HOW EFFECTIVE TEACHERS IN TOP-PERFORMING SCHOOLS CONDUCT ERROR ANALYSIS TO MAKE SOUND INSTRUCTIONAL DECISIONS

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SUMMARY: The role of an error analysis is no doubt very important in Mathematics and second language teaching and learning. This is because learner performance is often affected by mistakes and/or errors that learners make in an assessment.

This policy brief outlines how after marking the errors, teachers in schools that work analyse them further to identify the types of errors that have been made. Conducting error analysis involves addressing four critical questions:

- What might the learners have been thinking to make this error?
- How can teachers find out which of their hypotheses about what cuases an error are true?
- What different teaching strategies could teachers use to "fix" or undo whatever led to this error and help learners solidify their skills and concepts?
- How can teachers plan and manage time and tasks in class so that they secure time to re-teach the skills and concepts?

After conducting an error analysis, teachers translate error analysis into revised and better teaching of the content to learners who made the errors.

INTRODUCTION

It is certain and understood that learners make mistakes and errors in the process of learning. Identifying the types of errors that learners make and understanding the reasons behind these errors is a prerequisite to taking remedial actions to address them.

Teachers in schools that work[1] always conduct an *error analysis* to determine whether an error is a one-time miscalculation or whether it is a persistent error indicating a misconception or an important misunderstanding of a maths concept or operation.

This is the third and the last of a series of policy briefs on effective assessments. **Policy Brief N-04** focuses on how good teachers conduct ongoing assessments and continuously adjust their classroom practices to achieve maximum performance. **Policy Brief N-07A** discusses how teachers in schools that work conduct item analysis to improve the quality of assessment items in a test or exam paper.

This policy brief discusses effective techniques to conduct an error analysis in Mathematics and English First Additional Language (FAL).

HOW AN ERROR ANALYSIS IS CONDUCTED

Conducting an error analysis involves addressing four critical questions:

[1] In April 2017, the Minister of Basic Education commissioned the National Education Evaluation and Development Unit (NEEDU) to conduct the *Schools that Work II* study. This study sought to examine the characteristics of top-performing schools in South Africa. The best practices discussed in this advocacy brief are based on the findings of that study. The full report is available on the Department of Basic Education website: www.education.gov.za.
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QUESTION 1

- What might the learners have been thinking to make this error? What are teachers' hypotheses?

QUESTION 2

- How can teachers find out which of their hypotheses about what cuases an error are true?

QUESTION 3

- What different teaching strategies could teachers use to "fix" or undo whatever led to this error and help learners solidify their skills and concepts?

QUESTION 4

- How can teachers plan and manage time and tasks in class so that they secure time to re-teach the skills and concepts?

Discussed next are techniques that effective teachers use to address these questions in Mathematics and English FAL.

ERROR ANALYSIS IN MATHEMATICS

Table 1 shows how 10 computation problems a learner answered incorrectly in a test are analysed to identify errors that he made:

Table 1: Common Mathematics errors

TYPES OF COMPUTATION ERRORS IN THE EARLY GRADES	
EXAMPLE	**ERROR TYPE**
9 +7 **27**	① **No mastering of basic number facts:** The learner does not know basic facts about addition, subtraction, multiplication and division.
957 +23.. **1 187**	② **Misunderstanding of place value:** The learner records the answer so that the numbers are not in the appropriate column. In this example, the learner added a unit and a ten, and tens and hundreds together.
65 +39 **914**	③ **Misunderstanding of regrouping:** The learner does not regroup, or she misapplies regrouping strategies. In this example, the learner either added left to right or did not regroup the "1" to the tens column but instead wrote "14."
708 -62 **766**	④ **Not regrouping with 0:** When a problem contains one or more 0s in the top number, the learner is unsure what to do. In this example, the learner subtracts 0 from 6 instead of borrowing.
754 -233 **987**	⑤ **Performing incorrect operations:** Learners often subtract when they are supposed to add or vice versa; multiplying instead of adding. In this example, the learner added instead of subtracting.
427 -189 **362**	⑥ **Subtracting the lesser number from the greater number:** Regardless of placement, the learner always subtracts the lesser from the greater number. In this example, in each column, the learner subtracted the lesser number from the greater number.
$\frac{3}{4}+\frac{1}{2}+\frac{4}{6}=\frac{8}{12}$	⑦ **Adding and subtracting fractions:** The learner fails to find the common denominator when adding or subtracting fractions. In this example, the learner adds the numerators and then the denominators without finding the common denominator.
$\frac{1}{2}\div 2$ $=\frac{1}{2}\times\frac{2}{1}$ $=\frac{2}{2}=1$	⑧ **Dividing Fractions:** The learner does not invert the second fraction and multiply. In this example, the learner did not invert the 2 to ½ before multiplying to get the correct answer of ¼.
7.45 +53.3 **127.8**	⑨ **Not aligning decimals when adding or subtracting:** In this example, the learner aligns the numbers without regard to where the decimal is located.
7.2 x 0.3 **21.6**	⑩ **Not placing decimal in appropriate place when multiplying or dividing:** The learner does not count the correct number of decimal places in the final answer.

ERROR ANALYSIS IN ENGLISH FAL

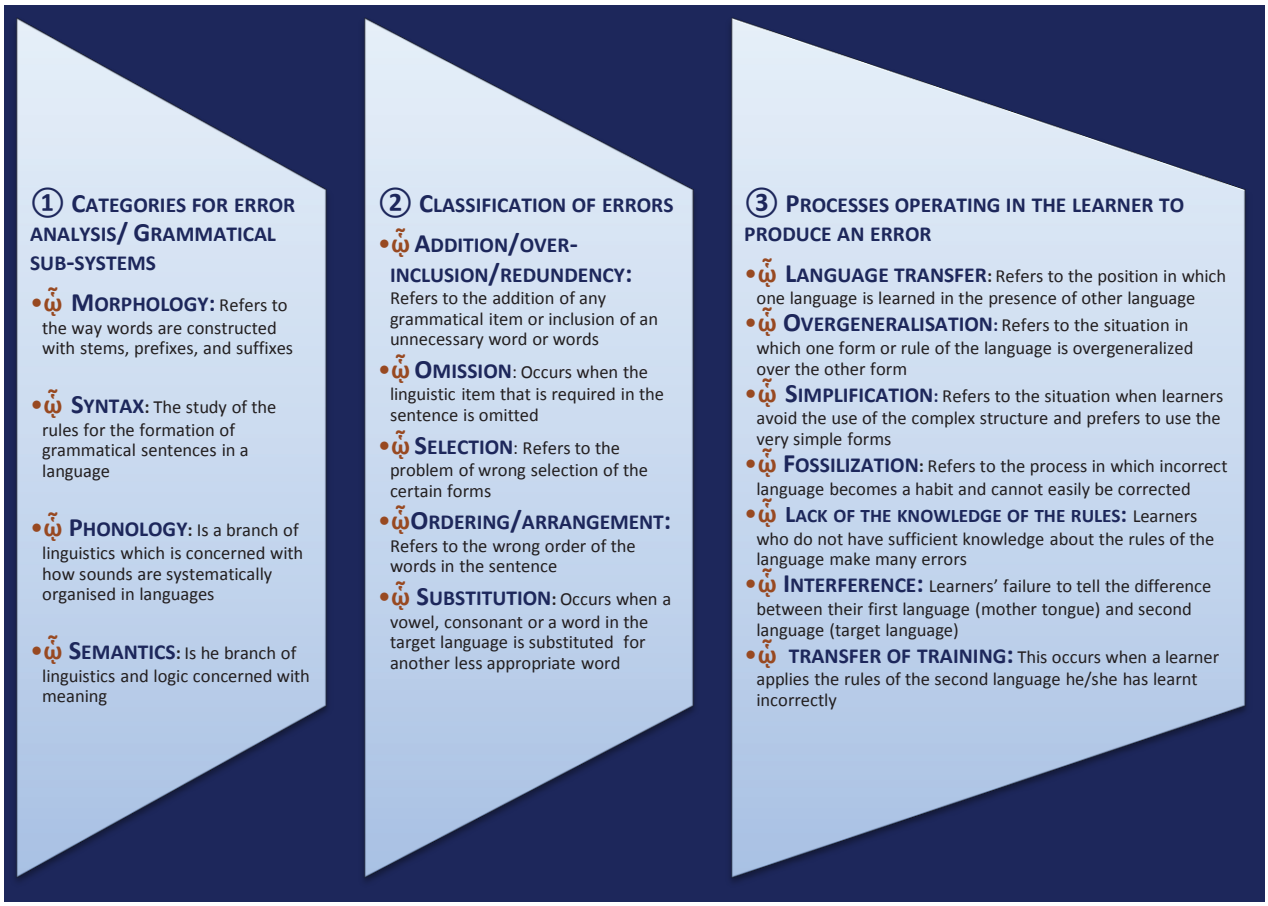
Teachers in the *Schools that Work II* study mostly talked about how they conducted error analysis in Mathematics. Error analysis in English FAL was not mentioned.

To throw some light on the role of error analysis in teaching and learning English as a second language, three studies[2] (each involving the acquisition of English by Chinese, Pakistani & Iranian, and South African high school and university learners) are reviewed.

There is no ideal model of classification of the varieties of errors found in learners' written work. No single model is exhaustive and all-

[2] Sobahle, P (1986). Error analysis and its significance for Second language teaching and learning. *PER LINGUAM* VOL. 2 NO. 2 1986 http://perlinguam.journals.ac.za
Jabeen, A (2015). The Role of Error Analysis in Teaching and Learning of Second and Foreign Language. *Education and Linguistics Research*, Vol. 1, No. 2
Huang, J (2014). Error analysis in English teaching A review of studies http://lib.csghs.tp.edu.tw:8080

inclusive. The Laurell Taxonomy of Interlanguage Errors provides a useful model to analyse inter-language errors. However, it was adapted in this policy brief to create a model of classification which teachers can use to classify many errors made by learners who use English as a first additional language (FAL) in South African classrooms.



Corder, a linguist expert in error analysis, identifies three important steps to use when conducting an inter-language error analysis. These are as follows:

STEP 1 •**Categorise the errors**

In the adapted Laurell Taxonomy, there are four categories in which errors can occur. These are ***morphological, syntactical, phonological*** and ***semantical/lexical***.

STEP 2 •**Classify the errors**

In the adapted Laurell Taxonomy, errors can be classified at five levels namely, ***addition*** (over-inclusion), ***omission, selection, ordering*** (arrangement) and ***substitution***. In this step, teachers try and find out what it is that the learner wanted to say—what exactly was intended.

STEP 3 •**Establish causes of errors**

The adapted Laurell Taxonomy identifies seven processes that operate in a learner to produce an error. These are ***language transfer, overgeneralisation, simplification, fossilization, lack of the knowledge of the rules, interference*** and ***transfer of training.***

In Table 2 below, researchers in the Chinese, Pakistani & Iranian and South African studies (quoted above) provide practical examples how teachers can use the adapted Laurell Taxonomy to analyse errors that hinder the acquisition of language skills in English FAL. In all three studies, learners' written work were analysed (using error analysis) to find out why learners failed to produce grammatically correct sentences in English.

Table 2: Common interlanguage errors

[Step ①] Categories for error analysis/Grammatical sub-systems	Learners' common interlanguage errors		[Step ②] Classification and Description of an error	[Step ③] Processes operating in the learner to produce an error
	Sample error	**What exactly was intended**		
Morphology: The error is morphological	**XL:** I am going to office.	I am going to **the** office.	**Omission:** The article "the" is omitted.	**Interference:** English syntactic system uses the article whereas in isiXhosa there are no articles.
	XL: There is no knee at this school. **Note:** This is a direct translation for an isiXhosa idiom for: Akukho dolo kwesi sikolo	The teachers of this school are impartial, straight forward-honest.	**Selection:** The learner translates an idiomatic expression in the native language (isiXhosa in this case) to the target language (English in this case) literally.	**Interference:** In isiXhosa, unlike in English, the verb form does not change to agree with the noun in number. What changes is only the prefix to agree with the class of noun or pronoun: Bathenga iincwadi > ✓ "Ba-" is a prefix for "they" ✓ "-thenga" (to buy) is retained unchanged as a root
	XL: They **buys** books. English for "Bathenga iincwadi"	They **buy** books.	**Addition:** The morpheme "s" is added to "buy." **OR** **Selection:** "buys" is chosen instead of "buy."	
Syntax: The error is syntactical	**XL: Does** the teacher **knows** that you are ill?"	**Does** the teacher **know** that you are ill?"	**Selection:** Instead of choosing "know" the learner chose "knows," and he chose "went" instead of "go."	**Transfer of training:** The learner knows grammatical rules about tenses but he applies them incorrectly He disregarded "does" and "did" which introduce the questions.
	XL: Did he **went** to town yesterday?	**Did** he **go** to town yesterday?		
	XL: Ivy went to town and met **his** friend Nomsa.	**Ivy** went to town and met **her** friend Nomsa.	**Selection:** The learner chose a wrong possessive pronoun.	**Fossilization:** This is a fossilized error. The learner cannot distinguish between 'his' and 'her.' This is because in isiXhosa gender is not differentiated lexically.
	XL: She will submit **his** work in the afternoon.	**She** will submit **her** work in the afternoon.		
	PIL: The **sparrows** is flying.	The **sparrow** is flying.	**Addition:** The morpheme "s" is added to "sparrow."	**Lack of the knowledge of the rules:** The learner has sufficient knowledge of grammatical rules, especially the lack of subject-verb agreement.
	PIL: He **go** to school.	He **goes** to school.	**Omission:** The morpheme "es" is omitted.	
	PIL: He is a dear to me friend.	He is a dear friend to me.	**Ordering/arrangement:** The order of the sentence or question is incorrect.	
	CL: What this is?	What is this?		
Phonology: The error is inter-lingual phonological interference	**XL:** feedin skin"	feeding scheme	**Selection:** Errors tend to cluster in four areas: Vowels, consonants, consonant clusters, voiced versus unvoiced	**Interference:** In isiXhosa the following sounds are represented by one sound, i.e. sound "ĩ": sh**ee**p, sh**i**p, **ea**t
	XL: I **head** the news	I **heard** the news		
	CL: Man is **eborubing**.	Man is **evolving**.	**Addition/substitution:** b is substituted for v, r for l and u is added	**Interference:** Inter-lingual phonological interference from Chinese
	PIL: Plz, b/w, b4, for before, thnx and thanku	Please, between, before, thanks and thank you	**Selection:** Wrong spelling was chosen using an SMS jargon	**Simplification:** The complete structure was avoided and abbreviated forms were used
Semantics/Lexical: The error is semantic / lexical	**XL:** Mr. Thusi is **late**.	Mr. Thusi is **dead** / **passed away**.	**Selection:** The learner selected a wrong word "late" instead of "dead."	**Overgeneralisation:** The leaners applied the rules used in the sentence "The man is kind" and overgeneralised these rules to the sentence "Mr. Thusi is late."
	CL: She is a **sensible** person.	She is a **sensitive** person.	**Substitution:** The adjective "sensitive" is substituted for "sensible"	**Transfer of training:** The learner confuses two words that almost sound alike.
	PIL: I am **biggest** than her.	**PIL:** I am **bigger** than her.	**Selection:** There is a wrong selection of the degree of adjective.	**Lack of the knowledge of the rule** The learner has insufficient knowledge of grammatical rules.

XL = Xhosa Learner in Sobahle's study; PIL = Pakistani/Iranian Learner in Jabeen's study CL = Chinese Learner in Huang's study