Language in content subjects from curriculum to test

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It's interesting to take a look at test items and ask yourself to what extent learners have been prepared to answer the questions in the test. I'm not just talking about the content. Being able to express in written form a sentence or paragraph in answer to a question involves more than understanding concepts. Indeed, you could argue without the language to express your understanding, that your understanding is less.

I often use the following test item from maths as an example to discuss this point with teachers.

5 Generate and solve problems with functions and graphs

5.1 Use a graphics calculator to plot and interpret a range of functional relationships, some continuous and others discontinuous, arising in familiar contexts.

Ahmed does a parachute jump. He jumps out of the plane and falls faster towards the ground. After a few seconds his parachute opens. He slows down and then falls to the ground at a steady speed. Which of these graphs shows Ahmed's parachute jump? Explain why each of the other graphs is wrong.



Figure 1: Maths test item

There are two parts to the test item. The first part of the question asks learners to simply choose which graph they think fits the description. So, they need to understand the text and then be able to relate that to the correct graph and pick a letter. The second part of the test item asks learners to do a number of things which are clearly linguistically more challenging.

In order to give a description of the other three graphs, and explain why they are the 'wrong' graph, learners will need to be able to bring to their writing several functions of thinking and language. Firstly,

they will need to be able to describe 'shape in graphs'. This might include 'sharp fall', 'slow decline', 'gradual fall' and so on. Secondly, the learners will need to make use of phrases for 'explaining meaning' in the shapes, for example a learner might use the verb phrase 'would suggest' for graph C adding their interpretation for the drop in height to zero. Lastly, learners will need to use a phrase or two for 'drawing conclusions' and writing 'this means that', or 'We can conclude from this that' follwed by information about the 'right shape' allows them to hone in on the correct graph. We can conclude, then, that learners who have not had their attention drawn to these three areas of 'general academic language' and experienced some 'practice' of using this language will be likely to do less well on this task.

So how do we focus attention on and practice general academic language?

The first job for any teacher is to know what general academic language is needed for any given topic in their curriculum.



Let's take a further example in more detail at the topic of 'circulatory systems' in Biology.

Figure 2: Investigating resources from curriculum to test

The busy image in Figure 2 offers an overview of places to look for language beginning with the curriculum guidelines, or objectives for a unit of work, through textbook pages, to test items and followed by suggestions for sample (general academic) language needed to answer test questions, and also an extra task suggestion for 'practice' of the language identified. Let's go through each of these steps in turn.

1) Curriculum guidelines

8.8 Explain how the structure of the heart and circulatory system is related to its function, including the role of the major blood vessels, the valves and the relative thickness of chamber walls 8.8 sets the scene for a description of the structure of the heart, the different parts and their relative roles. What we don't have here, and what we can find in textbooks, is explaining what happens when the heart or part of the heart misfunctions. Also, something else missing is how the human heart compares with the heart of other animals which we can also meet in study materials and test items.

Nevertheless, we have a clear indication that learners are expected to know the structure of the heart and circulatory system and to be able to describe and explain the structure and parts and what they actually do (it's assumed then that explaining about problems and making comparisons will occur and will be dealt with during the learning process).

2) Textbooks



Figure 3: The Human Heart

Figure 3 gives a basic illustration of the heart and points out that the muscle wall of the left ventricle is thicker than that of the right ventricle, there are valves which prevent backflow. Arrows indicate direction of blood flow.



Figure 4: Text on Closed Circulatory Systems

Part of the textbook text describes open and closed circulatory systems and describes single and double circulatory systems giving examples of a fish heart for the first, and mammals for the second.

3) Highlighted Command Words

If you're lucky, your textbook will make visible the command words that appear in your curriculum objectives. It makes a lot of sense for learners to see these terms alongside the very content they represent. A simple reason for this is that it is the 'command words' that are centre stage on the tests that learners do. In the examples in Figure 1, unfortunately, the command words are not highlighted or explained in any way more than appearing in actual questions.



The language itself that is needed to express the functions in the command words appears throughout the textbook pages. There are several examples of 'comparison' in the first page (The larger ... , and the smaller ... , the more ... ; Smaller ... can use Larger ... use



For 'describing differences' all three pages have examples of 'characteristics' and 'properties' (... share common ... ; ... consist of ... ; which can be combined with phrases for 'contrasting' and expressing differences (... have ... whereas ... have ... ; ... is different to ... ; Both systems have ... but in



Process language which naturally would appear in any 'explanation' of how structures and parts relate to functions (... need ... in order to ... ; This improves the speed ... ; ... this system allows ... ; ... can contract ... ; ... prevent ...) can be found on all three pages.



Lastly, ample phrases used for 'giving reasons' can be found in the pages (...do not need ... because ... ; ... so it does not ... ; ... making sure (that) ... ; There is a ... because ...).

Clearly, the assumption in this teaching and learning material is that learners will 'pick up' this general academic language' from somewhere and be able to express it when needed. I question this assumption, even in mother tongue settings, and suggest that particularly when working through a foreign language it can pay dividends for teachers to *highlight* and *practice* this language 'along the way' while going about the business of teaching and learning the subject. The extent to which a teacher will focus on this essential language, will naturally vary from context to context, but the very least teachers can do, and do quite easily, is become familiar with this language so that when opportunities and needs

arise they are equipped to be able to provide samples to learners.¹ There are a great many sources of information about this 'general academic language' but there is a job to do for colleagues to find it and organize it themselves in a way that they can use for their own specific needs. Your CLIL on Macmillan's <u>www.onestopenglish.com</u> website offers a collection of academic word lists with accompanying context lessons for a number of themes from natural and social science subjects, but it's not extensive. Ultimately, what we need is someone to do a PhD project in the style of Averil Coxhead's Academic Word List, perhaps one for primary CLIL and one for secondary CLIL. Until, then, we'll have to make do with helping each other and sharing what we produce ourselves.

In some textbooks, it is possible to find a 'language focus' box presenting some phrases which support general academic language. Nevertheless, having some techniques and tasks for highlighting and activating this language can be very helpful for teachers. One thing is clear and that is that it is surely haphazard, random and unpredictable to rely on learners 'finding' this language themselves, particularly when occurences of it are rare and unvaried on the page of the textbooks.

I recommend to teachers that they look elsewhere for sample language. If a teacher attempts to write an answer to a test question they will see immediately the kind of academic language they would make use of, and that may be a good sample of language to make available to their learners. Having a talk with a colleague focusing on exercises and questions can throw up useful language. Teachers need to be able to 'listen' to themselves and fish for language to give their learners. Other sources of necessary general academic language are curriculum documents, mark schemes and scripts.

4) Mark scheme and marking guidance

Question number	Answer	Mark
1(c)	 the fish heart has two chambers rather than four chambers (1) the fish heart only has one ventricle and one atria rather than two ventricles and two atria (1) only deoxygenated blood flows through the fish heart (1) the fish heart shows a single circulatory system rather than a double circulatory system (1) 	(4)

Figure 5: Giving an answer comparing / contrasting two items

A quick look at Figure 5: Giving an answer comparing / contrasting two items, gives us an indication of some general academic language NEEDED for structuring and expressing an answer.

'... x has ... y ... rather than ... z ...'

- "... x only has one ... and one ..."
- '... x shows ... y ... rather than ... z...'

https://www.victoria.ac.nz/lals/resources/academicwordlist

¹ Tertiary level courses in Law, Medicine, Business and many others have been fortunate in that a postgraduate work has been done which provides precisely for this area of general academic language. Averil Coxhead's Academic Word List is a rich resource for colleagues working in specific subject areas through English as a foreign or second language

In the classroom, a short, clear focus on options of language for 'comparing / contrasting' can be helpful for learners.

Comparing and contrasting

The human heart is like / unlike the fish heart	with respect to
The human heart and the fish heart are dis/similar	as far as is concerned
The human heart is similar to / unlike the fish heart	regarding
The human heart is the same as / different from the fish heart	in that is the same.
The human heart resembles / differs from the fish heart	in terms of
	in

Both the human heart and the fish heart (do) ...

The human heart	Similarly, it has a Likewise, it has a Correspondingly, it has a It has a, too. It also has a	On the other hand, whereas, while, however, by contrast	a fish heart
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Figure 6: Language for comparing and contrasting

Figure 6 offers a range of structures which can be used for writing a comparison between the heart of a fish and a human heart. Try not to let yourself pick and choose from the collection right now! Let's take a look at another area in the sample materials in this investigation.

Question number	Answer	Mark	
1(a)(iii)	 An answer that combines the following points of understanding to provide a logical description: blood would flow backwards from ventricle to atria/blood will leak through (1) less (oxygenated) blood would be pumped to the body (1) 	(2)	

Figure 7: Giving an answer making predictions

In learning how to describe how the human heart works, it's quite possible that learners will be asked to describe what happens when things don't work properly. It's an advanced but clearly useful cognitive challenge to make predictions and we can see that the mark scheme in Figure 7: Giving an answer making predictions makes use of conditional structures with 'would'. This is assuming sentences being written beginning with 'If...'. To follow through then on my argument, it would make sense in the classroom to have attention drawn to structures which enable learners to express predictions about problems with the heart and circulatory system.

Predicting

If ... a happens, then ... b happens / will happen

Predicting with a lesser degree of certainty

If ... happens,... may/might/can/could happen (possibility) If ...happened, ...would happen (probability) Assuming...happened, ...would happen (probability) If ...had happened, ...would have happened (speculation about the past)

Predict using a negative construction

Unless ... happens, ...will not happen / ... will not happen, unless ... happens If/When... does not happen, ...will happen / ... will not happen, if ... does not happen

Figure 8: Language for making predictions

Again, try and avoid, please, honing in on any particular structure that you would argue is not appropriate. What I'd like to focus on is the physical process of coming up with this language, writing this language down. Deciding what to use, and what not to use is the next job for the teacher and it is the task itself that will determine what general academic language fits the purpose.

5) Test items

(c) Compare the differences between the structure of the circulatory system of a fish and the human circulatory system.

Figure 9: Test question compariing two items

With the specific test item in Figure 9: 'Compare the differences between the structure of the circulatory system of a fish and the human circulatory system' we see quite easily what general academic options are available to the learner from those presented in Figure 6.

(4)

From the language presented, pick two phrases/structures. Choose a structure (a) you would consider appropriate for the whole class; pick a second structure (b) you would be happy to make available for your more advanced language users.

You may (or may not!) choose the following.

(a) The human heart is different from the fish heart in that the human heart has four chambers, and the fish heart has two.

(b) The human heart and the fish heart differ in terms of the number of chambers. The human heart has four chambers, whereas the fish heart, by contrast, has two.

(iii) Describe what would happen to the flow of blood in the left side of the heart if the bicuspid valve did not function effectively.

(2)

Figure 10: Test question making a prediction

With the specific test item in Figure 9: 'Describe what would happen to the flow of blood in the left side of the heart if the bicuspid valve did not function effectively' we can see quite easily what general academic options are available to the learner from those presented in Figure 8.

From the language presented, pick two phrases/structures. Choose a structure (a) you would consider appropriate for the whole class; pick a second structure (b) you would be happy to make available for your more advanced language users.

You may (or may not) pick the following:

(a) If the bicuspid valve does not function properly, blood flows backwards from the ventricle to the atria. As a result, less oxygenated blood is pumped to the body.

(b) If the bicuspid valve doesn't function properly, blood may/might/can/could flow backwards from the ventricle to the atria. As a result, less oxygenated blood may/might/can/could be pumped to the body.

My final word on test items is quite a simple maxim: 'we shouldn't test what we havent taught'. In this context, I would argue that many assumptions are made on learners (including mother tongue learners) in this regard where learners are expected to perform linguistically in 'tests' when they are unlikely to have had much if any focus on the general academic language they need for 'passing tests'. I stress that this is not the same as focussing on key subject-specific terminology, which in many cases does get bolded in textbooks, and get its own place in a glossary at the back of the book. General academic language like the above, on the other hand, is dealt with randomly even in many so-called CLIL textbooks. In my opinion, it certainly is one criteria teachers can and should use when assessing the quality of a coursebook, namely to what extent the course deals with this general academic language of the subject.

6) Cognitive-academic language functions

Here, we have looked at 'comparing and contrasting' and 'predicting and describing conditions'. What teachers need through is a reference they can use which covers all the academic functions of language which occur in the subject specialism. This reference will present 'basic' and 'advanced' phrases and structures that the teacher can then make decisions about use in their classes. I've started a work in progress which I've called 'The Language Audit' which I share with teachers in my workshops. I also set colleagues the challenge to consider 'what is missing', because it goes without saying that these colleagues know their subjects much better than I do, and so investigating their subject for cognitive-academic language functions is a good professional job to do. I invite colleagues to then add their discoveries to the language audit document. In many cases colleagues can take a function from another subject and simply adapt it to suit their own subject area.

In the example we're given above in Figure 2: Investigating resources from curriculum to test there are many more cognitive-academic language functions that the two I've dealt with in this article. We can see the following: describing function/purpose predicting describing process/sequence/conditions describing consequences comparing (describing process) describing characteristics (function/purpose)

From the short list identified, we can see that there is overlap. This is quite normal and to be expected simply because functions *do not exist in isolation* but coexist with the other functions and concepts in any given 'theme' in a unit of work. Indeed, this fact suggests to teachers and curriculum designers that a sequenced approach to cognitive-academic language is need where along with the growing complexity of the concepts in a course, there should go hand in hand a development of the general academic language.

7) Tasks for activating cognitive-academic language

The human heart is made up of four large chambers called the atria and ventricles. There are two of each.	is not as efficient as a four-chambered system.	
While the human heart has four large chambers,	Insect hearts, by contrast, have just one chamber.	
insects have a one-chamber heart,	However, there is a marine animal called a tunicate that can stop its heart and pump in the reverse direction!	
Humans have a heart which pumps blood only in one direction.	On the other hand, in a fish oxygenation occurs in the gills.	
In a human blood is oxygenated in the lungs.	By contrast, in humans the lungs alone put oxygen back into the blood.	
The human heart is similar to that of a cow	whereas bony fish have a two-chamber heart.	
The normal range of beats in a human heart at between 58-104 per minute	Similarly the heart rates of fish will fall to the lower end of the range of 60 to 240 beats per minute in colder water.	
Amphibians and reptiles have a heart with three chambers.	Likewise, your pet dog, cat, and horse also have two atria and two ventricles.	
A three-chambered heart in amphibians and reptiles	in terms of the average number of heart beats per minute.	
The heartbeat of reptiles and amphibians increases the higher the temperature.	is vastly different from a hamster with between 300-600 beats per minute.	
In amphibians the skin can help with gas exchange when submerged in water.	from that found in mammals, containing unique anatomical features such as air sacs.	
The respiratory system of birds differs significantly	a fish has two chambers.	

Figure 11: a task for activating academic language of comparison

We could simply stop here. A teacher may decide that making visible a couple of key structures for students is enough. It may be enough to have a single structure for the whole class, 'a bottom line', and a structure to feed the language need of the more advanced English users in the class. However, teachers may want to, need to, go further having identified learner needs wanting more general academic language support.

Figure 11: a task for activating academic language of comparison offers a single example focusing specifically on a selection of phrases students will meet (they all come from science textbook contexts) during their course, and it goes without saying that if students can draw on theese linguistic resources in

their own science utterances, written or spoken, they are likely to 'perform' better in the subject. There are a number of ways of using the resource in Figure 11. It could be cut up and handed out to pairs in class. The pairs read their 'strip' of paper which has the beginning and the end of a sentence which do not match. The teacher then picks one learner to read the beginning of their strip and invite a pair to put up their hand and read the ending of their sentence if they think it goes with the beginning they have heard. Once they 'loop' has been around the class and we get back to the beginning, then the teacher could hand out a worksheet to each student to work individually to match the sentence beginnings with endings. Lastly, the learners can get back into their pairs to check their matched halves.

Clearly, all of the above is a choice. Indeed, all dynamic (or passive!) activity in a class is a choice, it's a teacher choice. A CLIL teacher could do well to collect ideas for active tasks for the language in their subject like the one in the example above. A good place to start is by asking a language colleague!

8) Final words

This article had as its aim to begin to describe the investigation I believe is necessary for all subject teachers to get to know the general academic language of their subject, and to begin to think about how they can make this language available to learners. Lastly, we have one example of activating this language in supplement to teaching and learning the content. It should be said that the world of general academic language IS the language of exams, it IS the language which is accepted as standard for many subjects and as such, it IS crucial to a good curriculum in any given subject.

Sir Alan Bullock, in his ground-breaking report *A Language for Life* on language in education 1975 described the responsibility all teachers have for language in their subject classroom and this is as true today as it was in 1975, particularly if you teach CLIL.

References

http://www.onestopenglish.com/clil/clil-teacher-magazine/your-clil/ (accessed 14.01.19)

https://www.victoria.ac.nz/lals/resources/academicwordlist (accessed 14.01.19)

http://www.educationengland.org.uk/documents/bullock/bullock1975.html (accessed 14.01.19)