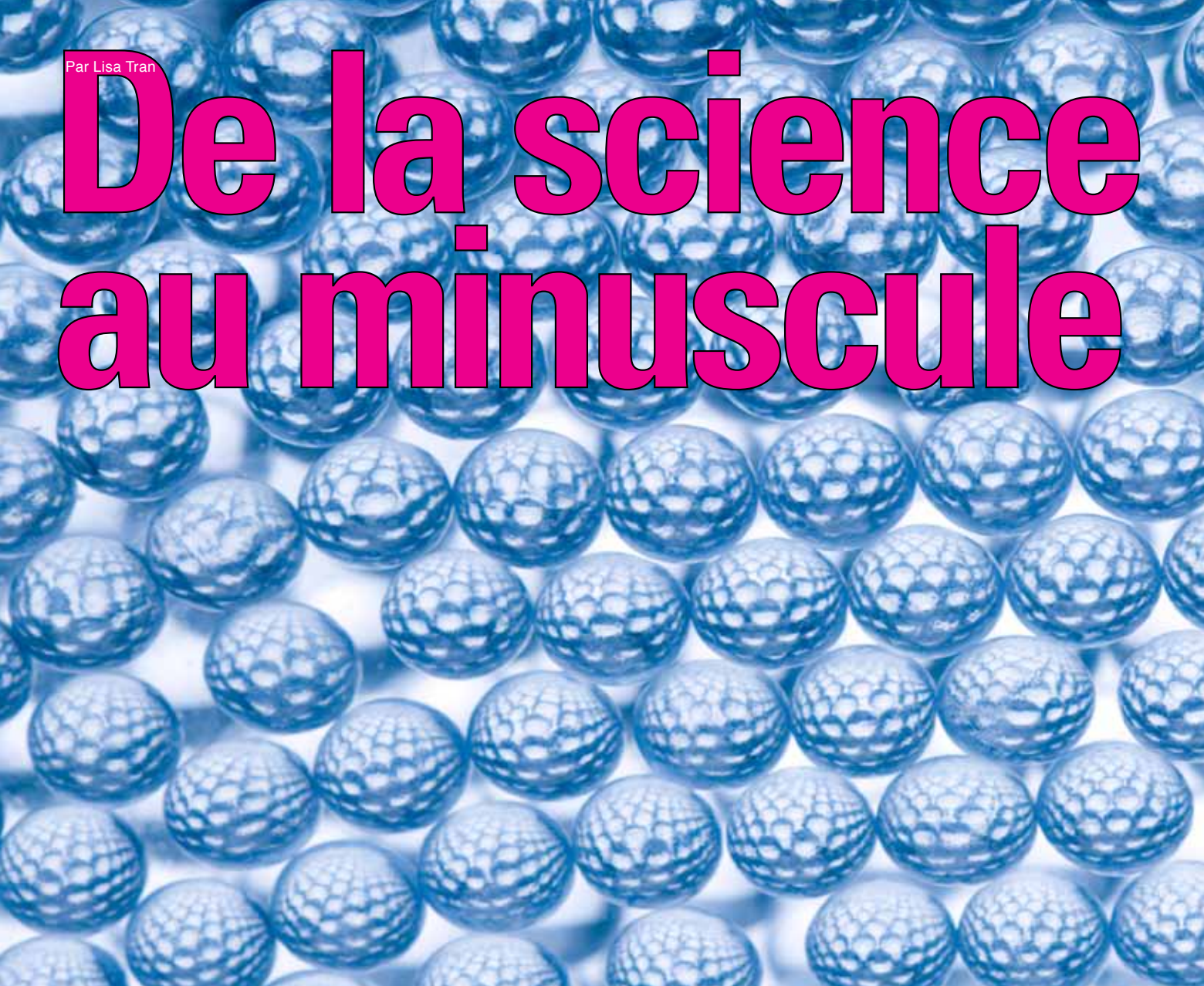
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De la science au minuscule



La nanotechnologie marque le début d'une nouvelle ère où, science dominante, elle s'imposera d'elle-même en classe.

Le « monde de la nanotechnologie », voilà une notion qui semble tout droit sortie de l'imagination des meilleurs écrivains de science-fiction. C'est un monde où les fenêtres se nettoient par elles-mêmes et où les matériaux sont plus durs que le diamant et plus forts que l'acier tout en étant beaucoup plus légers. Mais c'est un monde bel et bien réel que nous dévoile aujourd'hui Deb Newberry, physicienne nucléaire et nanotechnologue au Dakota County Technical College à Rosemount au Minnesota. Dans le livre dont elle est la coauteure, *The Next Big Thing Is Really Small: How Nanotechnology Will Change the Future of Your Business*, elle décrit la nanotechnologie comme « l'art et la science de la manipulation et de la restructuration des molécules et atomes pour créer des matériaux, des appareils et des systèmes efficaces ».

La nanotechnologie, ou nanoscience, s'appelle ainsi parce que les atomes et les molécules y sont minuscules, quelques nanomètres en fait, un nanomètre équivalant à un milliardième de mètre. Pour avoir une meilleure représentation, il suffit de comparer un cheveu humain avec les atomes de l'or. Un cheveu humain fait environ 7 000 nanomètres de largeur alors qu'il faut deux atomes d'or et demi pour obtenir un seul nanomètre. Si les atomes sont petits, la nanoscience fait, elle, dans le minuscule.

Tout scientifique assidu ne s'en tient pas qu'aux observations. En fait, les nanoscientifiques ont réussi à répliquer les structures atomiques de certains des matériaux les plus solides et les plus durables de la Terre et à les modifier pour former des structures particulièrement résistantes. De nombreux analystes extérieurs au milieu scientifique ont encensé la nanoscience et tout le potentiel qu'elle présente. Capitaliste de premier ordre, Steve Jurvetson de la société Draper, Fisher and Jurvetson croit que « la nanotechnologie est la prochaine vague technologique, le nec plus ultra de l'innovation scientifique qui révolutionne beaucoup d'industries et touche indirectement le tissu social. Les historiens de l'avenir considéreront l'ère à nos portes



comme aussi importante que l'a été la révolution industrielle. »

La population en général n'est pas épargnée par la vague nanotechnologique : des dizaines et des dizaines d'années d'expériences ont donné vie à des produits de tous les jours qui abondent maintenant en magasin. L'équipement sportif en est un bon exemple. Dans un sport comme le tennis, les raquettes plus solides propulsent la balle plus loin, mais les matériaux durs sont très lourds. Un joueur de tennis n'utiliserait jamais de raquette en acier dur à moins que son objectif soit de se déplacer le plus lentement possible tout en portant une raquette lourde mais robuste. À l'aide de la nanotechnologie, cependant, les scientifiques peuvent fabriquer des raquettes plus solides et plus légères que les raquettes traditionnelles grâce à des matériaux innovateurs comme les nanotubes de carbone.

Toujours dans les sports, les nanoscientifiques ont aussi créé des balles de tennis à meilleur rebond. Les fibres des balles sont réduites à des nanomètres et ajoutées au revêtement extérieur. Elles sont si petites qu'elles se tissent mieux entre elles que les fibres ordinaires. Les nouvelles balles de tennis ont maintenant une surface plus uniforme. Cette surface permet à l'air de mieux

contourner la balle et à la balle de rebondir plus longtemps.

De nombreuses applications nanotechnologiques ont été tout récemment incorporées dans la conception de produits cosmétiques. L'oxyde de zinc est par exemple l'ingrédient secret de la lotion solaire qui protège la peau des rayons ultraviolets du soleil. Les particules d'oxyde de zinc sont blanches, mais lorsqu'elles sont réduites à l'échelle nanométrique, elles deviennent transparentes. Nous pouvons maintenant nous procurer de la lotion solaire qui « n'a pas la même apparence que ce qu'on voit sur les sauveteurs, mais qui protège tout de même bien », précise Newberry sur un ton blagueur.

Étonnamment, la nanotechnologie peut même améliorer la qualité des aliments. « Je me souviens lorsque le yogourt faible en gras est arrivé sur le marché, lorsqu'il avait cette étrange texture liquide, dit Newberry. Le gras est un émulsifiant, il donne à la nourriture sa consistance lisse. » Donc, moins de gras équivaut à une texture plus rude. Pour remédier à la situation, les fabricants réduisent maintenant les particules de gras dans les produits faibles en gras. Les aliments restent donc faibles en gras, mais la nouvelle texture est plus lisse parce que le gras devient pratiquement invisible. Délicieux et nutritif.

La nanotechnologie est un milieu qui évolue sans cesse dans les grands laboratoires et les entreprises de fabrication. « Les découvertes sont incorporées dans des produits et des modes de fabrication et c'est ce qui créera une toute nouvelle catégorie d'emplois : les essais et l'assurance de la qualité dans les entreprises de fabrication », explique Newberry. Selon Dean Hart, de NanoInk, entreprise de nanotechnologie, la National Science Society estime qu'il faudra deux millions de nanotechnologues d'ici 2015.

« Actuellement, il n'y en a que 20 000 dans le monde. La situation est alarmante : il faut plus de spécialistes en peu de temps », mais nous pouvons commencer par former les prochains nanotechnologues en enseignant la science aux élèves assoiffés de connaissances.

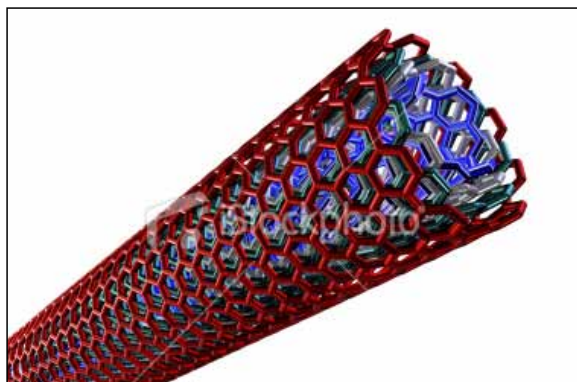
Dans la plupart des domaines scientifiques, la recherche est traditionnellement réservée aux instituts dont c'est la vocation. La nanoscience est différente en ce que les étudiants peuvent mener leur propre recherche et contribuer au bassin croissant de connaissances au moyen de leurs expériences. Les étudiants intéressés par la nanotechnologie ont potentiellement la chance de faire carrière dans ce qui les passionne. Les étudiants en nanoscience peuvent commencer à se spécialiser aussi tôt qu'à l'école secondaire. Pour le milieu de l'éducation, c'est certes l'intérêt durable pour la science, la technologie, le génie et les mathématiques que suscite la nanotechnologie chez les jeunes qui demeure le plus grand avantage.

L'enseignement de la nanoscience est souvent excessivement complexe, mais nul besoin actuellement de créer un tout nouveau cours. Newberry suggère qu'« on étoffe ou modifie légèrement les plans de cours pour y inclure les concepts de nanotechnologie. » Elle a acquis de l'expérience dans l'enseignement de la nanotechnologie à des jeunes lors d'un camp d'été annuel pour les élèves du secondaire au Dakota County Technical College.

L'incorporation de la nanotechnologie aux programmes scolaires en sciences peut être relativement simple comme en témoignent les exemples ci-dessous.

Chimie

Si vous faites un laboratoire où on fait bouillir et mélange des substances pour former des précipités, il suffit d'ajouter une étape à l'expérience. Pas besoin d'en créer une autre! Il suffit de remplacer les produits chimiques par d'autres tout aussi faciles à obtenir. Les élèves peuvent alors choisir une solution qui contient déjà de l'or, séparer les atomes d'or et les regrouper. Ils créeront alors des nanoatomes d'or et obtiendront au final une solution rouge qui, lorsqu'on y ajoute du sel, devient grise parce qu'on change la taille des particules. « Les élèves créeraient ainsi des nanoparticules d'or au lieu de cette matière blanchâtre qui s'accumule au fond d'une éprouvette, explique Newberry. À l'aide d'un microscope, ils observeront le résultat et comprendront qu'ils ont fabriqué de l'or sans faire d'alchimie! »



Physique

Lorsque les élèves étudient la vitesse, l'exemple classique est celui de l'eau qui coule d'un tuyau de jardin. Ils doivent alors calculer la vitesse de l'eau et déterminer où tombera le jet. Les enseignants ont la possibilité d'ajouter une autre étape et de demander aux élèves d'observer le mouvement du fluide si on attachait une paille au tuyau. Ainsi, on montre aux élèves la notion de circulation de fluides dans des tubes capillaires. « Ce ne sont pas des atomes de taille nanométriques, mais c'est tout comme »,

explique Newberry. Les élèves réfléchissent ainsi au mouvement des fluides à une échelle microscopique.

Les possibilités de mise en pratique abondent dans le processus d'apprentissage d'un élève en sciences. En effet, les élèves sont stimulés lorsqu'ils sont actifs dans leur apprentissage. La nanotechnologie est donc idéale en classe parce que ses applications sont nombreuses, mais c'est là chose plus facile à dire qu'à faire. Heureusement, ceux qui évoluent dans le milieu de la nanotechnologie veulent faire connaître leur science à un large public, y compris le milieu de l'éducation.

La nanomachine, un outil important de la nanoscience, exige habituellement une salle blanche pour bien fonctionner, une salle qui « peut facilement coûter de 80 à 100 millions de dollars à construire et à entretenir. Qui peut se le permettre?, se plaint Hart. Nous devons trouver un moyen d'introduire des outils dans les salles de classe. » Et c'est exactement pour cette raison que NanoInk a conçu la NanoProfessor Suite. C'est à la fois un équipement et un programme scolaire pour les écoles secondaires sans nécessité de salle blanche. Tout ce dont on a besoin pour enseigner la nanoscience se trouve dans la trousse : le NLP 2000, une nanomachine de table; un microscope de force atomique qui permet de voir les matériaux solides et un microscope à fluorescence qui permet de voir les matières biologiques comme l'ADN, les virus et les bactéries. On y trouve aussi un manuel complet; tout le matériel nécessaire pour mener des expériences en laboratoire; des ressources didactiques comme des évaluations, des stades de progrès, des guides et des présentations; des notes et, le plus important, des explications sur l'équipement, le programme scolaire et les laboratoires. Tout ce qui manque, c'est vous.

Les progrès de la nanotechnologie ont été minés par le manque d'équipement à la fine pointe, mais dès que de nouvelles machines ont été mises au point, les scientifiques se sont mis immédiatement à la tâche dans leur spécialité respective. Bien que la nanoscience en soit encore au stade de recherche, ses applications ont eu des effets concrets pour les consommateurs et les entreprises de fabrication, et les conseils scolaires devraient bientôt emboîter le pas. La nanotechnologie modifie le visage de la science, la manière dont nous vivons et le monde dans lequel nous vivons. Nous sommes maintenant capables d'améliorer nos machines et nos matériaux en les rendant plus robustes, plus rapides, plus efficaces et plus petits. Aucun secteur d'activité n'y échappera. Et pour la première fois, les enseignants ne seront pas les grands oubliés.

CURRICULA

LESSON 1: MULTICULTURALISM AND CANADA'S NORTH



Introduction:

The goal is for students to reflect on their understanding of multiculturalism and learn how it connects to Canada's North, including Canada's sovereignty in the north. Students will explore the role of the Inuit and Aboriginal peoples as stewards of Canada's north and share ways to support and enhance this role. By participating in this activity, students will research to learn more about the culture of these fellow Canadians. They will gain a better understanding of how they have been the traditional stewards of Canada's North and reflect on whether they may be best equipped to continue as the stewards of Canada's North.

Project North Graphic Novel: Canadian Sovereignty in the Arctic is structured in sections to mirror the themes and issues in the four lessons. It follows the progress of Alex and ZaZi as they work to help their country by finding a solution to protecting Canada's sovereignty in the North. They are discovering information and putting together a white paper to submit to an online summit on Sovereignty in Canada's North. As students in class complete a challenge, pages of the graphic novel are then 'unlocked' so students can follow along with the story. Familiarize yourself with the graphic novel before beginning the lessons with the students. Assign the relevant pages as they explore each lesson.

Materials Required:

computers with Internet access detailed map of Canada's North: <http://maps.nationalgeographic.com/maps/atlas/north-america-geophysical.html>
writing paper and utensils

Key Concepts and Issues:

Students will explore the concept of multiculturalism and how it connects to issues surrounding Canada's North.

Subjects:

Multiculturalism and Canada's North

Grade Level:

Grades 9 to 12

Duration:

5 to 8 classes

Curriculum Links:

Social Studies, World History
World Geography

Expectations/Outcomes:**Students will:**

- increase their knowledge of Canadian history and geography
- analyze major issues involving the rights, responsibilities, roles, and status of individual citizens and groups in a local, national and global context
- explain, analyze, and compare the effectiveness of various methods of influencing public policy
- explore the concept of protecting Canadian identity and sovereignty
- examine one or more aspects of multiculturalism in the Canadian context

Background

The concept of sovereignty is an evolving one. It has traditionally focused on the rights of a country to control a territory (the land and its inhabitants) legitimately without interference from other countries. Now, instead of focusing on rights, sovereignty is being considered in terms of responsibilities, especially the responsibility of a country to protect, and have authority over, its territory and to be perceived as protecting it and having authority over it. Sovereignty is also thought to include stewardship over the territory.

For thousands of years, Canada's North has been home to Inuit and Aboriginal peoples. Their unique culture, one of many within Canada, is a reflection of their northern environment and their close relationship with the land.

"The concept of the land included not just the earth itself, but all of nature: plants, animals, water, ice, wind and sky. Nature and Inuit are one. They have depended on each other for centuries and any and any change or alteration to just one aspect can unbalance the whole."
– Innuuqatigitt curriculum, page 31

While climate change in the North is affecting the way of the Inuit people in a detrimental way, it is also drawing international attention to the North as a possible North-West passage is emerging. Thus, what is detrimental to the culture and even survival of the Inuit may be of economic benefit to others.

Step One: Teacher-Led Discussion

Begin with a general discussion about multiculturalism and what it means. Explain that Canada has an official policy of multiculturalism. It was announced in 1971; it acknowledged the diversity within the country and it encouraged cultural pluralism, instead of assimilation. It suggested the Canadian identity was based on an acceptance of ethnic difference. In 1982, multiculturalism was mentioned in section 27 of the Canadian Charter of Rights and Freedoms. It states: "This Charter shall be interpreted in a manner consistent with the preservation and enhancement of the multicultural heritage of Canadians."

Remind students that Canada is a land of immigrants, and that people have been coming to live in Canada for hundreds of years. Draw their attention to a map of Canada and indicate the Arctic regions. Ask the students who were the first inhabitants of this land. Discuss the word Inuit, and tell students it means "the people." Ask them to share anything they already know about the Inuit, their culture, their daily lives, their traditional system of governance, and their contemporary way of life.

Step Two

Tell students that Canada's North, ancestral home of the Inuit, has become an area of interest to many countries. They are eyeing its natural resources (uranium, natural gas, diamonds) with interest and, as global warming is causing the northern ice to melt, they are becoming interested in the possibility of a North West passage through the area. They are challenging whether this land, and its people, are actually within Canada's political sphere. (The students will learn more about this in Lesson 2.) Explain that the four of the lessons in this program will be investigating different aspects of this issue.

Also, explain to students that, throughout these four lessons, they will be reading a graphic novel "Project North: Canadian Sovereignty in the Arctic." Have them read the first pages of the novel. As well as being introduced to the general concepts surrounding sovereignty issues in the North, they will gain an understanding that

- the North is home to the Inuit
- and the Inuit are vitally important to the region.

Step Three

Tell students that the focus of steps 3 and 4 of this lesson is on answering these questions:

- Are the Inuit uniquely equipped to be stewards of Canada's North and, if so, why?
- What does this mean to them, and to Canada?
- How does this influence the challenges to Canada's traditional role in the Arctic?
- How can you educate students within your school about the Inuit to help raise their profile as fellow Canadians and enhance their role as stewards of the North?

First, have the students define the word "steward" (one who protects or looks after nature, public property, or money; one who manages another's property or affairs). Have them look for the more recent definition of environmental "stewardship." (Environment Canada defines it as "being the act of entrusting the careful and responsible management of the environment and natural resources for the benefit of the general community.) Discuss reasons why Canada's North needs stewards.

Read them this excerpt from a speech called "Inuit and the Canadian Arctic: Sovereignty Begins at Home" made by Mary Simon (President of the Inuit Tapiriit Kanatami, which in English means "Inuit are united in Canada").

"The Arctic is in urgent need of attention by all Canadians and, indeed, by the world community. ... As leader of the national Inuit organization, I am determined to generate public interest and galvanize political attention on Arctic issues....

Canada is an "Arctic nation." The Arctic ... is a vital part of our country, and its peoples contribute to the cultural and social diversity that we value so dearly. ...

Together we must build robust and sustainable northern communities. A healthy, confident and prosperous Inuit population will create the foundation for keeping the Arctic firmly within Canada. ...

For us, the Inuit, it is our homeland – our special place on Earth. But for all Canadians, the Arctic must become part of our shared sense of who and what we are, of what defines us, and what we are accountable for – not just a remote region with beautiful icescapes and polar bears.

Part of that accountability is accepting that the Arctic is a place where people live, where families are raised, where problems need solving, and where resources exist that will continue to nurture human development, and help finance this wonderful place called Canada."

Discuss Mary Simon's comments, for example:

- Why might some people have difficulty accepting that the Arctic is a place where people live?
- What does she mean by "accountability"?
- Why do you think she mentions resources as a source of financing for the country?
- Why do you think her speech is called "Sovereignty Begins at Home"?

Think about Simon's biases and why she might hold these views. For example, how might it benefit her and the Inuit to generate public interest? Also, consider whether you think all Inuit share her views.

Now remind the students that the land has special meaning to the Inuit. They are connected to the land. It sustains them, and they feel a responsibility to care for it. Scientists believe climate change will be more pronounced in high latitudes. The change in temperatures is causing changes in the natural environment, for example, there is a longer sea-ice free season, there are more insects, more pronounced windstorms, and shorter snowmobile seasons over sea-ice.

Read this quote from Sheila Watt-Cloutier, President of Inuit Circumpolar Conference (Canada), speaking in Ottawa, in 2002:

"Inuit are not prepared to be seen, to be treated, or to act as powerless victims of external forces over which we have no control. In fact, Inuit are involved in every aspect of life that affects us, from the science to the policy, in the communities, in Canada, in the circumpolar Arctic, and globally. Unfortunately, the federal government seems to think our role is to adapt to climate change. But that is only part of our role. We intend to bring our concerns, interests, and perspectives, and those of the Arctic more broadly, to the attention of international decision-makers. We must give climate change in the Arctic a human face -- an Inuk face -- and we must show climate change negotiators that impacts in the Arctic foreshadow impacts around the globe. We want to do this in co-operation with the Government of Canada and other Arctic states."

With the students, discuss these questions:

- Are the Inuit particularly vulnerable to climate change, as a people, compared to other Canadians?
- How does climate change threaten the survival of the Inuit as a people?
- How does this connect to the role of the Inuit as stewards of the North?

Last, explain to them that one theory of sovereignty states that demonstrating use of the North gives legitimacy to a country's claim to the region. Read them the following quote:

"The Inuit have been using the Arctic for thousands of years. It's their historic use and occupancy of the sea-ice that provides the basis for Canada's claim in the Northwest Passage. It's they who have given us all that they have, in pursuit of a quintessentially Canadian dream." – Michael Byers and Jack Layton, in "How to Strengthen Our Arctic Sovereignty" in The Tyee, Sept 2007



Have the students gather in small groups and tell them they are now going to synthesize the information they have just been exploring as they work to answer these questions:

- Are the Inuit uniquely equipped to be stewards of Canada's North and, if so, why? Has the policy of multiculturalism played a part in this, and if so, how?
- What might it mean for the Inuit themselves to be considered "Canada's stewards of the North"?
- How might demonstrating that the Inuit are Canada's stewards of the North influence the challenges to Canada's claims to Northern lands?

Allow the students time to do individual research, seeking out, in particular, Inuit perspectives on all these questions, and then write responses. Have each group do a brief oral presentation of their answers to the class.

Step Four

Remind the students that the Inuit had no written history until recently; they have a tradition of oral history, passing down stories, information, and wisdom through stories and narrative. Tell them they will create a presentation for students at school that includes an oral element and addresses this final question:

- How can you educate students within your school about the Inuit in order to raise their profile as fellow Canadians and enhance their role as stewards of the North?

Encourage them to brainstorm suggestions, such as hosting an assembly, putting on a play for students, doing presentations in each classroom, and so on.

With your assistance, have the students discuss and then choose one idea. Give them time to set a goal for themselves, to formalize the idea into a plan, and to create an agenda (or a step by step process) for accomplishing the plan and assigning duties. During the discussion, help focus their thinking by asking, Do you think this will educate students within your school about the Inuit in order to raise their profile as fellow Canadians and enhance their role as stewards of the North?

Allow students time to research for their presentation. Guide them toward sources that convey a breadth of information of the Inuit past and present, including online newspaper articles, reports of circumpolar summits, and the website of the Inuit Tapiriit Kanatami. Remind them that they will need to educate other students on the concept of stewardship and offer evidence that the Inuit are "stewards of the North." They will need to briefly describe Canada's traditional political role in the North and how it is currently being challenged. Encourage them to relay Inuit points-of-view, using their own words directly, whenever possible.

Help make arrangements for them to visit other classrooms or host other classrooms in a specified location.

Step Five

When the scheduled day(s) for the presentation arrives, provide help as needed for the students.

Step Six

Discuss as a class the results of the presentation. Help the students evaluate the process they created, and establish whether their final goals were met, and how they know. Have them think about what they might do differently next time.



Optional Extension Activities:

- In her Globe and Mail article, Marie Wadden writes: “How can Canada claim to “own” the Arctic when it can’t provide adequate housing, health care and schooling for our Inuit, who number only in the tens of thousands (about 40 000 in the Arctic) but live in 26 communities stretched out over more than 4000 kilometres, from Nunatsiavut on the Labrador Sea to the Inuvialuit homeland of the western Arctic. Instead of soldiers “guarding” our Arctic borders, we should have Inuit citizens who feel truly a part of this country, who are respected and given the necessary tools to succeed in the 21st century. ... Let’s stop funding Canadian Arctic sovereignty and, instead, fund Inuit Arctic sovereignty. If we’re lucky and do the right thing, they may let us call them ‘Canadian Inuit’.” Explain how you think Wadden’s view is different than, or similar to, Simon’s view. Write a short first-person narrative from the perspective of someone who believes Canada may be trying to take advantage of the Inuit people in order to keep the North.

- There may be people who still believe that all Inuit live in permanent igloos and hunt by dog sled. Have students create a poster showing two contemporary scenes: one of an Inuit family living on the land in a traditional lifestyle, and one of an Inuit family living in the city of Iqaluit in a modern lifestyle. They can add a heading for each scene, captions, and title the poster: Inuit Myth Buster!

- “I used to be able to predict the weather, but now I often get it wrong.”
– Akumalik, 73, Arctic Bay, Nunavut, through translator

Pose the question again: In what ways are the two issues -- climate change in the North and difference of opinion about Northern sovereignty – connected? Interested students can do further research to learn about climate change in the North, in particular, its effects on the Inuit peoples. Have them look for personal Inuit accounts of changes to the northern ecosystem, as well as evidence as to who is trying to solve this problem and whether the experience and knowledge of the Inuit people is being taken into account.

- Students can research to find all the countries where Inuit traditionally live. Have them mark these locations on a world map. Then have them look up, and read, A Circumpolar Inuit Declaration on Sovereignty in the North. Have them discuss, in partners, section 1: Inuit and the Arctic. (They will look more closely at the rest of the document in Lesson 2.) Ask them to think about why the Inuit felt it necessary to convene and create these statements.

Assessment and Evaluation rubrics:

Rubric - General

Discussion

Level 1—Did not participate or contribute to the teacher-directed discussions

Level 2—Participated somewhat in the teacher-directed discussions

Level 3—Active participation in the teacher-directed discussions

Level 4—Made a significant contribution to the teacher-directed discussions

Content

Level 1—Demonstrated limited understanding of concepts, facts and terms

Level 2—Demonstrated some understanding of concepts, facts and terms

Level 3—Demonstrated considerable understanding of concepts, facts and terms

Level 4—Demonstrated thorough understanding of concepts, facts and terms

**Written Work**

Level 1—Written report had many grammatical errors, is poorly structured and confusing

Level 2—Written report was generally clear but has numerous grammatical errors

Level 3—Written report was well-structured and clear but has a few significant errors

Level 4—Written report was very clear, well-organized with few errors

Oral Presentation

Level 1—Oral report was confusing, lacked emphasis and energy with no discussion resulting

Level 2—Oral report was clear but lacked energy and emphasis with little discussion resulting

Level 3—Oral report was clear and vibrantly presented but lacked some emphasis and energy with a good discussion resulting

Level 4—Oral report was clear and enthusiastically presented with energetic discussion resulting

Team Work

Level 1—1 or 2 members dominated the team, very little cooperation

Level 2—Majority of the group made a contribution with some recognition of individual strengths but cooperation was superficial

Level 3—Most members made a significant contribution with a good level of cooperation

Level 4—All members made a significant contribution, individual strengths were recognized and used effectively, excellent cooperation among group members

Specific**Step One**

Student has a poor understanding of multiculturalism

Student has a basic understanding of multiculturalism

Student has a good understanding of multiculturalism

Student has an exemplary understanding of multiculturalism

Step Two

Student poorly communicated a summary to a partner
 Student adequately communicated a summary to a partner
 Student communicated a summary to a partner well
 Student communicated a summary to a partner in an exemplary manner

Step Three

Student has a poor understanding of the concept of Inuit stewardship
 Student has a basic understanding of the concept of Inuit stewardship
 Student has a good understanding of the concept of Inuit stewardship
 Student has an exemplary understanding of the concept of Inuit stewardship

Step Four

Student exhibited poor participation in the planning of the presentation
 Student exhibited basic poor participation in the planning of the presentation
 Student exhibited good participation in the planning of the presentation
 Student exhibited exemplary participation in the planning of the presentation

Step Five

Student exhibited poor participation in the class presentation
 Student exhibited basic participation in the class presentation
 Student exhibited good participation in the class presentation
 Student exhibited exemplary participation in the class presentation

Step Six

Student demonstrated a poor ability to evaluate the presentation
 Student demonstrated a basic ability to evaluate the presentation
 Student demonstrated a good ability to evaluate the presentation
 Student demonstrated an exemplary ability to evaluate the presentation

Resources:

Diversity Watch (info about Inuit): <http://www.diversitywatch.ryerson.ca/backgrounds/inuit.htm>

The Curriculum from the Inuit Perspective : Inuuqatigitt curriculum http://www.ece.gov.nt.ca/Divisions/kindergarten_g12/curriculum/curriculum_Services/INUUQATIGIIT%20Curriculum/INUUQATIGIIT.pdf

<http://www.stewardshipcanada.ca/>

Mary Simon's Speech: "Inuit and the Canadian Arctic: Sovereignty Begins at Home" http://www.tvos.org/theagenda/resources/pdf/MarySimonSpeech10_2A1370.pdf

A Circumpolar Inuit Declaration on Sovereignty in the North: Go to <http://www.itk.ca/publications/circumpolar-declaration-sovereignty-arctic> and click on the attachment

Inuit Tapiriit Kanatami:
www.itk.ca

Unikkaaqatigiit: Putting the Human Face on Climate Change -- Perspectives from Inuit in Canada:
<http://www.itk.ca/publications/canadian-inuit-perspectives-climate-change-unikkaaqatigiit>

climate change and the Inuit: <http://www.canada.com/vancouversun/story.html?id=50c89709-aa8f-4da9-bef8-27e051d2cfc8&k=26596>

FIELD TRIPS : what's on

Welcome to the latest installment of Field Trips: What's on. This issue's spotlight subject is dramatic arts. Somewhere between education and participation, entertainment can often be a forgotten factor in coordinating a classroom field trip. An excursion for your next dramatic arts lesson is the perfect opportunity to present students with an experience that is filled with both learning and excitement. Theatres for young people are promising with its flexible academic applications and reasonable ticket prices.

Teachers can first build anticipation for their students by arranging for the theatre to visit them. Many theatres run an in-school program that can complement a field trip or act as a substitute for one. A visit from the theatre will help prepare students for the show, which is ideal for younger students who may be attending a performance for the first time.

After the show, almost all theatres offer dynamic workshops, many of which are included in the cost of the ticket. Workshops can include behind-the-scenes tours where students can explore the stage area and equipment and view the props and costumes up close. Other complimentary workshops can include a Q&A session with the actors or producers of the show. Teachers can also request additional workshops for their students that are designed specifically for that class' grade level and learning style. Once the final curtain has drawn and students are back in the classroom, teachers can encourage them to share their experiences by using the resources provided by the theatre.

Consider your local theatre for young people as your upcoming dramatic arts field trip. Involve the entire school and view the show together. Afterward students will separate into grade appropriate workshops and groups, ensuring that the educational and entertainment components are met.

Field Trip Opportunities:

Calgary Young People's Theatre

Box 65067
North Hill PO
Calgary, Alberta
T2N 4T6
Telephone: (403) 230-2664
Fax: (403) 230-2669
Email: cyp@cyp.ca
Website: www.cyp.ca

Carousel Theatre

1411 Cartwright Street
Vancouver, British Columbia
V6H 3R7
Carousel Theatre is located on
Granville Island in Vancouver.
Phone: (604) 669-3410
Toll Free: 1-877-722-8449
Fax: (604) 669-3817
Email: info@carouseltheatre.ca
Website: www.carouseltheatre.ca

Lorraine Kimsa Theatre for Young People

165 Front Street East
Toronto, Ontario
M5A 3Z4
Telephone: (416) 363-5131
Fax: (416) 363-5136
Email: online@lktyp.ca
Website: <http://www.lktyp.ca>

Manitoba Theatre for Young People

#2 Folks Market Road
Winnipeg, Manitoba
R3C 4X1
School sales: (204) 947-0394 Ext 228
Toll-free in Manitoba: 1-877-871-MTYP (6897)
Fax: (204) 943-4129
Website: www.mtyp.ca

TEACH Magazine welcomes you to the 17th Annual Technology Supplement. This year we introduce you to some of the latest technologies for your classroom – from digital learning tools for students to online management systems to help keep you organized. We hope you find our choices useful and remember to inquire about educational pricing. Please note: our reviews are not meant as endorsements.

HARDWARE

Epson BrightLink 450Wi

<http://epson.ca>



The Epson BrightLink 450Wi is an interactive projector that turns any standard whiteboard or smooth wall into an interactive learning area. This classroom tool is a cost-effective way for educators to integrate interactive capabilities without purchasing dedicated interactive whiteboards.

The BrightLink 450Wi allows networked presentations so that educators can include several classrooms in one lesson. The projector is also compatible with virtually any interactive software program. The BrightLink 450Wi features size flexibility. Educators select the size to match and maximize available space. Epson's new projector also features built-in closed captioning that makes presentations accessible to viewers with hearing impairments. The project also features "USB Plug 'n Play" that projects images from a Windows PC or Mac computer via a USB connection. Last, the BrightLink 450Wi has speaker and microphone input that allows teachers to use a microphone to amplify voice using the internal speaker.

Interwrite Mobi System

<http://einstruction.com>



The Interwrite Mobi and Interwrite Mobi System is an interactive whiteboard system tablet designed to support student-centered, collaborative learning. Teachers and students can concurrently interact with and contribute to the same digital content. The tablet features a Kwik Screen, a 2.4" color LCD display, which instantly reports student responses when used with eInstruction's Classroom Performance System.

The Interwrite Mobi system has wireless connectivity and works with existing computers and projectors. Each includes one tablet for instructors, two tablets for students, a charging dock and security station, and Interwrite Workspace software. The tablets are light weight in design and ergonomic and up to nine tablets can work together simultaneously. Single InterWrite Mobis can be charged by connecting to a computer using a USB cable.

The Interwrite Mobi System can be used with Examview and Interwriteworkspace to access lesson materials from virtually any source and publishers' content from more than 6000 textbooks.

SAMCAM 860

<http://samcam860.com>



The SAMCAM 860 is a new document camera with high-end features that is affordable.

Features of the SAMCAM 860 include: optical Image with 1.4 megapixel resolution, larger aperture lens that provides a total of 48x zoom with 6x optical zoom plus 8x digital zoom, video and image recording, SD memory card – up to 32GB, built-in microphone with optional microphone jack, built-in LED lamp, microscope adapter and macro setting, can be used with virtually any whiteboard. The SAMCAM 860 can be used as a web cam that connects directly to applications such as Windows Moviemaker, and GradeCam. SAMCAM 860 is PC and Mac compatible and comes with a remote control.

SOFTWARE

LS2 Kids

<http://www.tlcdelivers.com>



LS2 Kids is a child-friendly portal and search software designed specifically for young library users who are technologically proficient.

Children can find books in a series more easily with a predefined list of popular titles like "Harry Potter," "Junie B. Jones," and "The Magic School Bus." There is an interactive title display that allows users to view book covers in a full screen mode and find detailed information about their selections. A category wheel offers dozens of subject areas ranging from math and reading to baseball, cats, and scary stories. Last, a search box provides spelling suggestions and corrections when needed.

TeachSmart Basic Math

<http://teachsmart.org>



TeachSmart Basic Math provides math solutions for teachers, individual students, small groups, and entire classes. Each lesson is entirely presented on video by an experienced, award-winning teacher. There are 290 questions and tutorial video clips. Video elements are chosen from a table of contents consisting of 35 lessons arranged in 5 chapters. After viewing the video lesson content, students are prompted to answer a group of about eight questions. Each question is supported by video content illustrating the correct response. A management module allows teachers to review student progress based on a single module, or cumulatively over a specified time period. The chapters include: Whole Numbers, Business and Consumer Applications, Ratios, Proportions and Percents, and Decimals.

Tool Factory Assessing for Disabilities Bundle

www.toolfactory.com

Tool Factory's Assessing for Disabilities Bundle includes a number of programs for students experiencing a variety of disabilities, us-



ing researched-based norms. The bundle includes assessments in reading, math, emotions, and sensory awareness across a full range of ability levels. Educators can assess students' level of Dyscalculia, or Dyslexia. A student's range of emotional awareness can also be determined with Emotional Literacy Screener. Assess whether students understanding their own emotions, and how those emotions affect others. Finally, educators can test a student's perception of their sensory environment using the Snoezelen sensory screener. Additional printed resources are provided for teachers. The bundle includes: Dyscalculia Guide Book, Dyslexia Screener, Dyscalculia Screener, Emotional Literacy Screener Ages 7-11, Emotional Literacy Screener Ages 11-16, and Sensory Screener.

WEB

EtherPad

<http://www.etherpad.com>

EtherPad is a web-based word processor that allows people to work together in real-time. When multiple users edit the same document simultaneously, all the changes are instantly shown on everyone's screen. EtherPad makes it easy to collaborate on text documents. Some of the features include: colour-coded edits by authors and an infinite undo history where all changes are saved on the server and can be undone at any time.

it's learning

<http://www.itslearning.net>

it's learning, is a subscription-based program that is used for preparing, presenting and managing both face-to-face and online instruction and student interaction. It comes with a full suite of multimedia and Web 2.0 tools including, student blogs, custom-designed e-portfolios, user-created personal web pages, and cus-

tom-created online identities and profiles.

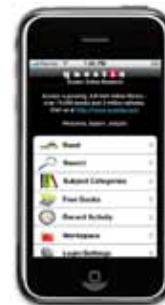
Teachers can also use it's learning to organize their lesson plans and task. it's learning also features auto-corrected tests and peer and self-assessments. Teachers can also adapt teaching to the varying needs of learners through formative assessment and individual learning plans and paths.

Administrators can use it's learning to connect everyone within the organization and increase teacher and faculty collaboration. Adapt to meet needs of learning at all levels with differing interfaces for early learners, middle school, and older students or adults

it's learning also acts as a technology manager. Users can easily set up and administer their own students, courses, and content in a secure, streamlined environment. The software also provides automatically generated reports that quickly and comprehensively show group and individual progress tracking.

Questia Online Library

<http://questia.com>



Questia is the first online library to provide 24/7 access to the world's largest online collection of books and journal articles in the humanities and social sciences, plus magazine and newspaper articles.

Users can search each and every word of all of the books and journal articles in the collection. They can also read every title cover to cover. The selected materials are made by professional collection development librarians and are not available elsewhere on the Internet. Users have unlimited access to the books and articles in the collection no matter how many others are reading the same materials

Questia also offers a range of search, note-taking, and writing tools. These

tools help students locate the most relevant information on their topics quickly, quote and cite correctly, and create properly formatted footnotes and bibliographies automatically. Questia now has an iPhone app that can put the library into any student's pocket.

Skoolee

<http://skoolee.com>



Skoolee is a suite of web-based school management systems for educators. Skoolee's management system allows you to spend less time on administrative tasks. Some of Skoolee's features include: a scheduler where users can view by teaching hours or extra-curricular activities. A course and lesson planning feature allows teachers to build and upload lesson plans for different courses and classes. An assignment manager

that can publish daily assignments in one click in an "agenda" for all students. Users can also analyze student performance through generated reports; viewing grades by assignment or exam, by term course and throughout terms; drop lowest grades; and take one-click attendance. Skoolee can also be used to communicate with parents or guardians, director or principals regarding student performance.

Sylvan Dell eBooks

<http://www.sylvandellpublishing.com>



Sylvan Dell Publishing offers eBook formats for all of their hardcover and paperback titles. The eBooks are accessed online and feature: auto-flip, auto-read, 3D page flipping, and selectable English and Spanish text and audio. The eBooks can also be viewed using smart-board technology or projectors. Every eBook comes with supplementary activities

called the "For Creative Minds" section, found at the end of each book. Additionally, Sylvan Dell's website offers teaching activities that can be accessed for free. A one-year site license provides unlimited access to all Sylvan Dell eBooks. The license can be used on all school computers and can be shared with parents to access the eBooks at home. Site licenses are available for school and district-wide purchase with small school, multi-school, and multi-year discounts. Personal eLibraries for individual teachers, who want access to all Sylvan Dell eBooks for one year, are \$49.95 USD. Schools can purchase a license for one year to be used on all of their computers in libraries and classrooms for \$599 USD. A single eBook for an individual for life is \$11.95 USD. Additionally, Sylvan Dell provides numerous grants to schools that allow unlimited access to the eBooks for one year.

TEACH
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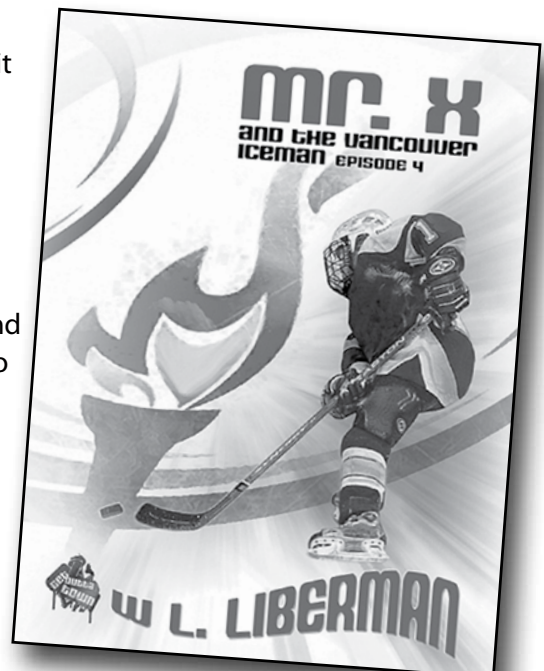
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