

EDUCATION MATTERS



Kindergarten Dinosaurs and Rocks: An Example of Integrating a Field-tested Lesson Plan for Geoscientists into the Alberta Curriculum

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SUMMARY

Professional geoscientists have to make many presentations to colleagues, engineers, executives and accountants. However, panic is often felt when a note comes home from a child's educator looking for parents to help in teaching elementary school students. For the teacher, this is a chance to integrate many core subjects from the curriculum with the special and exciting resources available to geoscientists. This paper presents guidelines developed over time, and includes an understanding of how children learn and ask questions, the

pace of the talk, and what children need to learn. In addition, data sources and gateways available to geoscientists have been included. While the premise outlined in the paper is applicable across Canada, it is based on the Alberta curriculum requirements. With these suggestions, the classroom experience is really no different than presenting to senior management, although you have to remember that your audience is shorter and does not drive a big BMW or Lexus.

RÉSUMÉ

Les géoscientifiques ont souvent à faire des exposés à des collègues, des ingénieurs, des dirigeants et des comptables. Cela dit, il arrive souvent qu'un sentiment de panique s'empare d'eux lorsqu'ils reçoivent une note des enseignants du primaire aux parents faisant appel aux compétences professionnelles des parents. Les enseignants y voient là une occasion de lier les thèmes du programme d'enseignement aux ressources fantastiques dont disposent les géoscientifiques. Le présent article présente les lignes directrices qui ont été validées avec le temps et décrit les modes d'apprentissage des enfants, leurs manières de poser des questions, le rythme particulier de présentation, ainsi que ce qu'ils ont besoin d'apprendre. L'article comporte aussi des références à des sources et des passerelles de données que les géoscientifiques peuvent consulter. Les principes de base présentés dans cet article peuvent s'appliquer partout à travers le pays, simplement, on les a appliqués aux exigences particulières du programme scolaire de l'Alberta. En tenant compte des suggestions offertes, on se rendra compte qu'une classe d'école n'est pas différente d'une d'un auditoire de gestionnaires; il faut simplement se souvenir que les

membres de l'auditoire sont plus courts et ne conduisent pas des BM ou des Lexus.

INTRODUCTION

Many geoscientists have sometime in their career mentioned that at university they enjoyed presenting the "Rocks for Jocks", or similar course, to first year non-majors. If this falls within earshot of a schoolteacher, the question of a classroom presentation will invariably arise. This paper discusses the integration of a geoscience presentation with the Alberta kindergarten curriculum (also applicable to the Alberta Grade 3/4 curriculum), outlines the audience and teaching assistance needed, and discusses some of the challenges of presenting to young children. While the presentations have been made by petroleum geoscientists to Alberta students, the authors contend that the lesson plan can be integrated, with suitable modification, into schools across Canada.

A KINDERGARTEN TEACHER'S PERSPECTIVE

Why Dinosaurs and Rocks?

The beauty of the Alberta kindergarten curriculum is that it can co-ordinate the student's learning around themes that capture the interest of 4 and 5 year-old students in the classroom. A kindergarten teacher wants children to become life-long learners with a passion to come to school each day; using "Dinosaurs and Rocks" as a theme is one way to do this. It is an excellent opportunity for the active, hands-on learning that kindergarten children need. Each year in September, students brainstorm about their interests and what they want to learn. Of course, there are topics that must be covered, but "Dinosaurs and Rocks" seem to have universal appeal for both sexes, and it is exciting to have

the flexibility to include this topic as one of the monthly themes during the school year. In addition, Alberta is world-renowned for access to dinosaurs, fossils and rocks due to the proximity of the Royal Tyrrell Museum and the oil industry. Unfortunately, though, some students only study dinosaurs in kindergarten and there are many young students, who may want to become paleontologists, but never get a chance to study fossils in school.

Kindergarten Curriculum Links

In planning a theme, Alberta kindergarten teachers look at seven learning areas:

- early numeracy (mathematics)
- early literacy (English language arts)
- environmental and community awareness
- citizenship and identity
- physical skills and well-being
- creative expression
- personal and social responsibility

Every kindergarten day typically involves large group activities, small group activities, and centre choices including purposeful play. 'Centres' are designated areas where small groups of students or individuals can do particular activities. The seven learning areas are commonly integrated throughout the half-day of school, and a theme ties it all together to help the students learn in a developmentally appropriate way. All centres and activities for each month are planned carefully by the kindergarten team of teachers. If students are provided with rich learning opportunities, some background knowledge, and interesting centres, they will be ready for a special presenter, and then will be able to expand on their learning after the presentation is complete.

The "Dinosaurs and Rocks" Theme

For the "Dinosaurs and Rocks" theme, all seven of the kindergarten learning areas can be easily covered. For example, in the mathematics area, many large group activities can be integrated and a special centre for mathematics provided. At this centre, the children make non-standard rulers using dinosaur stamps on a strip of paper. Children need to measure their own body parts, everyday items, and objects of their own choice. Mathematics is also integrated into a tub toy centre. Students are provided with a

tub of plastic dinosaurs that they count and sort according to size, colour and what the dinosaurs ate (meat eaters or plant eaters). In addition, many large group mathematics activities happen regularly throughout the month. An example is the class activity of unravelling a ball of string the length of a Sauropod from head to tip of its tail in the school hallway. Another activity is comparing a model of a *Tyrannosaurus* tooth to the size of a banana.

A further learning area example is language arts, which has special learning centres, along with many other related activities. At the ABC/writing centre, the children have simple research books on the dinosaur of their choice. They can copy text from provided pictures and from text with picture clues in order to provide a simple report about their dinosaur, its choice of food, and prominent physical characteristics. Another centre involving the language arts curriculum is the science centre. Here, a large variety of rocks and fossils are on display, complete with labels. There is also a school microscope (sometimes a stereoscope), hand lenses, assorted sizes of magnifying glasses, and a magnifying stool so that the students can study the samples in detail. In addition to centre time, children also work on language arts areas of the curriculum when they do activities such as:

- "read" poems/songs about dinosaurs that are added into their treasure book (yearly collection of poems),
- share with the class what happened in the centres each day,
- add a story sentence to a drawing or painting,
- look at the classroom collection of fiction and non-fiction books about dinosaurs daily,
- draw and print about dinosaurs in their journals, and
- complete a "*This is my favourite dinosaur*" sheet that is kept in each child's portfolio.

As demonstrated by the above exploration of these two curriculum areas, dinosaurs and rocks can be woven into all areas of the curriculum successfully and memorably. Children are motivated and creatively engaged in their learning for the entire month. They learn many of the curriculum goals, many facts and much extended incidental learning because of their high interest level.

The Special Presentation by a Geoscientist

Presentations brighten and enrich a child's learning and could be the start of a future Phil Currie, Tuzo Wilson or even Isaac Newton. From a teacher's perspective of the topic, there is no chance of "burn-out" when you are able to have young children's eyes light up with excitement daily. When there is a special presenter, the theme becomes much more important and memorable for the children. Without a special presentation, you would not hear the wide-eyed comments from students such as, "*Is that the meteor that killed the dinosaurs?*" that one 5 year old girl asked the presenter when he showed her a meteorite this year. Also, the presentation encourages the children to make a strong connection as to what a scientist does. A kindergarten boy recently answered the question, "*What does a scientist do?*" posed by another student, by answering with, "*Remember the paleontologist that visited us...*" and proceeded to confidently give her examples. When Grade 3/4 students were invited to participate in the presentation, they lined up not only to get special rocks and fossils identified, but to get the presenter's autograph as well. Finally, in years where a special presentation on, "Dinosaurs and Rocks" was made, many students at the end of the year stated that that theme was their favourite and that they wanted to be a paleontologist/geologist/scientist when they grew up.

LESSON PLAN FOR THE GEOSCIENTIST

For the geoscientist visiting a school, the task of presenting can be daunting. However, below are some pointers, all 'field tested', which have assisted the authors during many presentations.

Outline

In Alberta schools, there is normally at least 75 minutes before the lunch break, which is ideal for a presentation. This can be planned as shown in the lesson plan with consideration of the attention span of the audience. Specimens and activity material are best kept out of the way of the children and brought out later in the presentation as needed. If available, place microscopes and black lights not only on desks that an adult

can operate from, but also at a height that the young audience can use.

10 minutes: What is a geologist?

A slide show introduction of geologists at work is a great opener. About 10 to 15 slides are probably enough for this section. Show how geologists live and work in the field. Pictures of rigs, mines and big trucks can be mixed in with fieldtrip shots and how geologists travel to isolated places.

5 minutes: What is a dinosaur?

At the kindergarten level the students know that dinosaurs are big animals which lived a long time ago. However, the misconception that all big creatures alive 100 million years ago were dinosaurs is common. Slides of tortoise, crocodiles, dinosaurs and birds can be used to illustrate the differences, and the concept of evolution can be briefly introduced.

5 minutes: What did dinosaurs eat? (Carnivores and Herbivores)

Illustrations of dinosaurs often show them with their food. Close-ups of teeth can be talked about as well as what human teeth are used for (molars vs canines).

10 minutes: How did dinosaurs walk?

Most dinosaurs at museums are now mounted with the tail outstretched off the ground counterbalanced by the head and neck. This can be illustrated to the class by a model and by bending at the waist and trying to hold your head up (as humans lack the tail for balance, this is tiring). The class can then be asked to try this and see if walking on two legs in a bent position is as easy as using four legs. Try to look to the left and right for food and to see if a predator (classmate) is creeping up for the kill. Also ask if the neck or back hurts after awhile. As can be seen in Figure 1, the class enjoys the activity and this is also a good "let off steam" activity.

10 minutes: How did dinosaurs see?

The concept of, "how dinosaurs saw," can be illustrated using the concept of eye location on the skull. To show this, two volunteers can be brought to the front of the class. A girl, as in Figure 2, is asked to put on a paper shopping bag



Figure 1. Students walking like dinosaurs. Note that the two-legged dinosaurs have three long "fingers".

in which two holes are cut in the sides to mimic how a herbivore dinosaur would have seen the world. A boy volunteer is asked to put on a similar bag but with two holes cut into the front to illustrate how *Tyrannosaurus* viewed the world. Each student is asked to look at the other and the class shown that predator and prey had different skull shapes to help see, or watch out for each other. The point is then reinforced by showing pictures of dinosaurs' skulls and asking if they were herbivores or carnivores.



Figure 2. Students in dinosaur hats illustrating how carnivore and herbivore eyes are positioned differently on the skulls.

5 minutes: What colour was a dinosaur?

The final full class discussion activity is to show pictures of dinosaurs with different coloured skin in different patterns. Often the best examples can be found at fun fairs and town monuments where blue, pink and purple striped dinosaurs make appearances. The objective is to show that paleontologists do not know if dinosaurs were camouflaged, had display colours or were just a boring green-brown as shown in most reconstructions.

25 minutes: Activities Including colouring, looking at fossils, discussing children's specimens and handling fossils

The objective of this section of the presentation is to let the children be creative with the colours of a dinosaur and let a slow trickle of students have one-on-one time with the presenter. Prior to coming to class the students are asked to select a special rock or fossil to show or have identified, and often some quite spectacular examples are presented. The use of a standard wellsite binocular microscope (Fig. 3) can show special parts of the rock as can an oil fluoroscope (both obtainable from most company stores). This is also a good time to show some of your special rocks from your collection (and borrowed from

places such as the Geological Survey of Canada (GSC)). A ready supply of adults is useful at this stage in protecting the equipment and fossils, though damage is very rare as most students are careful in handling specimens. About a minute per student is needed for everyone to come up and ask questions (Fig. 4), and the time will fly if you get a keen child.

5 minutes: Wrap up

To complete the learning process it is a good idea to repeat some of the key learnings about dinosaurs and rocks. This can be done with a few more slides or just a discussion. Thank the class for their attention and the teachers for letting you visit their classroom. After the children have left it is permitted to breathe again.

CONSIDERATIONS FOR THE VISITING GEOSCIENTIST

Size of class, boy/girl breakdown, special needs

Calgary Board of Education (CBE) kindergarten classes range in size from about 17 to 26 students, with a teacher and one or more aides. Most classes have a fairly equal mix of boys and girls with both sexes being very inquisitive about science at this age. When you ask for volunteers to come up to the front of the class there are always a lot of



Figure 3. Student viewing a coprolite using a binocular wellsite microscope.

hands, but it is best to try to get a mix of the quieter and keener students; both girls and boys.

Kindergarten programs in Alberta are based on the concept that all children can learn. Consequently, there is often a huge diversity (social-emotional, physical, communication and learning level) in any kindergarten classroom. This need not pose a difficulty for any

presenter because it is the responsibility of the teacher to ensure that every child is included in an appropriate manner. One year, there was a child with a hearing difficulty who wore a hearing aid and sat at the front. Other years, there have been children with more significant special needs who have had an educational assistant assigned to help them gain the most out of the presentation.

School location, facilities, and equipment

In a school where the presentation is to be made, there should be a large area where the pupils can sit on the floor. As there are often many diversions in the home classroom, the chance to present in a large, separate space might be worth investigating. The extra space is useful when the students explore how dinosaurs walked, and perform the colouring exercises and discuss specimens.

Teachers, aides, volunteers, presenters

Teachers are normally very receptive to geoscientists coming into their classrooms. In kindergarten, the students are only at school for a half-day, so there may be the chance to do two presentations in a day to different classes in the same space. Each class may have a different teacher's aide and often volunteers will be present to help with the set-up of teaching resources, microscopes and projectors.

Most kindergarten students have heard of geologists and have seen them on the television, but their image may be a little coloured by movies such as *Jurassic Park*. It is best to wear standard work clothes (be that office or field) but do make a point of bringing along a hammer and hand lens.

Presentation Resources

To obtain books aimed at the kindergarten to Grade 4 (K-4) level student, a quick visit to the local toy store can often provide useful material. Other locations available in Alberta include the Royal Tyrrell Museum of Palaeontology Bookstore, the Glenbow Museum Bookstore, the Public Library, and local rock and mineral stores.

The hunt to find good photographs of dinosaurs can be difficult because of copyright issues. However,



Figure 4. Student listening to the teacher and asking questions about coprolites.

in Alberta, there are a number of museums and public areas, which have replicas that can be visited. At Calgary International airport there are a number of displays of dinosaurs (and pterosaurs), which can be photographed. This paleontology theme is also used at Chicago O'Hare airport, so travel with a camera can provide usable images. At the Royal Tyrrell Museum of Palaeontology it is possible to take photographs of the collection for educational purposes without the problem of copyright issues and this could be the case at other museums if they are asked. For modern animal analogues the local zoo or even university may be a source. Here, in Calgary, the zoo has many animals as well as dinosaur statues in many colours, although some of the latter are older models which do not represent the current understanding of dinosaur posture.

Web pages are probably the best sources of data on dinosaurs for the geoscientist going into the classroom. There are many available but some of the best and most useful include:

- Geological Survey of Canada (GSC) at gsc.nrcan.gc.ca. This large web site has links to many geological resources. In Calgary, the GSC also has offices and a bookstore. At the former is a collection of teaching rock specimens and fossils which may be borrowed to aid "show and tell". Across Canada similar collections are available at local offices.
- EarthNet at earthnet-geonet.ca. This is a major resource of classroom activities, guides and data for teachers as well as geoscientists.
- Canadian Geoscience Education Network at cgen.bio.ns.ca.
- Dinosaur illustrations can be found at www.search4dinosaurs.com. Some of the pictures do not have copyright restrictions for teachers.

Calgary-based web pages include:

- Calgary Science Network at www.calgarysciencenetwork.ca. This organization seeks to pair local volunteer scientists with teachers. The web page is an excellent starting point to find resources in the Calgary area.
- Alberta Palaeontological Society at www.albertapaleo.org. The society also has volunteers who can present talks in the classroom, along with

fossils and books which can be borrowed.

- Calgary Board of Education outlines the Alberta curriculum at www.edc.gov.ab.ca/parents/hand-books/summaries/kinderbro.pdf
- The Alberta Kindergarten Program Statement can be found at www.education.gov.ab.ca/k_12/curriculum/by_subject/kingergarten.pdf

This is not intended as an exhaustive listing but more of a gateway to the many resources available to both the presenter and the teacher. Local resources are always preferable because many students can relate better to places and things that they have seen and touched.

CONCLUSIONS

The lesson plan presented has been given to 12 different classes and has always been well received by all in attendance including students, parents and teachers. For the geoscientist entering the classroom, this is a chance to affect the girls' and boys' lives and perhaps make more scientists in the world.

Probably many geoscientists can trace the development of their interest back to a long forgotten person who spent a little time sharing the excitement of discovery. Presentations to young children's classes are a fun and challenging experience and, with the right teaching resources, can be one of the most rewarding parts of a geoscientist's work.

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