

Matching University Geography with the Ontario Curriculum

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Matching undergraduate university courses with classroom teaching areas continues to be a problem for future teachers in Ontario Canada. As a result many teachers at the elementary and secondary levels do not have the subject based knowledge for effective teaching. This study examines geography within the new Ontario curriculum by matching topics and courses with those in university, as well as measuring the curriculum material in order to determine the best fit. Crossover of geography into other discipline areas is also included. For future teachers, this work establishes a set of university geography courses that will provide the best background for teaching geography in Ontario. Unfortunately the weak subject requirement for entry into the Ontario faculties of education will continue to encourage a mismatch between the undergraduate experiences and the school geography curriculum.

Keywords: Curriculum, subject crossover, systematic geography, amount of coverage

The new elementary and secondary school Ontario curriculum has moved a great deal of educational material down the grade system and at the same time increased the amount of content that teachers are required to cover. This development has put increasing pressure on classroom teachers and those students that will be entering the teaching profession. Teachers already in the classroom particularly at the Primary/Junior level, grades 1 to 6, who have a limited university subject area background and those entering into Education Faculties who do not require a designated teaching subject area at this level, will be put at a great teaching disadvantage. They will be forced to learn concepts, terminology's skills and even applications that previously were not required or spelled out in as great a detail in the former Ontario curriculum. A similar scenario follows for teachers at the next two teaching levels. In the Junior/Intermediate level, grades 4 to 10 candidates entering the Education Faculties are required to have three full undergraduate courses in a school teaching subject and at the Intermediate/Senior level grades 7 to 12, five and three full undergraduate courses in two teaching areas. If at any level the teacher's undergraduate background does not match the teaching area then knowledge base of teaching

is eroded and may affect the content and processes of instruction. (Grossman P. et al 1989). Moreover lower levels of achievement can be expected for students when teachers are not well qualified in their teaching field. (Darling-Hammond L. 1997) Consequently a solid and an in depth subject area background that matches the teaching areas is imperative.

To determine the type of university background that future geography teachers will need requires an examination of the new Ontario curriculum for geography and other related disciplines. This includes matching university geography courses with the Ontario geography curriculum, examination of the cross-over of geography into other disciplines, measuring the amount of coverage for each systematic geography in the system and comparison of the coverage of the different branches and topics and courses* within the geography curriculum.

Research Methods

Identifying and Matching University and Ontario School Courses

Using the new Ontario curriculum for geography which is divided into Social Studies for grades 1 to 6, and the Geography curriculums for grades 7 to 12 (Tables 1 and 2), the curriculum was divided into the standard geography subjects taught at both the university and the school levels. This was based on the curriculum description of each topic and course. The Ontario geography curriculum at the grade 11 and 12 levels includes a full range of courses but, the ones, which are offered may vary depending on the Board or even the school. This is often determined by budgetary pressures,

teacher expertise and student interest. Since most of the physical topics in geography were shifted into the Science and Technology section of the Ontario elementary school curriculum under Earth and Space Systems and in the Science curriculum under Earth and Space Science in Secondary school, except physical geography in grade 11, these were used to match the physical systematic geography courses (Table 3 and 8) Based on the curriculum descriptions this match up produced 14 standard geography subject areas within the four branches of geography. These were divided into 7 human geography courses, 5 physical, 2 regional/countries and the general category of techniques/methods (Table 4).

| Grade | Topic |
|----------|---|
| Grade 1: | The Local Community Features of Communities around the |
| Grade 2 | Urban and Rural Communities |
| Grade 3: | The Provinces and Territories of Canada |
| Grade 4: | Canada and Its Trading Partners |
| Grade 6: | Geography Topics Grade 7 and 8 |
| Grade 7: | The Themes of Geographic Inquiry Patterns in Physical Geography Natural Resources |
| Grade 8: | Patterns in Human Geography Economic Systems Migration |

Table 1 The Ontario Curriculum Social Studies, Geography, Grades 1 to 6

Canada and World Connections: Geography Topics, Grades 7 and 8

| Grade | Topic |
|-----------|--|
| Grade 9 | Geography of Canada |
| Grade 11: | The Americas: Geographic Patterns and Issues Physical Geography: Patterns, Processes, and Interactions Geographics: The Geographer's Toolkit Regional Geography: Travel and Tourism |
| Grade 12: | Canadian and World Issues: A Geographic Analysis World Geography: Human Patterns and Interactions The Environment and Resource Management Geomatics: Geotechnologies in Action |

Table 2 The Ontario Curriculum Canadian and World Studies: Grade 9 Senior Division Geography: Grades 11 and 12

(The Ontario Curriculum: Grades 11 and 12, Canadian and World Studies 2000) (The Ontario Curriculum: Grades 9 and 10, Canadian and World Studies 1999)

Only two regional areas including Canada and World Regions were used since geography topics and courses were offered on Canada or Canada in connection with other world regions or countries. The techniques and methods were used as a general category because every geography topic or course included two applied subtopics. At the elementary level this included Developing Inquiry/ Research and Communication Skills and Developing Map and Globe Skills while at the secondary level each course included two applied subsections. As well two separate techniques and methods courses are offered in grade 11 and grade 12.

Identifying and Matching Geography Cross Over into Other Disciplines

The linkage and crossover of both human and physical geography with other disciplines is acknowledged in introductory textbooks. Norton (1998) states that human geography is closely linked to other disciplines - social sciences, humanities and physical sciences and Strahler and Strahler (1992 pl) claim that physical geography draws on several natural sciences for its subject matter, among them sciences of the atmosphere (meteorology, climatology), oceans (oceanography), solid earth (geology), landforms (geomorphology), soils (soil science) and vegetation (plant ecology, biogeography). Within the Ontario curriculum, physical geography in particular crosses over at the elementary level into the life systems and the earth and space systems strand in the Science and Technology Curriculum, grades 1 to 8 and at the secondary level into biology and earth and space science in the Science curriculum, grades 9 to 12. In the case of human geography, the crossovers occurred into various sections of history, civics and politics.

In the Life Systems strand, material taught in standard university biogeography courses crossed over into three grades under such topics as Characteristics and Needs of Living Things in grade 1, Growth and Changes in Animals in grade 2, Growth and Changes in Plants in grade 3 and Diversity of Living things in grade 6 (Table 5). These topics are covered in various texts including Biogeography: An Ecological and Evolutionary Change and Challenge (Dearden and Mitchell 1998) and also covered in biogeography texts. Most of the physical geography course material has been shifted into the

elementary curriculum under Science and Technology within the Earth and Space Systems strand. As a result physical geography appears as only one geography topic in grade 7 and in small sections of the Social Studies curriculum in grades 2 and 3. Topics such as Air and Water in the Environment in grade 2 and Weather in grade 5 and their descriptions clearly fit into a university climatology course. Similarly Rocks, Minerals and Erosion in grade 4 and Water Systems in grade 8 are covered in both geomorphology and introductory physical geography courses.

A certain amount of crossover occurred from human geography courses into history topics in 6 elementary grades (Table 6). This material is covered in university geography courses such as cultural and social,

| Grade | Topic |
|----------|----------------------------------|
| Grade 1: | Daily and Seasonal Cycles |
| Grade 2: | Air and Water in the Environment |
| Grade 3: | Soils in the Environment |
| Grade 4: | Rocks, Minerals, and Erosion |
| Grade 5: | Weather |
| Grade 6: | Space |
| Grade 7: | The Earth's Crust |
| Grade 8: | Water Systems |

Table 3 The Ontario Science and Technology Earth and Space Systems Grades 1 to 8

(The Ontario Curriculum: Grades 1 to 8, Science and Technology 1998)

economic, urban, population and the geography of Canada. In secondary school the cross-over of geography into other disciplines took place into the science curriculum and into sections of the history, civics and politics curriculums. Within history several topics in each course from grades 10 to 12 dealt with material covered in human geography courses, especially with Canadian

| | |
|---------------------------------------|---|
| Systematic Human Geography Courses | Introductory Human, Cultural, Economic, Community/Urban/rural, Population, Natural Resources and Management, Travel and Tourism |
| Regional/Countries | Canada, World Regions |
| Techniques and Methods Courses | Statistics, Cartography, Air Photo Interpretation, Remote Sensing, Geographic Information Systems |
| Systematic Physical Geography Courses | Introductory Physical, Geomorphology, Climatology, Bio-Geography, Soils |

Table 4 Matching University Geography Courses with the Ontario Geography Curriculum

and World History courses in the twentieth century (Table 6). Certainly a political geography course would be useful to teach any of these courses.

Interestingly, the aim of science in the curriculum states the importance of connections, linkages and overlaps between science and many other disciplines. It does not, however, mention the strong overlap with physical geography, but does mention the links between geography and other areas of social studies. (The Ontario Curriculum Grades 9 and 10, Science, 2000 p3 and The Ontario Curriculum Grades 11 and 12, Science, 2,000p4)

In secondary school as in elementary a great amount of material from physical systematic geography courses crosses over into various strands of the Science curriculum. In grade 10, two of the five topics including the sustainability of ecosystems and weather dynamics/systems under the biology and earth space

science subdiscipline strands respectively were covered by course material from biogeography, natural resources and resource management and climatology. (Table 7) Within the grade 11 and 12 Science curriculum, 9 out of 35 topics in biology, earth and space science and general science were identified as curriculum content that geographers with a strong physical geography background would be capable of teaching (Table 8). In this case the strongest crossover occurred into the earth and space science course which included the topics of Introduction to Earth Science, Earth Materials, Internal and Surficial Earth Processes and Earth History. In general, within the school curriculum human and physical geography crossed over in various amounts of subject area coverage in these various disciplines 17 times at the secondary level and 12 times at the elementary level.

Determining the Amount of Coverage for each Topic

Although it is possible to match curriculum geography topics and courses with university systematic courses, material in social studies in grades 2, 3 and 6 fits into more than one systematic geography area. For instance, in grade two the material under the topic Features of Communities

| | |
|----------|--|
| Grade 1: | Characteristics and Needs of Living things |
| Grade 2: | Growth and Changes in Animals |
| Grade 3: | Growth and Changes in Plants |
| Grade 4: | Habitats and Communities |
| Grade 6: | Diversity of Living Things |
| Grade 7: | Interactions within Ecosystems |

Table 5 Geography Cross-over Into Life Systems in Elementary school

(The Ontario Curriculum: Grades 1 to 8, Science and Technology 1998)

| Grade | Topic |
|---|---|
| Grade 1: | Relationships, Rules and Responsibilities |
| Grade 2: | Traditions and Celebrations |
| Grade 3: | Pioneer Life |
| Grade 5: | Early Civilizations |
| Grade 6: | Aboriginal Peoples and European Explorers |
| Grade 8: | Canada: A Changing Society |
| Grade 10: | Canadian History in the Twentieth Century |
| Three of 5 Subtopics including Communities, Local National and Global Change and Continuity Social, Economic and Political Structures | |
| Grade 11: Three of 5 Subtopics: same as above | Canadian History and Politics Since 1945 |
| Grade 11: Three of 5 Subtopics: same as above | Twentieth Century History, Global and Regional Perspectives |
| Grade 12: Three of 5 Subtopics: same as above | Canada History, Identity and Culture |
| Grade 12: Three of 5 Subtopics: same as above | Canada History, Identity and Culture |
| Grade 12: Three of 5 Subtopics: same as above | Adventures in World History |
| Grade 12: Subtopics two of three | Canadian and World Politics |

Table 6 Gography Cross-over into History Topics Heritage and Citizenship

(The Ontario Curriculum: Social Studies, Grades 1 to 6, History and Geography: Grades 7 and 8, 1998, The Ontario Curriculum: Grades 9 and 10, Canadian and World Studies 1999, The Ontario Curriculum: Grades 11 and 12, Canadian and World Studies 2000)

Around the World fell into the fields of culture, community/urban, world countries and climate. It did not, however, fit into the regional category since most of

the other physical geography elements were not part of this topic. Similarly, at least one subsection in every geography course is devoted to techniques and methods.

| | | | |
|------------------------|----------------------------------|-------------------------------|--|
| Subject | 10 academic | 10 applied | |
| Biology | The Sustainability of Ecosystems | Ecosystems and Human Activity | |
| Earth and Space System | Weather Dynamics | Weather Systems | |

Table 7 Geography Crossover Into Science Topics Grade and Topics

Therefore, to determine the amount of coverage from each area requires some type of measure for each systematic geography topic or course. Such a measure will provide a better understanding of the emphasis placed on various branches and topics and courses within the geography curriculum.

In elementary school each geography topic is divided into six subdivisions. A general overview

describes the basic elements of the topic. The overall expectations describe in general terms the knowledge and skills that students are expected to achieve by the end of each grade. The specific expectations describe the expected knowledge and skills in greater detail. They are organized under the following subheadings. Understanding Concepts, Developing Inquiry/Research and Communicating Skills, Developing Map and Globe

| | | |
|--------------------------|-----------|--|
| Biology Grade 11: | | Strand 5 Plants Anatomy Growth and Functions |
| Grade 11: | | Strand 5 Environmental Science |
| Grade 12: | | Strand 5 Population Dynamics |
| Earth and Space Science: | Grade 12 | Strand 2 Intro to Earth Materials |
| | | Strand 3 Earth Materials |
| | | Strand 4 Internal and Surf icial Earth Processes |
| | | Strand 5 Earth History |
| | | Strand 5 Human Impact on the Environment |
| Science: | Grade 11 | Strand 5 Human Impact on the Environment |
| | Grade 12: | Strand 4 Gardening Horticulture landscaping and Forestry |

Table 8 Geography Crossover Into Science Strands

| | Grade | | | | | | | | | | | | Total |
|--|-------|------|------|------|-----|------|-------|-------|------|-----|------------|-----------|-------|
| Geography | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| Intro Human | | | | | | | 1 | | | | | 1 | 2 |
| Cultural | | 0.83 | 0.33 | | | | | | | | | | 1.17 |
| Economic | 0.17 | | 0.1 | | | 1 | | 1 | | | | | 2.33 |
| Community/ Urban/Rural | 1 | 0.67 | 1 | | | | | | | | | 1 | 3.66 |
| Population | | | | | | | | 1.0x2 | | | | | 2 |
| Natural Resources & Management | | | | | | | 1 | | | | | 1 | 2 |
| Travel/Tourism | | | | | | | | | | | 1 | | 1 |
| Region/Countries | | 1 | 0.16 | 1 | | 1 | | | 1 | | 1 | 1 | 6.16 |
| Techniques/ Methods | 0.33 | 0.33 | 0.3 | 0.33 | | 0.3 | .33x3 | 0.33 | 0.33 | | .33x3;+1.0 | .33x4+1.0 | 8.33 |
| Intro Physical | | 0.67 | 0.67 | | | | 1 | | | | 1 | | 3.33 |
| Earth and Space Systems/Science | | | | | | | | | | | | | |
| Techniques/ Methods | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | | 0.2 | 0.2 | | 0.3 | 0.25 | | 1.9 |
| Geomorphology | | | | 0.83 | | 1 | 0.83 | | | 1 | | | 3.67 |
| Climatology | 1 | 1 | | | 1 | | | 0.5 | | 1 | | | 4.5 |
| Bio Geography | 0.67 | | | | | | | | | | | | 0.67 |
| Soils | | | 1 | | | 0.33 | | | | | | | 1.33 |

Table 9 Proportion of Topic or Course Covered

Skills and Skills in Various Context (The Ontario Curriculum. Social Studies Grades 1 to 6, 1998, p5) These same subtitles are used in Grades 7 and 8 in which specialization of geography as a separate discipline begins.

Similarly courses at the secondary level are divided into 5 subtopics including an Overview, Geographic Foundations: Space and Systems, Human-Environment Interactions, Global Connections, Understanding and Managing Change and Methods of Geographic Inquiry. Except for Regional Geography courses, the mixing of substantial amounts from various systematic geography course areas into any one topic disappears from grades 7 to 12 and the material tends to focus more closely around that particular topic or course.

Using the curriculum terms and descriptions within each subheading becomes a useful indicator of how much any of the geography topics or courses is covered by material from different systematic areas. For instance, if the term community is described or named within each or most of the subheadings, then that would indicate major coverage of material from the community/urban field. If, on the other hand, it is found in only one subheading then little or some material is from that particular field.

This can be used as a measurement indicator of which geography and how much material must be covered from that field. In grade 2 under the topic of Features of Communities Around the world, the word culture or a description of culture is found within 5 of the 6 subheadings or in 83.3 percent of the material suggesting that culture requires major coverage. The word community is found in 4 of 6 subheadings or in 66.6 percent of the material. It is thus possible to determine a measure of how much coverage is present from any particular systematic geography course area. Instead of using actual percentage, the proportional value out of one is used so that it is possible to add these for each type of geography in order to provide the total number of topics or courses that are covered by that curriculum material from grades 1 through 12. For each geography and grade a value of 1 represents the coverage of that geography field within subheadings. Table 9 shows the proportion of the topics and courses covered in each matched geography course for each grade and the total number of topics and courses within that geography area for the school system.

It is also possible to measure the amount of coverage that techniques and methods have within the curriculum since these are included as part of every topic or course. At the elementary level in the geography curriculum, these are dealt with in two out of six subdivisions including Developing Inquiry/Research and Communication Skills and Developing Map and Globe Skills. Proportionally this represents coverage of .333 for each grade except grade 5, and three times .333 in grades 7 and 8, for each of the three geography topics. A similar emphasis is placed on techniques and methods in secondary school for every geography course. One complete section is devoted to this under Methods of Geographic Inquiry and it is included in the overview, which mentions the use of geographic tools and methods. Consequently these also account for .333 proportion coverage of each course.

In the Earth and Space Systems of the Science and Technology curriculum from Grades 1 to 8 less emphasis is placed on techniques and methods and only one section out of five deals with this topic under Developing skill of Inquiry, Design and Communication. The section titled Developing Map and Globe Skills is omitted even though most of these topics are within the field of physical geography. A similar situation takes place in secondary school in the Earth and Space Science courses of the Science curriculum. As a result the techniques and methods accounted for a proportional coverage of .200 for each topic or course (Table 9). This measurement method was not used in the case of regional geography topics or courses since in every case numerous parts of physical and human systematic courses are included and therefore make the measurement unmanageable.

Coverage Comparison of the Branches of Geography

Examination across the curriculum of the amount of coverage of topics and courses within the human, physical, regional and techniques and methods shows a close balance between the systematic human and physical branches for the system. A total proportional difference of 0.664 coverage between the two branches was evident. Similar results were present for the elementary level,

which had a 0.330 proportional difference for topic coverage in favour of physical geography and 1.00 course coverage in favour of human geography at the secondary level.(Table 10) The most surprising result was for techniques and methods, which accounted for 10.23 proportional topics and courses, covered in Geography and Earth and Space Systems: Science: curriculums. It is, of course, important to remember that techniques and methods are included as part of every course. On the other hand it is clear that geography teachers at all levels will have to be well versed in this branch. The regional branch was a distant fourth with 6.16 geography topics and courses covered within the curriculum. It showed split coverage 3.16 topics at the elementary level and 3.00 courses at the secondary level.

Coverage Comparison of Individual Topics and Courses

Comparison of the totals for individual systematic courses and topics across the curriculum (Table 9) shows that in order of coverage importance within the human branch, community/ urban and rural, economic, natural resources and natural resource management and population tended to be most frequent. In the physical branch it was climatology and geomorphology. Other areas of less coverage included culture, soils and biogeography.

Findings

The topics and courses covered in the geography curriculum suggest a more balanced course selection from the human and physical branches at the university level for elementary school teaching and a more human, regional and technique orientation for secondary school teaching. In elementary school a slightly greater emphasis on physical geography is present with most of the topics found in the Science and Technology curriculum under Earth and Space Systems. The reverse is true at the secondary level where under the geography curriculum only one introductory physical geography course is included. Table 11 shows 3 courses in physical geography, but 2 of these are from the Science curriculum. This includes weather and dynamics in grade 10 and four of 5

subsections in grade 12 dealing with the earth. The majority of the courses in geography curriculum in secondary school are human systematic, regional and techniques and methods.

The inclusion of techniques and methods in every topic and course at both levels suggests the need for a solid foundation in this branch of geography particularly for teachers at the secondary level. Elements of statistics, cartography , geographic information systems, remote sensing and air photo interpretation are included in almost every course and taught exclusively in two individual courses in grades 11 and 12. At the elementary level, elements of statistics and cartography was part of every geography topic, while in the general human and physical geography topics in grade 7 air photo interpretation and satellite images were mentioned as examples from which students could gather information.

Despite the fact that most four-year university degree programs require several techniques and methods courses, it is still possible to avoid many of these courses resulting in a knowledge gap at either school level. Moreover the entry into the Intermediate/Senior level requires only five full courses in the first teaching subject and three in the second leaving it open for students to avoid techniques and methods or even other branch areas. As Bale and McPartland (1986) found in their sample of secondary school student teachers this was an area of inadequacy compared to the other branches of geography.

The regional branch which in many universities has been de-emphasized in spite of the fact that it is taught at both levels and continues to play an important part in the education of children about their own and other countries. According to Bale and McPartland (1986), regional topics were the least studied by undergraduates. Even though it was a distant fourth in terms of the geography branches covered by the curriculum there were still 3 topics and 3 courses covering the regional areas at each level. In social studies, the topics were placed under the general topic of Canada and World Connections and in secondary school the geography curriculum falls under Canadian and World Studies with each non regional course having a section titled Global connections. Every systematic course provided examples and application from Canada or various parts of the world. In the least university geography students entering the teaching

| Geography Branch | Elementary | Secondary | Total |
|--------------------|------------|-----------|-------|
| Human | 10.16 | 4 | 14.16 |
| Countries/Regions | 3.16 | 3 | 6.16 |
| Techniques/Methods | 5.06 | 5.16 | 10.23 |
| Physical | 10.49 | 3 | 13.5 |

Table 10 Topics and Courses Covered

profession in Ontario should complete one course on the study of Canada and a general course on world regions.

Conclusions

It is clear that the detailed and rigorous new Ontario curriculum in geography will require teachers to be competent and familiar with material to be taught at both the elementary and the secondary levels. This will necessitate a strong background in basic systematic courses in the human and physical branches, a solid knowledge of techniques and methods and mastery of certain regional courses. A breakdown of the branches of geography and the accompanying topics or courses are matched with elementary and secondary school levels in Table 11. It includes courses exclusive and inclusive to both levels as well cross-over courses that deal with topics and courses in the life sciences: biology, history and politics. A student with a geography concentration and additional courses in any of these disciplines would further strengthen their background and range of teaching areas.

The 3 or 4 year university degree, which is a requirement for entry into the Bachelor of Education programs in Ontario, is the umbrella that provides the core knowledge necessary for teaching school subjects. This is also true of the rapidly developing Concurrent Education programs.

As a result, students interested in entering the teaching profession are going to require more diligence and guidance before entering and completing their initial degree. In particular geography students will have to select their courses more carefully in order to be better equipped to handle the geography curriculum at the elementary or secondary levels. A careful and strategic choice of courses and programs will not only equip them for the new Ontario curriculum but will also make them more marketable as future teachers. The right type of geography course background will even provide them with

the ability to bridge their geography background into courses offered in other subject areas such as the life systems, biology and history. This may prevent the type of mismatch between student undergraduate geography background in the teaching of geography at the secondary level (Rynne E and Lambert D, 1997) and as well at the primary level.

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| Geography Branch | Elementary | Both levels | Secondary |
|--|------------------------------------|--|--------------------------------------|
| Human Systematic | Economic Cultural Population | Intro Human Urban/Community and rural Natural Resources and Resource Management | Tourism and Recreation |
| Regional | | Geography of Canada, World | |
| Techniques and Methods | | Statistics, Cartography *Air Photo Interpretation *Remote Sensing | Geographer Information Systems |
| Physical Systematic | Soils | Intro Physical Climatology Geomorphology | |
| *Grade 7 only | | | |
| Geography Cross-Over Into Some topics/Courses of Other Disciplines | | | |
| | | Discipline | |
| Bio Geography Natural Resources and Management Climatology Geomorphology, Intro Physical, Soils | | Life Sciences Biology | |
| | | Earth Sciences | |
| Political Geography, Economic, Population, Cultural, Urban | | History, Politics | |

Table 11 Matching University Geography with the Ontario Curriculum

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