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ABSTRACT

Reported is a speech presented to a meeting in Canada regarding problems of converting to a metric system in Canada. Included in the discussion are political, educational, industrial, and home problems and uses. Suggestions to teachers for needed action are given. (RH)

AN SI CANADA: REALITY AND CHALLENGE

AT COMMITMENT PLUS SEVEN

Opening Address
Metrication for Vocational, Technical,
Industrial Arts Educators
Industrial Education Teachers Spring Conference
Nova Scotia Teachers College
Truro, Nova Scotia, Canada
22 April 1977

by

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Dr. Allen is Professor of Education at Nova Scotia Teachers College, Truro, where his instructional duties include Mathematics Education course-work at the early childhood and intermediate levels, and Physical Science. His 24-year career in public education has included service as elementary school teacher, high school teacher, teaching principal, and supervising principal, in Quebec; and a diversity of experience as teacher educator in Canada and the United States.

Known as an articulate and constructive critic of metric conversion and metric education activities in Canada, the United States, and abroad, Allen has been actively engaged in preparing Nova Scotia teachers for "metric" classrooms since 1972. His efforts have been cited by the Metric System Guide Bulletin (December 1974) as "an excellent example of the remarkable influence one individual can have."

A graduate of McGill University, Montreal, Allen earned his M.S.T.M. at University of Santa Clara, California, and Ed.M. and Ed.D. at Rutgers University, New Jersey. He is a Fellow of the Canadian College of Teachers and a life member of Phi Delta Kappa and Kappa Delta Pi.

Many Nova Scotians were reluctant to make the change and there were many protests against it.[1]

My barber . . . . he doesn't think people are going to go along with it.[2]

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[1]Introduction of "Canada currency," 1871. See The Bank of Nova Scotia, 1832-1932 (Halifax, N.S.: The Bank, 1932), p. 49.

[2]Student report (oral) on progress in metric conversion, Colchester County, Nova Scotia, April 1977.

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Fellow Educators, Ladies and Gentlemen:

"Why doesn't Ottawa get a move on . . . why don't they (in effect) tell us what to do?"

My interaction with the Canadian general public, from open-line radio in Ontario, to service club talks in New Brunswick and Nova Scotia, to the most casual of conversations in Truro, in Manitoba, or in my home province of Quebec, has been considerable, on this vital matter of Canadian metric commitment, and what I've just identified would seem to be a dominant area of concern. We're "going metric," or so we hear. Why don't we get on with it? Why not continuing, forceful, effective leadership from Ottawa and from the provinces?

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[1]Professor of Education, Nova Scotia Teachers College, with current teaching duties in Mathematics Education (intermediate and early childhood levels) and Physical Science.

You and I know some of the answers to those questions. The public doesn't, by and large. That's my point.

But, if at all possible, in metric conversion as in classroom teaching, you have to find and see the humour of it all.

Ottawa treading warily, like walking on eggs . . . less than incisive in action for fear of a wrong move. I've heard that. Someone has well observed that metric conversion, even well done, is not the sort of program that wins votes. Opposing it sometimes can. It's tricky business. Like you, I suspect, I'd rather be a teacher than a politician.

But let me say this to underline incisive action at federal level. I've been in Ottawa recently. I've haunted the bilingual halls of the Metric Commission . . . and found the sombre Board Room where, in their wisdom, they have--yea big!--individual framed portraits of each and every metric commissioner. My point about incisive action, of course: if they can hang our good friend Willis Hall, publicly; while in eight years that I've been in Nova Scotia I can't recall anyone seriously suggesting anything half that drastic . . . then, I submit, there's hope for early metric conversion for us all!

Fellow educators, I view as my primary task this evening in the opening address of a potentially very significant education conference, to do all I can to give you perspective as to what Canada's metric commitment is all about . . . and to help you, collectively and individually, to determine your role--which, I submit, is greater and more challenging than you likely came here believing.

Let me briefly talk politics and talk education, and then get

down to specifics--the "nuts and bolts" of what you need to know.

First, politics--at best, the art or applied science of getting things done. Like metric conversion! This metric conversion is not being done by chosen people on Ottawa's Elgin Street. (Ottawa, whatever else, is a horrendously unmetric city!) It certainly isn't being done by Halifax. It never was meant to be. It's being done . . . by people like you and me. Voluntarily (an interesting word). In our enlightened self-interest. Yes, and to talk as a teacher, in the interest of the communities we serve and the generation of children we now teach. Government coordinates. People do it! It took me several years to get that into perspective . . . into proper focus. Once you do, of course, you get on with the job!

Ottawa, which is to say our Metric Commission, is not strong on measurement experts . . . this, to me, has been very conspicuous. In "metric" halls in Washington and Pretoria, I gather, postgraduate degrees in measurement science or a related field, or real, hands-on, practical measurement know-how, are to be encountered. Not, however, among those I've had reason to deal with on Elgin Street.[2] This is not necessarily bad, but it must be understood. Steering committees, sector committees, task forces, concentrate appropriate expertise drawing on it from across Canada . . . they, in turn, require guidance, coordination. The Metric

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[2]Paul Boire, the Metric Commission's Executive Director, mastered his metric (as did the author) in the Macdonald Physics Building at McGill, and among Metric Commission sector plan managers are important recruits from the business and industrial community . . . but technical expertise has been less than marked among the author's Metric Commission contacts, often career civil servants, as speaker, educator, and information seeker.

Commission (that is, the secretariat, not the appointed commissioners), as I've come to know it, comprises, to a significant degree, career civil servants . . . their rather remarkable mandate to coordinate, to seek consensus, to view critical paths, to plan, to dovetail all the complexity that goes into a process of optimal national conversion. They don't do it--you and I do. They're not "metric experts"--their expertise is in getting things done, within the framework, the groundrules, of federal civil service. For some, I gather, a stint with the Metric Commission is a logical stepping stone in the building of a civil service career . . . they become knowledgeable, they move on. 'Expertise in measurement matters . . . that you'll find in people who measure every day, in every way . . . sensitive to precision and accuracy, to the essential process involved. Expertise in measurement matters, potential expertise in metric measures for Canada's education and related sectors, is (with distinguished exceptions), predominantly on your side of head table. This is something to think about as I go on.

Second, education . . . metric, in its essence, is decimal reckoning applied to measurement. Let that sink in. There's no particular distinction, to my thinking, in metric "base units." The metre is not, in itself, in some way superior to the yard.[3] Decimal reckoning means multiples that are ten, one hundred, one thousand, one million, . . ., times a fundamental unit. No 16½s, 5280s, 2240s, and such!

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[3]Of course, the metre, originally, was to be one ten-millionth of the Earth's quadrant--the distance from North Pole to Equator (measured through Paris) . . . but that, in itself, had usefulness only if latitude and longitude divisions were hundredths (not nintieths) of the quadrant (the kilometre would have corresponded to the nautical mile).

Decimal reckoning means submultiples that are one-tenth, one one-hundredth, one one-thousandth, one one-millionth, . . ., of a fundamental unit. Nothing could be simpler . . . that's the point! Kilometre, 1000 metres --distances between towns are given in kilometres. Centimetre, 0.01 metre--heights, clothing sizes, depths of snowfall, are expressed in centimetres. Millimetre, 0.001 metre--machine shop dimensions commonly are stated in millimetres. It's a hard system to improve on! It's also a hard system to get used to, for those of us brought up on quarter pounds and sixty-fourths of an inch. You think not? Potato chips are to be marketed in a package that is 225 g--that's nine-fortieths of a kilogram. There's to be a wine bottle that's 187 ml--that, by any other name, is three-sixteenths of a litre . . . but you don't fill little bottles to three significant figures. There's an approved packaging for milk that calls for three plastic sacks--the total milk comes to four litres.[4] As I say, the old thought patterns die hard . . . they remain to confound the clear thinker who seeks the simplicity of a new and decimal world. We have been going decimal all along, you understand. Gasoline, when you think of it, is sold by the tenth of a gallon; angles frequently are measured to the tenth or hundredth of a degree; building lots may be to

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[4] Borrowing a good idea, as schoolpeople will (in this instance from a drama class at University of Western Michigan), some of my students attempted a "metric play"--a puppet play based upon Goldilocks and the Three Bears. All went well--children would have loved it, and learned a little too. But I kept asking myself why such metric peculiarities were coming through as Papa Bear saying he had to watch his waistline as he'd gained 4.5 kilograms. One of the students hastened to explain: "4.5 kg sounded like a good metric number . . . you see it on packages all the time." Yes, you do--it's another name for 10 pounds! The script is to be rewritten, and Papa Bear will lament a well-rounded 5 kg mass gain.

the tenth of a foot. Money is decimal: a dollar of one hundred cents.[5] "Going metric" serves to accelerate the process . . . and gives us an ideal opportunity to tidy up whatever is illogical in our measurement lives. Metric is decimal. Intelligent use of decimal measures forces us to come to grips with such concepts as accuracy and precision. With whatever formality was deemed advisable, these notions have had a place in the shop, of necessity; but neither the mathematics classroom nor the school science laboratory has, in general, treated them with much success. "A third of a metre"? Thirty-three centimetres, if it's drapery material; 333 mm if its a length of board (give or take some sawdust)--decimal measure, expressed decimally and rounded to appropriate precision. It's not difficult . . . but, believe me, it's hard to teach to anyone who had blind faith in the exactness of "sixty-fourths"!

If measures are decimal, and in a metric world very largely they are (exceptions are such as the seven-day week and twenty-four hour day), then how early can and should decimals be introduced and what is the need for (and what are the roles of) non-decimal fractions, at least for young children? Teachers are going to have to come to grips with these questions.[6] They also are going to have to face up to the minicalculator,

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[5]Paradoxically, our decimal dollar is distinctly non-decimal in its origin: it recalls the Spanish Milled Dollar, or piece-of-eight (hence the unmetric expression for 25 cents: 2 bits)! Even its initial definition as Canada's dollar was awkwardly non-decimal: the dollar was to represent fifteen-seventy-thirds of the British gold sovereign.

[6]Good non-decimal illustrations of fraction "word problems" for elementary schoolers are hard to come by, as the author can testify from his textbook adaptation experiences. After the more obvious pizza questions, one cheats a bit, calling on the few remaining non-decimal measures: "3/7 of a week plus 4/7 of a week . . ."!

now available for well under the cost of many a textbook. The minicalculator, you realize, is an essentially decimal device.[7]

That's politics, and that's pedagogy! . . . The "politics": conversion is "voluntary" . . . it's coordinated by government . . . you and I bring it about. The "pedagogy": metric is decimal . . . what are called for are decimal thinking and sensitivity to such matters as accuracy and precision.

Of course, you'd better know the metric, and the details of how it's to be used. That's what I propose to touch on under my catch-all heading of "nuts and bolts."

The world has known more than one brand of "metric," you realize . . . which is to be expected when we refer to a development span of close to two hundred years. Current, international metric, the so-called SI (from the French, Système International d'Unites), is the major revision of 1960. Canada was a party to the revision, and this is the "metric" to which modern nations are committed. It's not necessarily the "metric" of your textbooks (although it will be), and almost certainly is not the metric you learned in school. The metre, the kilogram, and the second, remain numbered among "base units," . . . but the pascal measures pressure (not, for example, the gram per square centimetre or kilogram per square metre), and the newton measures force (not the "kilogram force"--kilogram is the mass unit). Ergs, dynes, even calories, are redundant . . . and are not SI. This is not the time for a technical

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[7] Significantly, a recent issue of The Arithmetic Teacher (23:7, November 1976) was wholly devoted to minicalculators.

lecture, but you do see that this could reach out to many activities in the shop.

A whole range of SI units, from nanosecond (the billionth of a second of computer-reckoning time) and micrometre (the millionth of a metre of microscopy) to megawatt (one million watts) of power, terajoule (one trillion joules) of energy, and beyond, exists to meet all known and forseeable measurement needs--but, let's face it, in a given time and place, rather few measurement units usually will suffice. What are the units we'll most commonly encounter in daily living, and in what contexts will they be appropriate? This is rather useful information for people who are thinking ahead. Let me suggest a few:

UNIT	TO MEASURE	REPRESENTATIVE USES
millimetre(s)	length, depth, etc.	dimensions in wood or metalwork; small objects; rainfall
centimetre(s)	length, depth, etc.	body measurements; clothing sizes; draperies; snowfall
metre(s)	length, etc.	dimensions of building lots
kilometre(s)	length, distance	distance between towns
gram(s)	mass	a chocolate bar; a letter
kilogram(s)	mass	body mass; a sack of flour
tonne(s)	mass	a load of gravel
litre(s)	capacity/volume	a container of ice cream
millilitre(s)	capacity/volume	a soft drink can (about 300 ml)

UNIT	TO MEASURE	REPRESENTATIVE USES
hectare(s)	land area	area of a farm
degree(s) Celsius	temperature	outdoor, indoor, cooking temperatures
kilopascal(s)	pressure	barometric pressure tire pressure
kilometre(s) per hour	speed	highway speed
tonne(s) per hectare	crop yield	agricultural sectors

Other such units as the newton for force, pascal for pressure, joule for energy, watt for power, and ampere and volt in household electricity, will have frequent use--I would think more so, and with greater understanding, than has tended to be the case to date. When one unit replaces a diversity (as with the pascal for pressure, substituting for a startling variety of units, many of them "metric"),[8] it is more likely to become familiar, to be recognized in its many uses. Also, of course, SI relationships are kept simple: coherence defines the pascal as one newton (of force) per square metre. A relatively few units do--or could--satisfy most measurement needs. The old textbook exercise of presenting, say, centigram, decigram, gram, decagram, hectogram, and such, accordingly, when carried beyond demonstration of theoretical structure of the system,

[8] How do you react to the question once posed to me by an American science educator: "Which is more, your blood pressure or the pressure in the tires of your car?" Using traditional measures, such a comparison is anything but simple.

is primarily an academic indulgence.[9] Practical people at this stage can and must bring intelligence and knowhow to bear on applying SI to the needs of a practical world. We cannot merely copy Europe, you understand . . . nor do we necessarily want to. Our ladies are not about to start "weighing out" kitchen ingredients, European style: they will continue to reckon by capacity, but in "metric" cups of 250 ml. No, Europe, whatever else, is not as yet markedly SI in its trades. Metric, yes . . . but to a French machinist, force is kilograms (the mass unit), while to SI force is newtons. No, to look for good SI in practice, one looks (significantly) to the Republic of South Africa, whose five-year changeover from Imperial to SI-metric serves as a model of efficiency for the world.

Know SI. Know its relation to an emerging real world of Canadian metric. Know, too, its simple (and, as such, elegant) symbolism: m for metre, cm for centimetre, g for gram . . . lower case (in these instances), Roman type (non-italic), no period (it's a symbol, not an abbreviation), no pluralization . . . 2-space-k-g: two kilograms of sugar, on a grocery shelf in Truro, Johannesburg . . . someday, the world. Watch out for metric "jargon"--it's all too tempting. Don't make your trade a guild or cult at the expense of broader communication . . . "kilos" for kilograms, "c.c.s" for (I guess) millilitres; "megs" for megahertz; "mils"

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[9] I recall a remark put to me on open-line radio by a retired Nova Scotia school teacher: "Metric is hard. I know. My students found it hard. I found it hard." I let other listeners rush to my rescue . . . but, of course, classroom metric can be hard. My point is that it needn't be.

for milliamperes. To symbols, being identical for all languages, represent, to me, a very real breakthrough in global communications.[10]

You and I are teachers.[11] What is our role in the metric conversion of our community, our province, our nation, and our world? Quite possibly we seek out a pamphlet from Ottawa, tidy up our practices in the classroom, the shop, and the laboratory, and worry a little about what it's all going to cost! (Costs, for the record, frequently turn out to be less than initial estimates, once a little ingenuity has been applied to keeping them down.) No, potentially, as teachers, we have a very real leadership role, both in our communities and (if we but let our voices be heard) in the nation . . . at this critical stage in conversion. You sense that I do not subscribe to the philosophy that teachers should be seen but not heard! The teachers who really teach measurement logically should be those with the most to say . . . and those, I submit (think about it) are the teachers of Industrial Arts, Home Economics, and (ideally) Physical Education. These people measure all the time. They must have a real feeling for what they are doing. They should be

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[10] It's not hard . . . but don't cheat. I found how one of our conference organizers has been coping with 24-hour notation for time (not really "metric," of course, but indicative of the kind of "cheating" to which I allude. He takes the program. Where it says, "21 30", he carefully pencils in 9:30 p.m. We've an elderly janitor who has solved the "Celsius" problem. He has located a hardware store which still stocks Fahrenheits, has bought himself one, and figures that he is set for life.

[11] The Canadian Teachers Federation is, of course, forcefully on record as favouring rapid, efficient conversion, in the interest of Canada's young.

well aware of inherent advantages to decimal measurement. And, logically, should be among the first to speak up.

Leadership might well come from teachers of Mathematics and the Physical Sciences . . . I've watched their organizations nationally and internationally, and I really don't expect this to happen. So . . . the buck stops here! Let me urge you to make yourselves available to your communities . . . and to the trades and sectors whose good work your efforts parallel. If you see something going wrong . . . in an industry, or in a nation . . . speak up! Poor conversion doesn't save money . . . it just passes the costs on to a future generation . . . and with interest, many fold.

You'll encounter resistance, of course . . . frequently rooted in apprehension, uncertainty, or misinformation. You may make your greatest contribution in simply meeting that resistance . . . and setting matters right. The British--Heaven help them!--were chanting this anti-metric ditty as early as 1883:

> Then down with every metric scheme
> Taught by the foreign school
> We'll worship still our father's God
> And keep our father's rule--
> A perfect inch, a perfect pint,
> The Anglo's honest pound,
> Shall hold their place upon the earth
> Till time's last trump shall sound.

The British set a course for metric in 1965, precipitating conversion commitment in Australia, New Zealand, Canada . . . and much of what has been the British world. Their struggle--which needn't have been a struggle--now is well into its second decade. Opposition, reluctance, resistance will take many forms. An Ontario industrial arts educator

has sent me this by a columnist in the Picton Gazette:

> In the future they will spring this system on us, and I wonder who consulted who, nobody asked me and you about the switch. Anybody my age will spend the rest of his life mentally comparing metric with our present system of measurement.[12]

If such a person will listen, you can do a lot for "the cause." All the high-pressure advertising and promotion campaigns this side of Toronto cannot guarantee the good of one practical man-to-man talk. My favourite anti-metric orator--a Michigan type!--assures me that metric is unAmerican, ungodly, and a communist plot! When all else fails, he alludes to the Biblical cubit. They don't grow them like that in Nova Scotia! But those who will listen and comprehend, you certainly can convince. No one on Parliament Hill has opposed metric conversion as such . . . very significantly, I think. And in convincing, believe me, you learn. I've seen one long, erudite protest letter to a television station that speaks knowingly of "metric freaks" . . . "metric zealots" . . . "a very small (although noisy) minority" . . . the station was in Portland . . . the "metric freak" you'll meet tomorrow--name's Howard Faulkner! I just don't rate letters like that!

Learn SI. Learn to think in it . . . to write it . . . to use it in the appropriate contexts. (I heartily recommend the Metric Commission booklet, How to write SI.) SI is a language, a measurement language . . . it's learned as a language--which, believe me, means not solely out of a book. Walk a kilometre . . . a brisk ten, twelve minutes.

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[12] Harry Evans, "'Arry Sez," Picton Gazette, 10 April 1974.

Get bathroom scales in kilograms . . . not "kilograms and pounds"--"dual," we well know, is useless for learning. It may be necessary on shop equipment, this we all realize, but it's not the way to take the plunge into a metric tomorrow. If there's a chef in the room, whomp up a metric recipe. You quickly "get the hang of it," and find that it's not hard at all. Remember, it's decimal; and sensible precision is crucial. Measure your height to the centimetre (not millimetre) . . . your mass to the kilogram (not "half kilogram," even if that absurdity is on the scale). Think in metric. Surprisingly quickly it becomes a part of your life.[13]

Outside Teachers College is what has been hailed as Canada's first "metric awareness" road sign . . . Halifax, 97 km; Sydney, 330; Yarmouth, 378. We've come a long way since students put together that sign, and Mr. Hall unveiled it, back in 1972. Five classes of students have comprehended that metric is the essence of simplicity . . . and that the teaching challenge is good measurement teaching, and metric follows. To you for whom good measurement teaching has always been fundamental to your task, I wish you two good days of SI discovery . . . and growth and leadership in the work that lies ahead.

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[13]However, one warning: conversion is not a one-shot effort . . . you must keep at it or thought patterns tend to revert. I tell the story of the school inspector who was organizing teacher workshops. "Metric, isn't it," queried a colleague of mine, "that's what everyone is into nowadays." "Why no," said the inspector, "that's what we did last year." Even during the late stages of my dissertation writing, when everything else (except teaching) had to suffer, I noted a conspicuous backsliding. Why, our Phys Eds, at one point, were sponsoring a three-mile walkathon! Shifting thought patterns takes time, but persistence pays off.