JUNIOR CYCLE SCIENCE

Syllabus or Specification?

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Introduction

This article arose as a result of correspondence sent to the Hon Secretary of the ISTA and discussed at the ISTA Council meeting held on 3rd Feb 2018. The correspondence referred to the Chairman's Report written by Mr Sean Fogarty, Hon Chairman ISTA, which was published in a recent issue of SCIENCE. (Fogarty S, 2017). The writer of the letter was critical of the fact that the Hon Chairman referred to the new Junior Cycle science course as a "syllabus". The writer described this as one of the "factual inaccuracies" in the article published in SCIENCE and pointed out that "what has been published by the NCCA is a Curriculum Specification for Junior Cycle Science". Since both terms are often used interchangeably, I was asked to clarify the situation and undertook to write this article.

In consulting dictionaries, I decided to visit the UCC library to consult printed copies of large volumes of dictionaries rather than simply going online as I wished to ensure that the sources consulted were trustworthy as printed publications of dictionaries are generally peer-reviewed prior to publications.

What is meant by the term "syllabus"?

In the *International Dictionary of Education* (1977) Page and Thomas define the term syllabus as "an outline or brief description of the main points of a text, lecture or course".

Rowntree (1981) in *A Dictionary of Education* defines the term syllabus as "An outline of the topics to be covered in a course".

In the *Longman Dictionary of the English Language* (1995) the term syllabus is defined as "a summary of a course of study or of examination requirements"

The *Oxford Advanced Learner's Dictionary* (2002) defines the term syllabus as "A statement or outline of the subjects covered by a course of teaching; a programme of study." This dictionary contains two examples of the usage of the word: "A play by Shakespeare is on our syllabus" and "He preached with nothing more than a syllabus of his discourse before him".

It is interesting to observe that terms such as "outline" and "summary" are commonly used to describe the meaning of the term syllabus.

What is meant by the term "curriculum"?

Rowntree (1981) in *A Dictionary of Education* explains the term "curriculum" as "the total structure of ideas and activities developed by an educational institution to meet the learning needs of students and to achieve desired educational aims. Some people use the term to refer simply to the content of what is taught. Others also include the teaching and learning methods involved, how students' attainment is assessed, and the underlying theory or philosophy of education".

In the *Longman Dictionary of the English Language* (1995) the word curriculum is defined as "the courses offered by an educational institution or followed by an individual or group". Note that this dictionary uses the plural "courses" rather than the singular form.

The *Oxford Advanced Learner's Dictionary* (2002) defines curriculum as "the subjects that are included in a course of study or taught in a school, college, etc". Note that the dictionary also uses the plural "subjects" rather than the singular form. It gives as an example of the usage of this word in the sentence "Spanish is on the curriculum".

The term curriculum generally refers to the overall programme of study followed by students, e.g. in Ireland we refer to the Junior Cycle curriculum, in the UK they refer to terms such as the National Curriculum and the Scottish Curriculum for Excellence.

In explaining the Curriculum for Excellence in Scotland, it is stated that "the term curriculum is understood to mean everything that is planned for children and young people throughout their education and not just what happens in the classroom" (Curriculum for Excellence, 2010).

Hence, we may conclude that the term "curriculum" is a very broad term covering an entire range of different subject areas.

What does the term "specification" mean?

Let us first consider the meaning of this word in general and then discuss when it started to become commonly used in education to describe a course of study.

In the *Longman Dictionary of the English Language* (1995) the word specification is defined as "a detailed precise description of something (e.g. a building or car) especially in the form of a plan or proposal"

The *Oxford Advanced Learner's Dictionary* (2002) defines specification as follows:

"An explicit or detailed enumeration or statement ….. A document drawn up by the applicant for a patent, describing the construction and use of his or her invention … A detailed description of the dimensions, construction, workmanship, materials, etc. of work done or to be done, prepared by an architect, engineer, etc."

This dictionary gives some examples of the use of the word specification: "His distilled advice was 'Work!' without any specification as to what the work should be' and "A new house built in accordance with my father's specifications".

Note the use of words such as "explicit", "detailed" and "precise" to describe the term specification.

The use of "specification" in Education

For the past thirty five years, I have been visiting the Association for Science Education (ASE) conference. The ASE is the UK equivalent of the ISTA as it is the professional body representing science teachers in the UK. I find the conference very beneficial as it keeps me up to date with developments in science education in the UK. Since some of my student teachers find employment in the UK, it also helps me to prepare them for teaching the General Certificate of Secondary Education (GCSE), and Advanced (A) level courses in the UK. During

the ASE conference, I never miss a visit to the exhibition stands of the Examination Boards (also called awarding organisations). Unlike Ireland which has just one examination board (the SEC), there are several exam boards in the UK. These exam boards are independent organisations which set and mark exam papers for examinations such as the GCSE (taken around the age of 16) and A-level programmes (usually taken around the age of 18). The examination board qualifications and assessments are regulated by a government organisation called The Office of Qualifications and Examinations Regulation (Ofqual).

In the UK the change from using the term "syllabus" to "specification" took place around the Curriculum 2000 reforms. In keeping with the meaning of the term "specification", the new specifications contain the syllabus but with additional guidance on the scope of the content which will be assessed, clarifications on depth of treatment for teachers and details about assessment structure.

Some examples of exam boards are EdExcel, OCR (Oxford Cambridge and RSA Examination), and teachers are free to choose which specification they will adopt for their own students.

Figure 1. Examples of four GCSE specifications published by some of the examination boards (awarding organisations) in the UK. These documents satisfy the criteria of "Specification" as they specify the depth of treatment giving detailed and precise guidelines to teachers on topics to be covered and laboratory practical work to be carried out.

All of the specifications published by the exam boards are very detailed documents as shown by the page numbers summarised in Table 1. The full documents may be downloaded using the URLs given in the list of references.

Examination Board / Awarding Organisation	GCSE Science specification	Document size
AQA	Combined Science	187 pages
EdExcel	Combined Science	115 pages
OCR	21st Century Science Combined Science	161 pages
OCR	Gateway Science	152 pages

Table 1 It is appropriates to refer to the syllabi published by these examination boards as "specifications" as the guidance provided to teachers is very detailed in terms of the depth of treatment of each topic being clearly specified.

In contrast, the Junior Cycle Science syllabus (2015) does not satisfy the basic criteria to be called a "specification" since it could not be described as a detailed or precise description and does not specify any depth of treatment, Fig. 2.

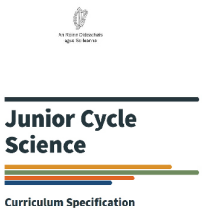

Figure 2. The document published by the NCCA is more correctly called a syllabus rather than a specification since it is simply an outline of what is to be covered and does not specify depth of treatment or give any detailed or precise guidance to teachers.

The final draft of the Junior Cycle Science syllabus (2015) is only 26 pages in length of which only 5 pages contain learning outcomes relevant to each strand of the syllabus, i.e. except for some general references, each strand of the syllabus (Nature of Science, Biological World, Chemical World, Physical World, Earth and Space) are each described by a single page of learning outcomes. Without doubt, this document satisfies the criteria of "outline" or "summary" as used to describe a syllabus.

The Hyland Report

The Junior Cycle Science syllabus (2015) follows the same format as the proposed new Leaving Certificate syllabi in biology, chemistry and physics, i.e. essentially a list of topics and learning outcomes associated with each topic. In the Hyland Report (Hyland A, 2014), Professor Hyland voiced her concerns about this format being used and stated "in every public examination system identified for this report, the syllabi for the end of senior cycle examinations include considerable detail about depth of treatment, examination specification, practicals and laboratory experiments and other advice for teachers and pupils. While learning outcomes are specified in all the syllabi, they are only one element of the detail provided". (Hyland A,2014).

A synthesis of the Hyland Report summarising the key findings has also been published (Kennedy D, 2014) . It is interesting to note that the current Leaving Certificate syllabi in Biology, Chemistry and Physics easily satisfy the criteria to be referred to as "specifications" since each syllabus contains details of depth of treatment, social and applied aspects as well as details of student and teacher activities and laboratory practical work.

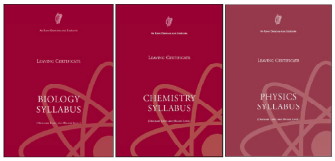

Figure 3 The three Leaving Certificate syllabi currently being taught are detailed and precise documents and hence are worthy of the term "specification" to describe them.

The problems highlighted in the Hyland Report are now being experienced with the Junior Cycle Science syllabus and it is not surprising that the ISTA chairman stated that "it is high time that a clarification document was produced removing all the ambiguities in the syllabus..... that is in line with the reality of the assessment that will be employed and that clearly identifies what will and will not be examined"

Conclusions

It is certainly appropriate to describe the Junior Cycle Science document as a syllabus as the document

simply contains an outline of learning outcomes to be achieved by students. It is clear that the word "specification" has the same meaning in the world of education as it has in everyday usage, i.e. a detailed, precise description. The Junior Cycle science syllabus does not give detailed and precise guidance to teachers regarding any depth of treatment or laboratory practical work and hence it is not appropriate to use the term "specification" to describe it.

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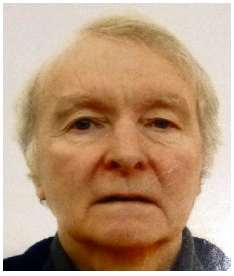
ENERGY

How the concept develops in Junior Science students

Ted Forde

Retired Chemistry Teacher



Many of us are familiar with how the concept of heat evolved from the 19th century notion of a fluid, known as caloric, to the more modern kinetic concept that explains heat in terms of moving particles.

Twentieth century properties of heat are still evolving as Carlo Rovelli describes in his recent short text *'Seven brief lessons on Physics'* (1). Heat is an everyday phenomenon. So it is intriguing to see it described in a novel context. Rovelli suggests that there is a tie-up between heat and time. He tells us that, if there were no heat exchange involved in such phenomena as the movement of our planets or of a swinging pendulum, we would be unable to distinguish the past from the future. Movements in both directions would be identical. However, there is heat loss involved in both cases, tiny in the case of the planets but more easily observed in the case of the pendulum. This heat loss allows us to distinguish the future (towards which the pendulum slows) from the past. For further discussion see his text.

From a teaching perspective our current ideas on how children's ideas on energy develop are also intriguing.

Driver (2) suggests that a difficulty for students is that while we may observe energy changes it is not possible to observe energy itself.

In broad terms student ideas may be described as a progression from concrete and personalized views of energy to more abstract concepts as shown in fig. 1.

Some references will be made to a study carried out by the present writer (3). The sample involved ninety students taking ordinary level junior science. In terms of gender, the sample was made up of 46 boys and 44 girls. There were 31 first year and 59 third year students.