Philippine National
RESEARCH CENTER FOR TEACHER QUALITY

An DFAT Australian Aid Project through the University of New England – SiMERR National Research Centre in partnership with the Philippine Normal University – The National Center for Teacher Education

Applied Policy-Relevant Research

Partnership funded through Australia AID

RCTQ

CONTEXTS AND PROCESSES FOR THE DEVELOPMENT OF CONTENT TESTS TO ASSESS TEACHERS' PEDAGOGICAL CONTENT KNOWLEDGE

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An DFAT Australian Aid Project through the University of New England – SiMERR National Research Centre in partnership with the Philippine Normal University – The National Center for Teacher Education

This presentation will cover:

1. Teacher Development Needs Study (TDNS) of RCTQ
2. Development of Content Knowledge Assessment to gauge in service and pre service teachers' readiness to teach K to 12
3. SOLO taxonomy

Disclaimer:

1. The report on TDNS awaits presentation with DepED Execom. No data maybe shown.

2. All sample items/questions which will be shown in this presentation are included in the 'long' content test and were removed from the National Sample Assessment content test.

The meaning of teacher quality

- Multiple meanings: e.g. academic ability, classroom practice, training and attributes of the teacher, raising student outcomes
- Few attempts to explicitly define meaning
- Cochran-Smith (2001) provides a historical overview of the emergence of the term and its different usages:

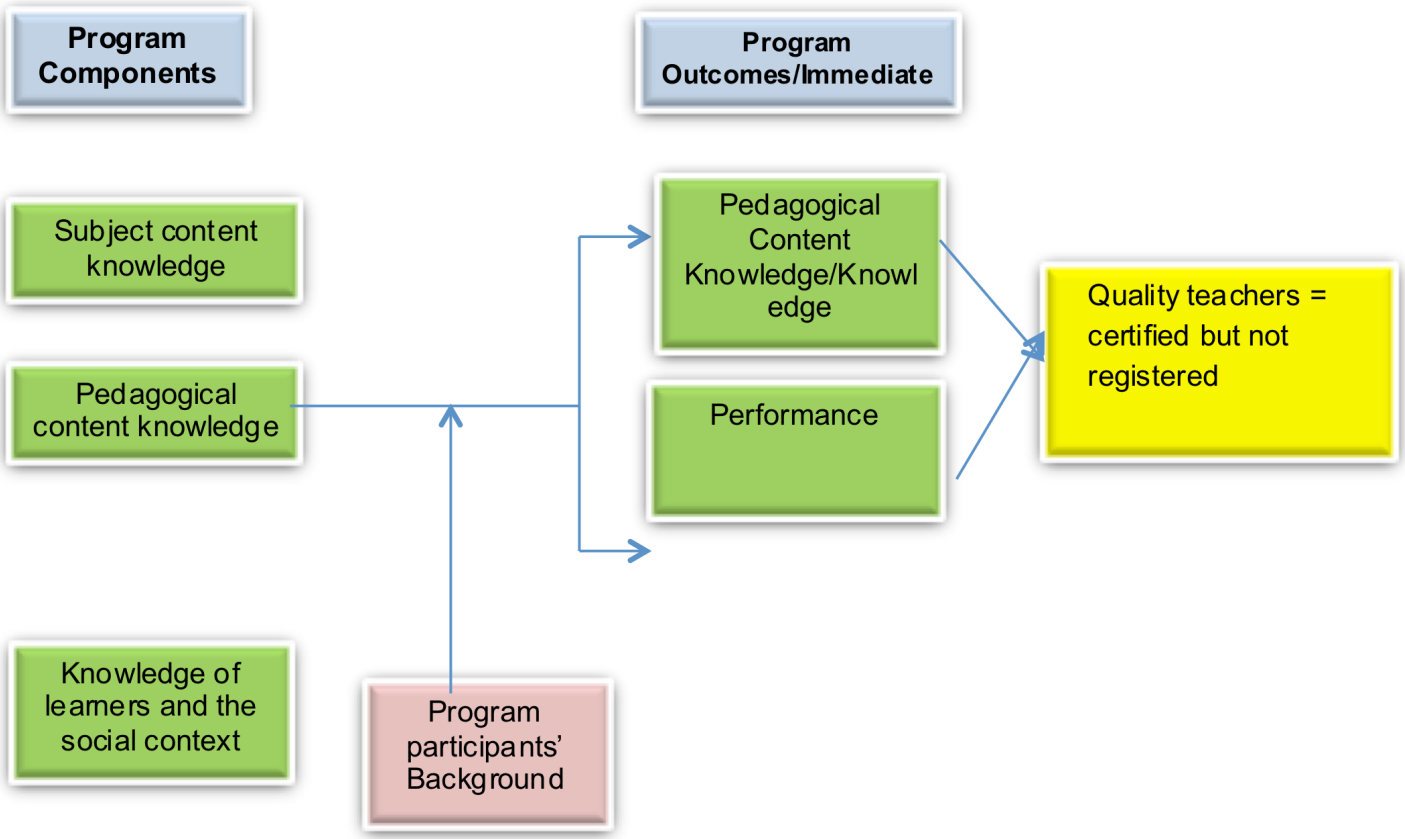
➢ Initial debates (1950s through the 1960s): the attributes approach

➢ late 1960s to the late 1980s: teacher effectiveness approach

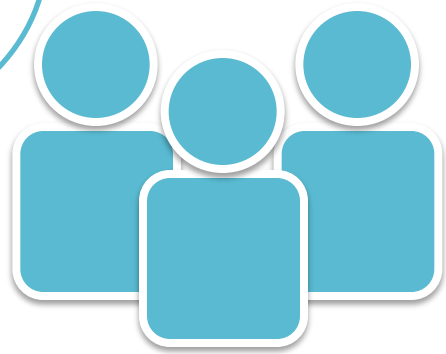
➢ early 1980s to late 1990s: teacher knowledge

➢ the 20th century and in the 21st century: the outcomes dilemma

Australian Aid and Teacher Quality



Teacher Quality Requirements in the K to 12



Know what to teach and how to teach it

- Strategies for developing critical and creative thinking skills
- Knowledge of research
- Use of Mother Tongue, Filipino and English in instruction
- Classroom communication strategies

Are responsive to learner diversity

- linguistic, cultural, socio-economic and religious backgrounds
- Learners in difficult circumstances
- Learners from Indigenous Groups

Plan and design effective instruction

Establish community relationships and uphold professional ethics

Engage in professional reflection and assume responsibility for personal professional learning

Use a variety of assessment tools to inform and enhance the teaching and learning process

Maintain a learning-focused environment

Dr. Dina Ocampo's 1st C:

CONTENT IS SUPREME!

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RCTQ's Research Projects at a Glance

1 Teacher Development Needs Study (TDNS)

2 Pre-service Teacher Development Needs Study (PTDNS)

4 Teacher Educator Development Needs Study (TEDNS)

a Assessment through TSNA
(Original 270 items / Short Form 101 items)

b Assessment through Content Tests
(Mathematics, Science, English & Filipino)

3 Developmental – NCBTS
(a continuum of professional standards for teachers across career stages)

2013 → 2014 → 2015

Monitoring, Evaluation, Certification & Recognition of Teachers and Institutions

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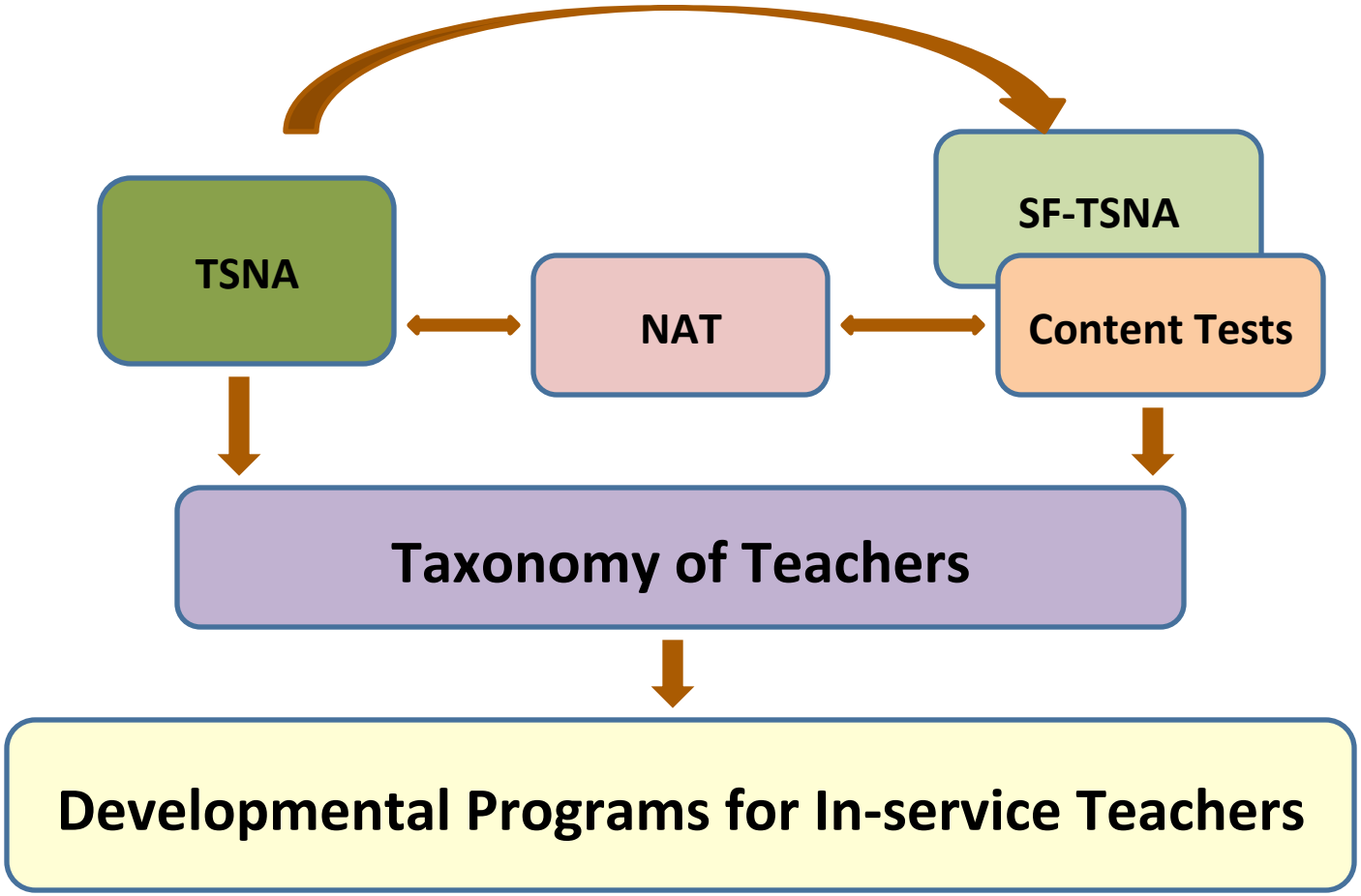
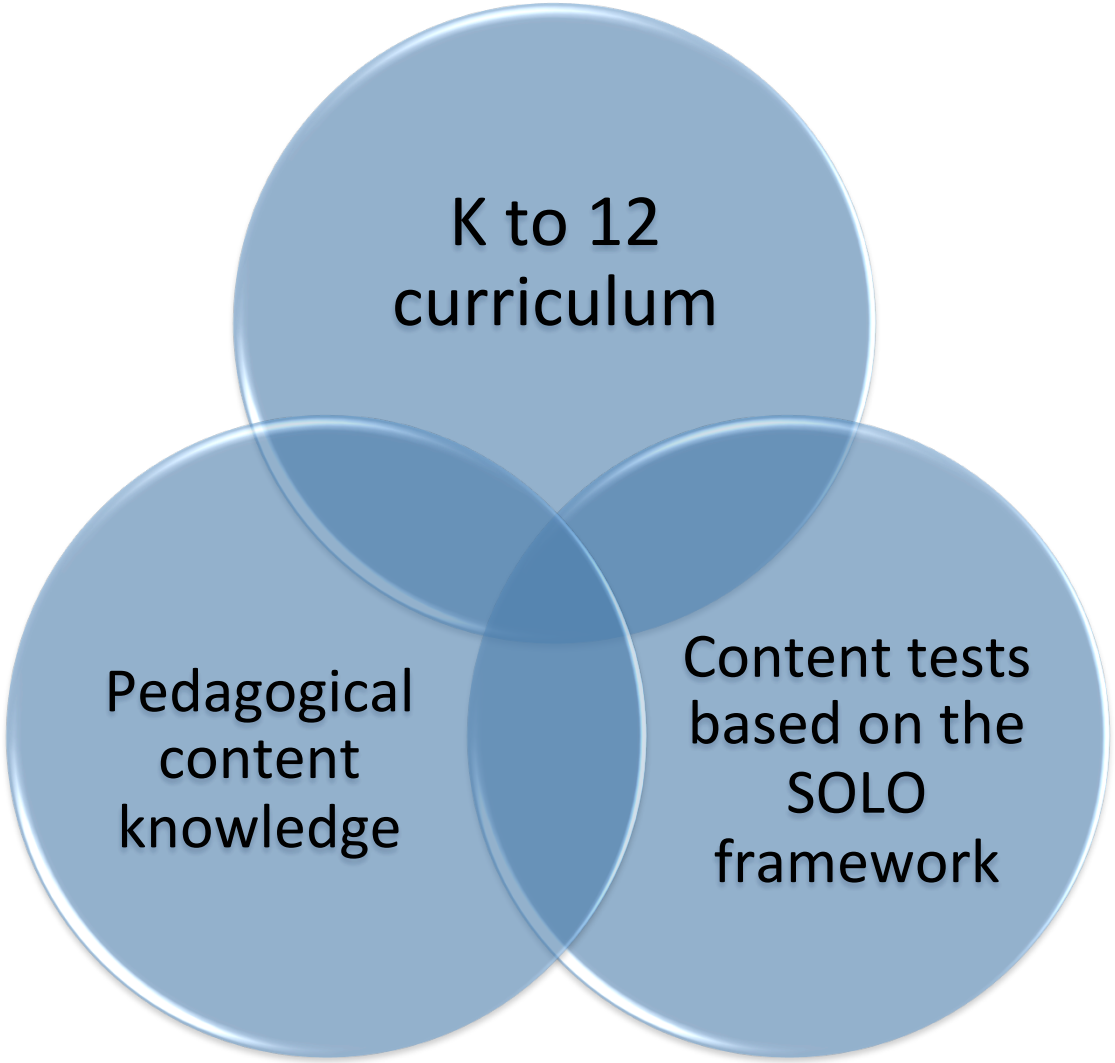
TDNS Conceptual Framework



The K to 12 curriculum, other than a response to the ASEAN 2015 is seen by the Philippine government as "designed to address the poor quality of basic education(http://www.deped.gov.ph/k-to-12/About/features).

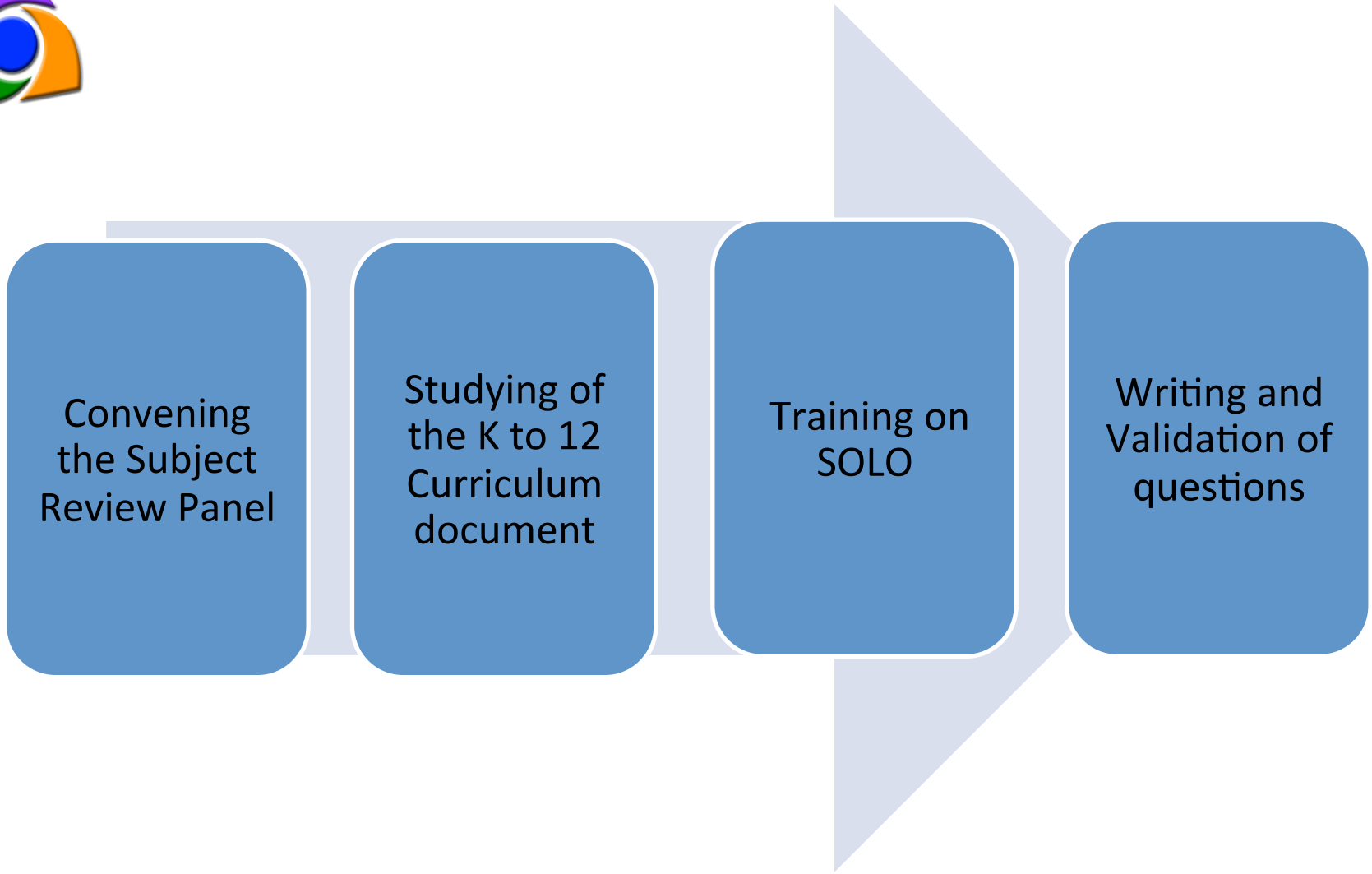
The law enacts several reforms and has the following salient features:

- Strengthening early childhood education or the Universal Kindergarten
- Making the curriculum relevant to learners (contextualization and Enhancement)
- Ensuing integrated and seamless learning or the spiral progression
- Building proficiency through mother tongue based multilingual education
- Nurturing the holistically developed Filipino or the College and Livelihood Readiness


K to 12 curriculum
Pedagogical content knowledge
Content tests based on the SOLO framework

Effective Test Development (Downing, 2006)

Over all plan
Content definition
Test Specifications
Item development
Test design and assembly
Test production
Test Administration
Scoring test responses
Passing scores
Reporting test results


Convening the Subject Review Panel
Studying of the K to 12 Curriculum document
Training on SOLO
Writing and Validation of questions

Convening the Subject Review Panel → Studying of the K to 12 Curriculum document → Training on SOLO → Writing and Validation of questions

1. They have relevant degrees in the fields of Mathematics, Science, English and Filipino.
2. They have been teaching the subject for the last 3 years.
3. They are involved in any work on curriculum.

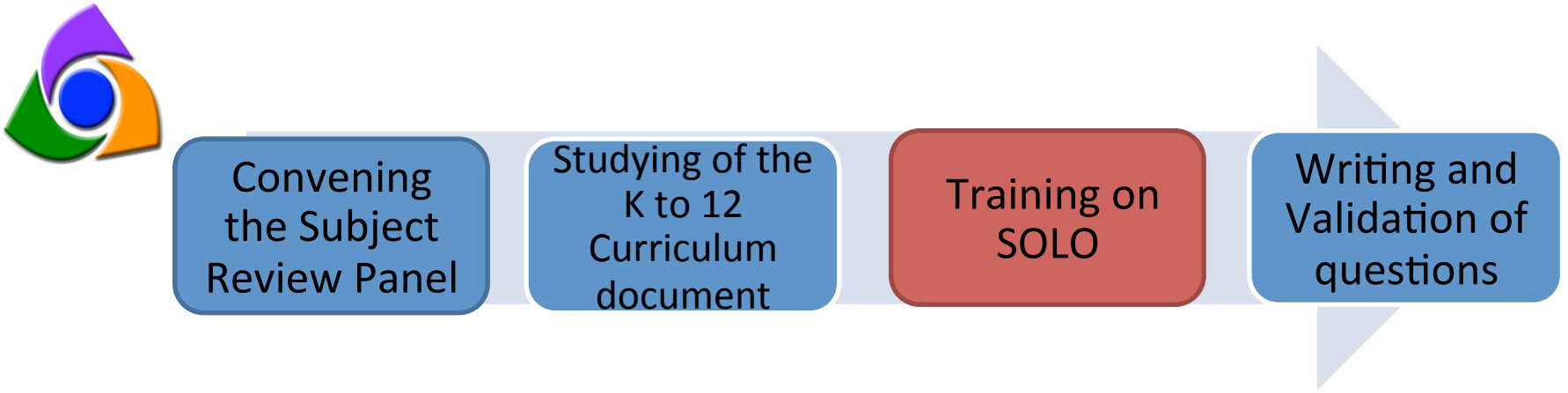
The members of the Subject Review Panel were from the Philippine Normal University, which has the mandate of helping teacher quality in the country being the country's National Center for Teacher Education, and from other Higher Education Institutions (HEIs) from the National Capital Region (NCR).

Convening the Subject Review Panel → Studying of the K to 12 Curriculum document → Training on SOLO → Writing and Validation of questions

The study of the documents led to the writing of the Table of Specifications (TOS) which focused largely on:

1. what can be measured in a pen and paper test. Some competencies, expectedly, are oral in nature, i.e. oral language competencies for English. Such are not included in the TOS and not reflected in the content tools.

2. competencies which reflect the alignments of the subject to the outcomes expected of learners who had training under the new curriculum; i.e. *Buo at ganap na Filipino na may kapaki pakinabang na literasi* from the Filipino curriculum.



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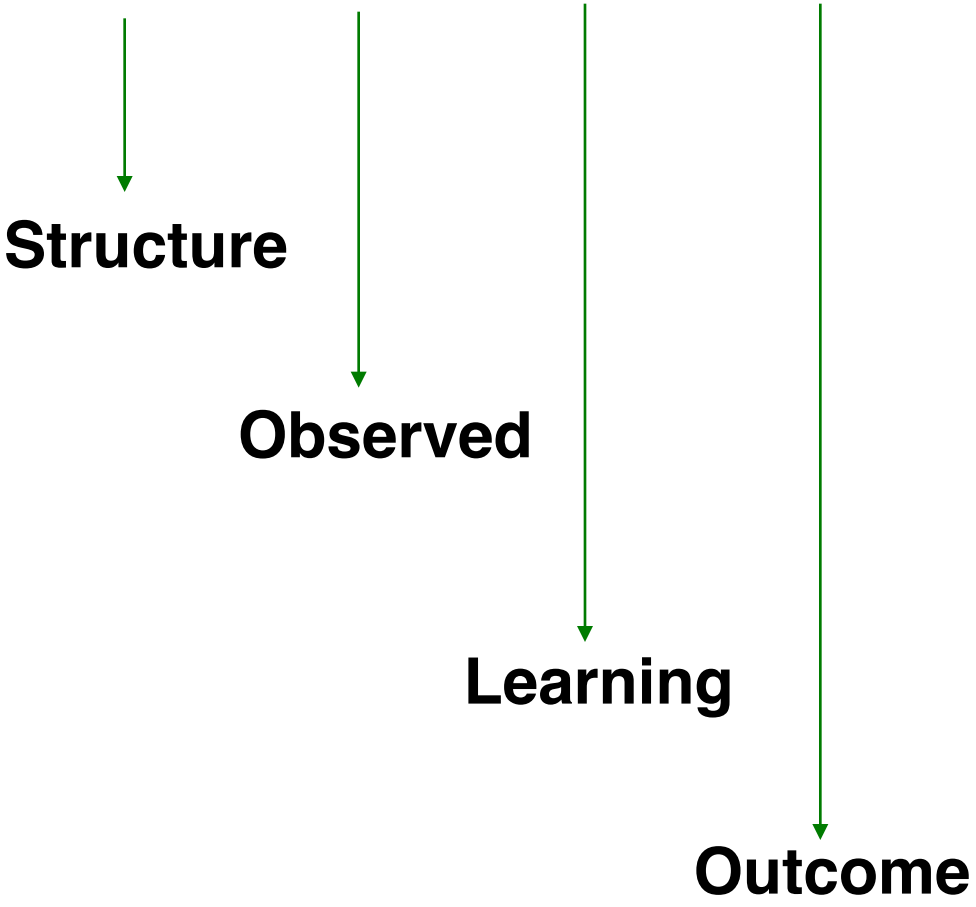
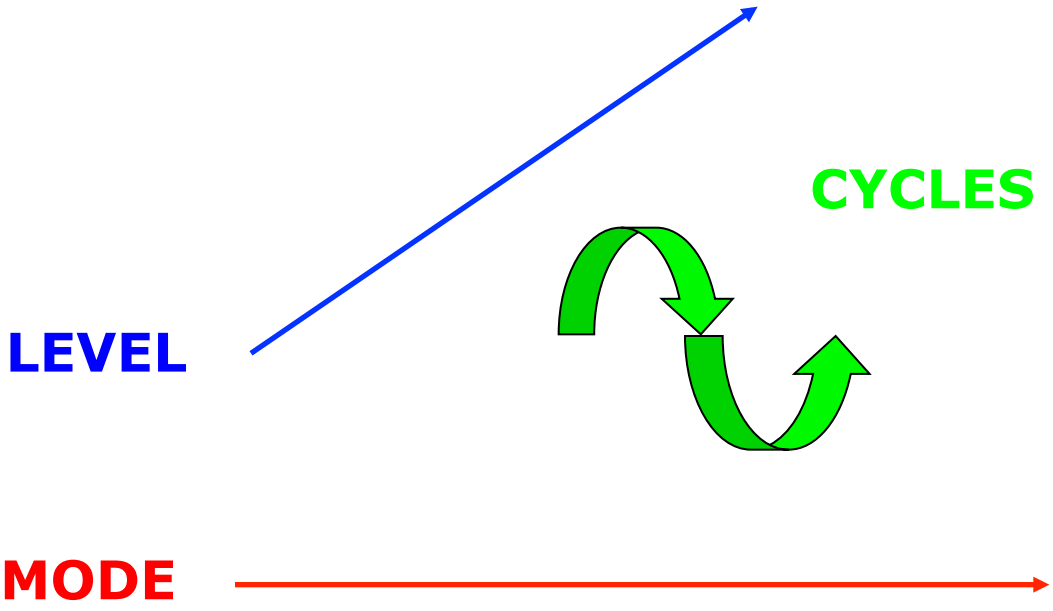
S O L O Model

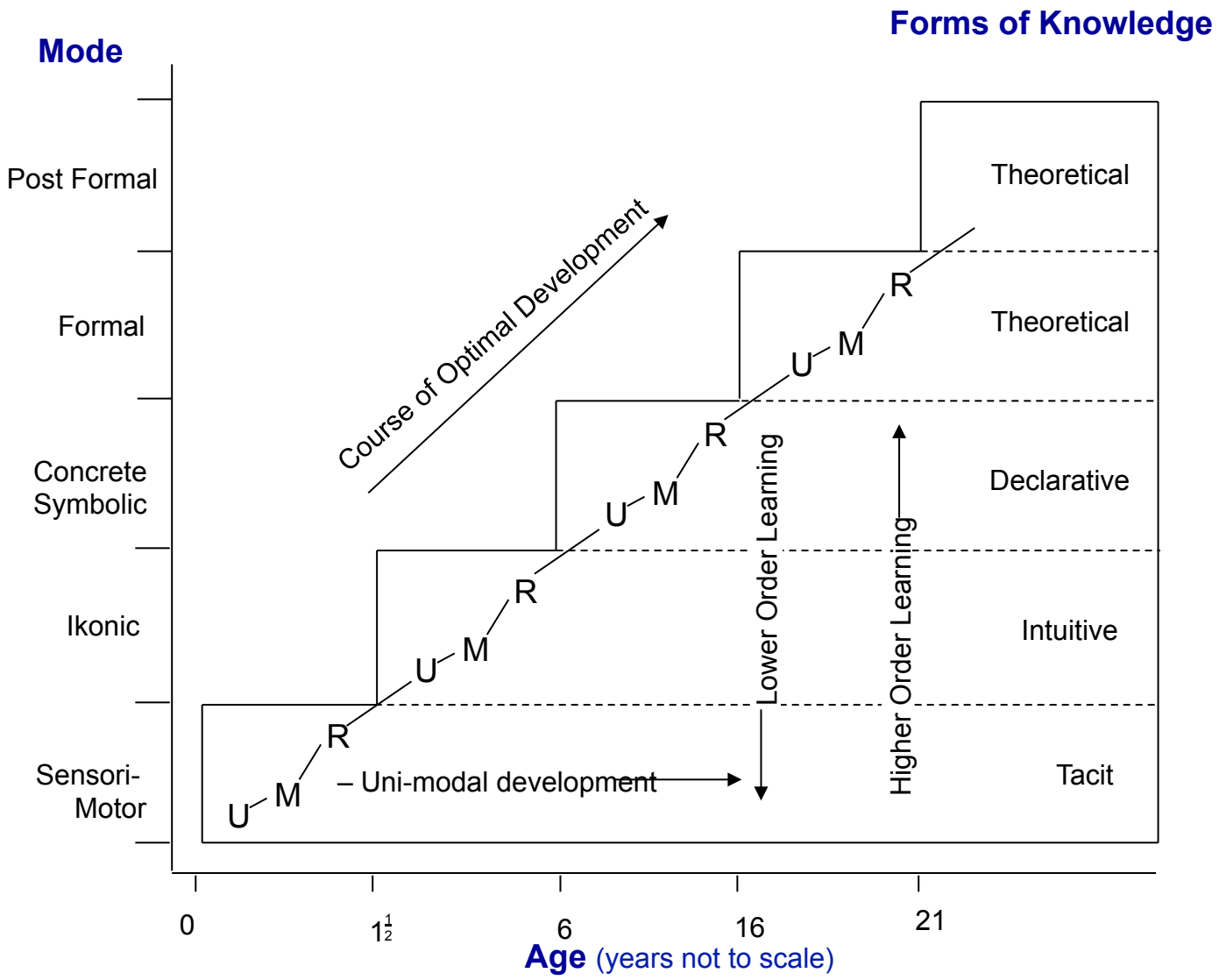


A system to classify the QUALITY of a response.

SOLO and its language



Modes, Learning Cycles and Forms of Knowledge

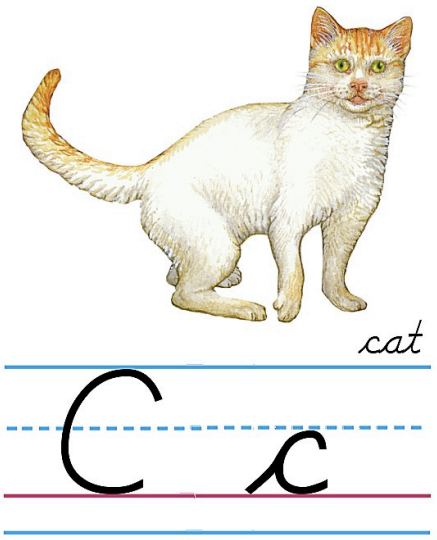


Descriptions of Modes in the SOLO Model

Sensorimotor:
(soon after birth)

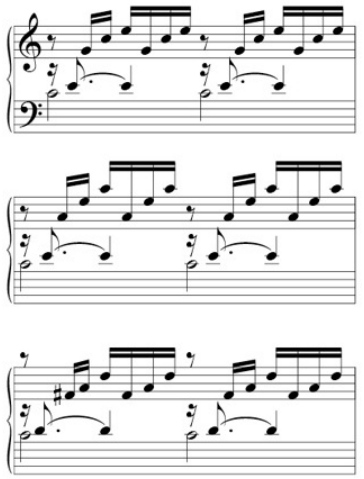
A person reacts to the physical environment. For the very young child it is the mode in which motor skill are acquired. These play an important part in later life as skills associated with various sports evolve.

Ikonic: (from 2 years)



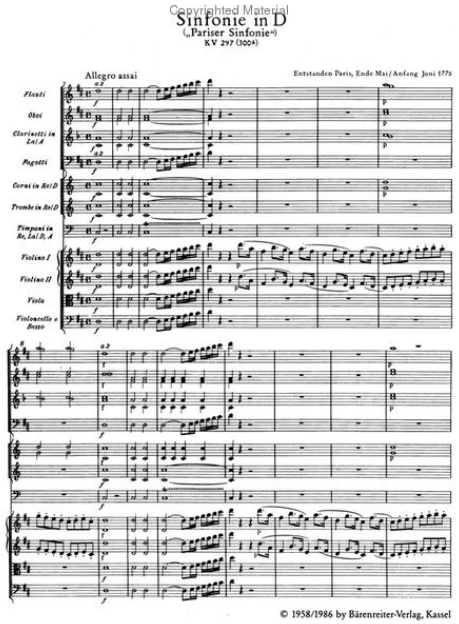
A person internalises actions in the form of images. It is in this mode that the young child develops words and images which can stand for objects and events. For the adult this mode of functioning assists in the appreciation of art and music and leads to a form of knowledge referred to as intuitive.

Concrete Symbolic:

(from 6 or 7 years)

M	U	S	I	C
		Free Space		

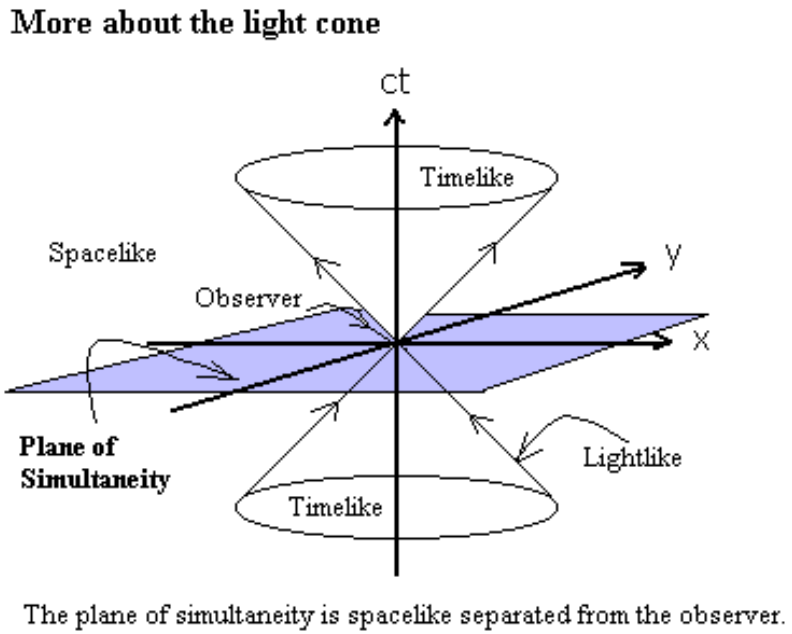
A person thinks through use of a symbol system such as written language and number systems. This is the most common mode addressed in learning in the upper primary and secondary school.

Formal:
(from 15 or 16 years)

A person considers more abstract concepts. This can be described as working in terms of 'principles' and 'theories'. Students are no longer restricted to a concrete referent. In its more advanced form it involves the development of disciplines.

Post Formal:

(possibly at around 22 years)

A person is able to question or challenge the fundamental structure of theories or disciplines.



Description of Levels in the SOLO Model

Unistructural:

The student focuses on the domain/problem, but uses only one piece of relevant data and so may be inconsistent.

Multistructural:

Two or more pieces of data are used without any relationships perceived between them. No integration occurs. Some inconsistency may be apparent.

Relational:

All data are now available, with each piece woven into an overall mosaic of relationships. The whole has become a coherent structure. No inconsistency within the known system.

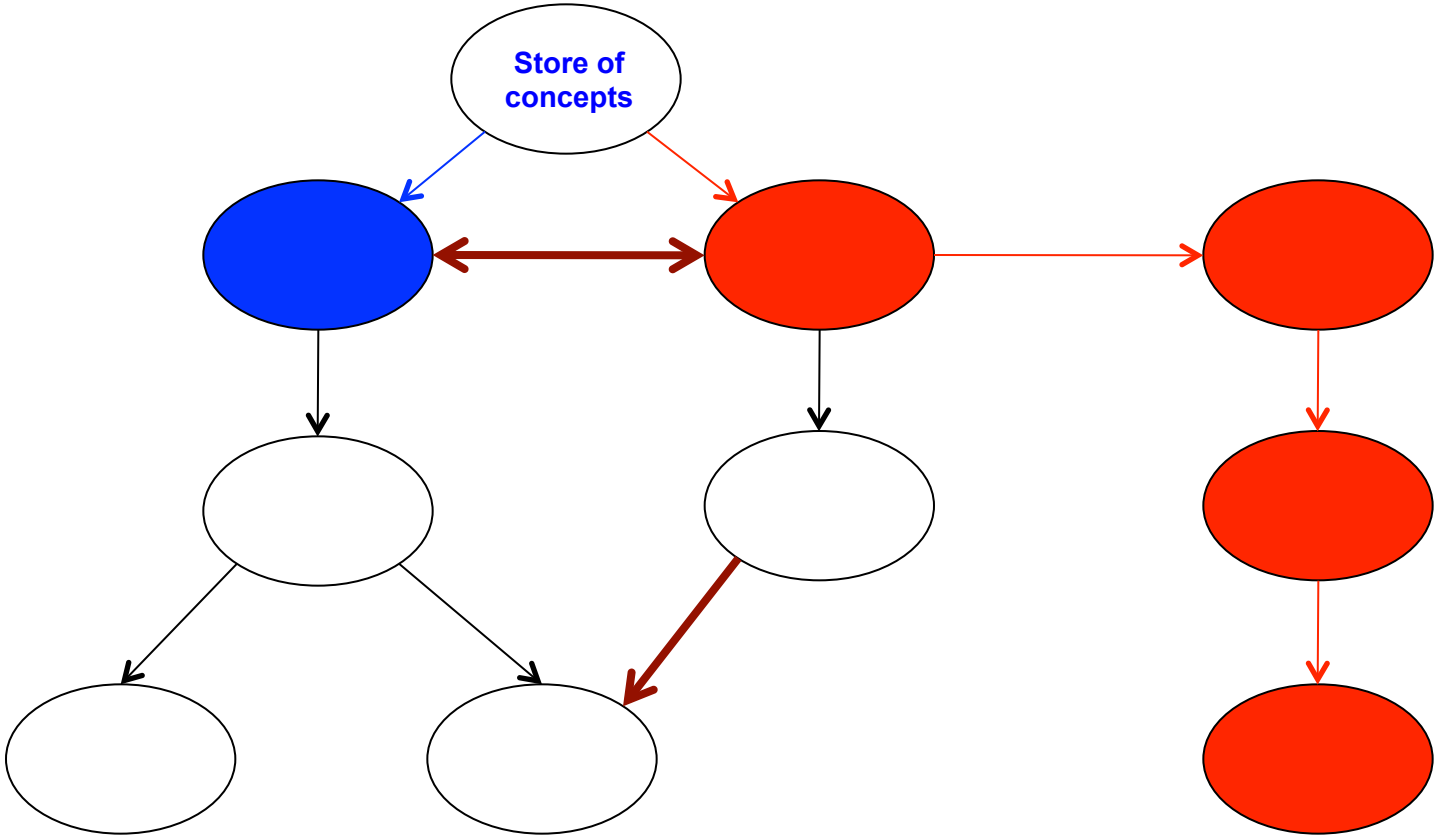
How are these levels determined for a particular task?

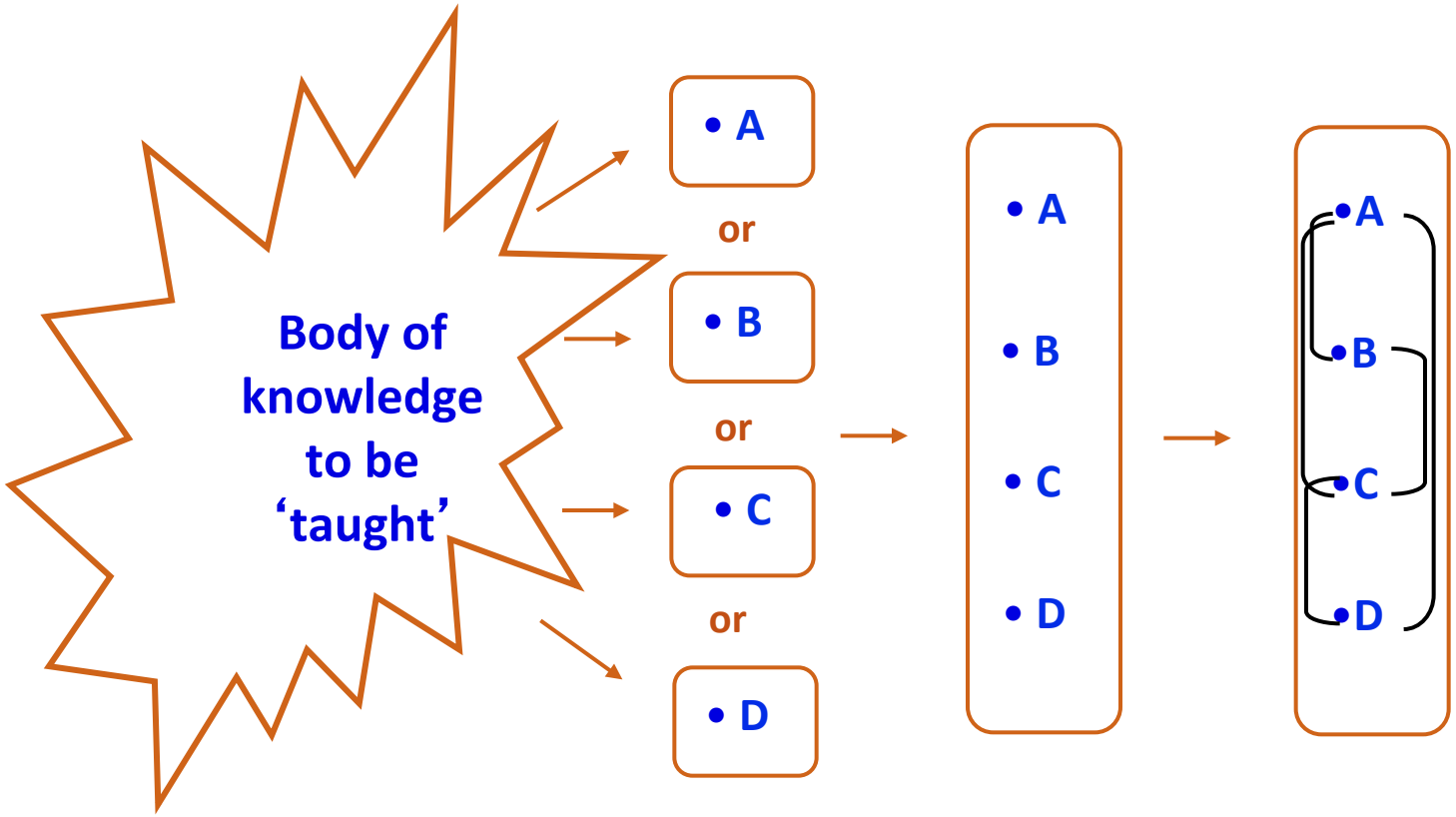
1. **General cognitive abilities of the student**
2. **Familiarity of the content**
3. **Presentation of the task**
4. **Degree of interest or motivation of the student**

5. **Amount of relevant information that can be retained simultaneously for the task**
6. **Amount of information processing required for solution**

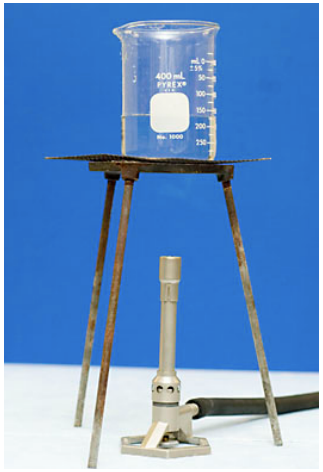
5&6 relate to the notion of *Working Memory* (WM)

UMR Overview:




Body of knowledge to be 'taught'
• A
or
• B
or
• C
or
• D
• A
• B
• C
• D
• A
• B
• C
• D

A Stage 4 cooperative learning group comprising Jack, Jill, Jay-Leanne and Ky wanted to clean some seashells that they had collected after a recent science excursion. They remembered that their teacher had once said that vinegar was a good window cleaner and they all knew that hot water was better for washing things than cold water. So they set about conducting their own investigation about cleaning seashells, and they came up with some interesting observations along the way …



	tap water	**vinegar**
cold	no bubbles	bubbles rising
heated	some bubbles attached	lots of bubbles rising

The task …

When seashells are placed in a jar containing tap water and allowed to stand, no visible change is observed even when the contents of the jar are heated.

When the same seashells are placed in a jar containing vinegar, bubbles immediately appear and rise to the surface. The appearance of bubbles then increases if the contents of the jar are heated.

Explain these observations.

Some of the explanations …

Water has no taste.

Vinegar is very strong and sweet. Tap water is the same as normal water and vinegar isn't.

Because of the salt in the vinegar, bubbles come to the surface. The vinegar flows all the way through the shells and the bubbles spring up. Because the shell contains salt crystals, when the vinegar flows through the bubbles arise. In normal water the bubbles stay locked up in crystal chambers. Vinegar unlocks the chambers.

The seashells probably have bubbles in them. Vinegar most probably has a substance which causes the air to come out of the shells.

Maybe vinegar eats into things. If so, shells often have air inside them so they would bubble. Hot water would possibly increase the power of the vinegar.

A substance which is contained in seashells obviously reacts with vinegar and not with water. The production of bubbles is a visible effect of the reaction. When heated the reaction becomes stronger.

Vinegar is acid. The vinegar eats away at the seashell causing bubbles.

Seashells do not react with water. Vinegar reacted with the seashells. Seashells contain limestone and vinegar is an acid. When you combine limestone and acid a gas forms causing he limestone to bubbles. The heating speeds up the reaction.

With the first part of the experiment, it is obvious that no reaction took place, because no visible change took place. With the second part of the experiment, a chemical reaction took place, as there was obviously a reaction between the limestone of the seashells and the acid in the vinegar. The bubble were products from the reaction, such a a gas like CO_2. The bubbles increased when the contents of the jar were heated, because heating helps to increase the rate of reaction, ie the reaction is quicker.

	R Generalizing	Because the shells are from the sea and the sea is salty and vinegar is salty but the tap water is plain so when the shells go into the vinegar it bubbles just as in the sea.	When shells are added to water the shells are insoluble and don't dissolve although when the shells are added to vinegar they show a chemical change because bubbles are present.	Seashells react with vinegar because it is an acid causing a gas to be given off (CO_2). When the contents are heated the reaction speeds up so there are more bubbles …
LEVEL	**M** Assembling additional concepts; comparing	Vinegar is sour and water is just plain. Water is nearly the same as seawater and vinegar is much too sour.	Maybe vinegar eats into things. If so, shells often have air inside them so they would bubble. Hot water increases the power of the vinegar.	The vinegar is acidic and water is neutral. The calcium (in shells) disintegrated by acids. Neutral liquids do not dissolve calcium. Heat is a natural catalyst.
	U Recall of associations & concepts	It has salt in like salt and vinegar chips	Vinegar has a substance which makes the air come out of the shells	Vinegar is an acid. The vinegar eats away at the seashell causing bubbles.
CYCLE		*Developing an intuitive framework to bring consistency to a set of observations and associations*	*First: Building concepts; what is known from science*	*Second: Developing a generalized science framework to discuss cause and effect*
MODE		**IKONIC**	**CONCRETE**	**SYMBOLIC**

Convening the Subject Review Panel → Studying of the K to 12 Curriculum document → Training on SOLO → Writing and Validation of questions

Discipline	Domain	Sub strands
English	• Book and Print Knowledge • Phonics and Word Recognition • Writing and Composition • Grammar Awareness and Structure • Vocabulary Development • Reading Comprehension • Study Strategies	• Reading • Reading • Reading and Writing • Reading and Writing • Reading and Writing • Reading
Filipino	• Gramatika at Kayarian ng Wika (Grammar and Language Structure) • Pag unlad ng Talasalitaan (Vocabulary Development) • Pagsulat at Komposisyon (Writing and Composition) • Pag unawa sa Binasa (Reading Comprehension) • Estratehiya sa Pag aaral (Study Strategies)	• Pagbasa at Pagsulat • (Reading and Writing) • Pagbasa at Pagsulat • (Reading and Writing) • Pagbasa at Pagsulat • (Reading and Writing) • Pagbasa • (Reading) • Pagbasa at Pagsulat • (Reading and Writing)

Mathematics	• Number and Number Sense • Geometry • Patterns and Algebra • Measurement • Statistics and Probability	
Science	• Biology • Chemistry • Physics • Earth Science	

The developed content tests aimed to assess these facets:

1. knowledge of specific content,
2. aptitude for teaching the subject, and
3. knowledge of tasks relating to the subject matter.

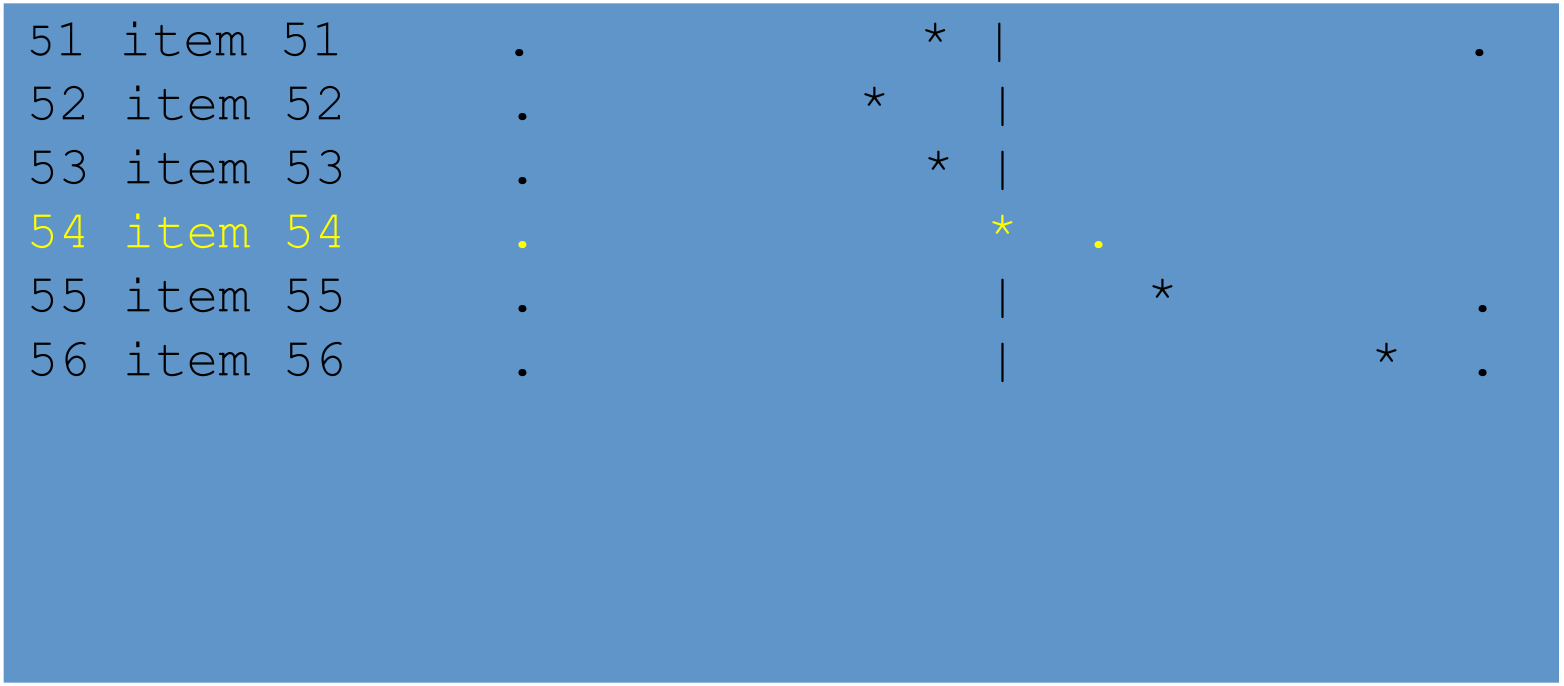
Literatures support these areas tested in each developed content tests. The separate categories reflect what Magnusson, Krajcik, & Borko (1999) and Gess-Newsome (1999) posited as transformative models of PCK.

Pilot Testing

The developed content tests were subjected to pilot testing to ensure that they respond well the curriculum and they offer good information and data to inform DepEd on the possible training programs to address teachers' needs. The series of pilot testing invited randomly selected schools from one region in the country.

Competency (Grade 6 English)	Question	SOLO code
Draw conclusions from a set of details; organize notes taken from expository text	54. Arrange the sentences in order to make a coherent paragraph: (1) Changes in food preparation methods, for example, have improved our lives greatly. (2) The twentieth century has brought with it many advances. (3) In some ways life is worse, but mostly it is better. (4) With those advances human lives have changed dramatically. A. 4, 3, 2, B. 3, 1, 2, 4 C. 2, 3, 4, 1 *D. 2, 4, 3,1*	A. 0 B. 1 C. 2 D. 3

Rasch analysis of the sample item (done after each pilot testing)



Item 54 Infit MNSQ = 1.24
Disc = .27

Categories	A	B	C	D	missing
Count	1	9	37	9	0
Percent (%)	1.8	16.1	66.1	16.1	
Pt-Biserial	-.18	-.18	.31	-.16	
p-value	.097	.096	.010	.125	
Mean Ability	.45	.88	1.20	.91	NA

Step Labels	1	2	3
Thresholds	.27	.33	.66
Error	.52	.51	.49

Implications to Philippine Education

Teacher quality is one of the driving forces of Philippine education laws and reforms.

1. The K to 12 mandates the whole education sector and stakeholders to focus attention and effort in bringing to the classroom the best learning experiences for both learners and teachers.
2. The development of content tools provide for much needed evidence based policy advice on the possible training programs for teachers in the country by assessing the teachers' knowledge.
3. The development of content tests to measure teachers Pedagogical Content Knowledge underscores a concrete basis for the desired intervention or solutions programs. Understanding the level of PCK knowledge of teachers will affect quality assurance on the deliver of the curriculum because the teacher remains to be the single most important success factor in the deliver of the curriculum (Darling-Hammond, 2006)

The Master said "Shall I teach you what knowledge is? When you know a thing, to recognize that you know it, and when you do not know a thing, to recognize that you do not know it. That is knowledge."

(from the Analects, Confucius)