The ONPAR Methodology in the Classroom:
Why and How It Seems to Work for Measuring Challenging Content of Many ELLs

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For English language learners to be competitive with their non-ELL peers in academic subjects such as mathematics, English language arts, and science they must have access to the full range of the content curriculum, from basic facts through challenging concepts, reasoning abilities, and skills. This is true not only as they reach full English proficiency but from the very beginning of their academic schooling. Evidence is clear that many English learners fall behind their academic coursework almost immediately and often stay tracked in lower level remedial academic classes, even as their language improves (for instance see McNeil, Coppola, Radigan, & Heilig, 2008; Rumberger & Gándara, 2004). At the same time, however, discourse studies and cognitive linguistics indicate that more complex concepts and skills in academic content areas typically require more complex language structures to handle the elevated language and discourse demands needed to participate in situations where these skills are generally employed (Schleppegrell, 2004; Talmy, 2003).

So, can ELLs with lower and middle English proficiency skills learn challenging academic content that is primarily taught in English when they don't yet have the formal language capacities in this language? The linguistics and pedagogical literature contend that they can and do. Grice (1975) and Schleppegrell (2004) argue that students lacking facility in comprehending and producing this distinctive academic language can and do utilize alternate communication channels. Walqui (2012, personal communication) suggests that this is because these students are making connections with academic information gleaned from creative teaching and resourceful self-motivations, and then making meaning by developing internal

communication schemas. These schemas may be immature in terms of academic language but are effective in building meaning of challenging content for these students. Echevarria, Vogt, and Short (2007), among others, have outlined successful instructional practices in academic subjects that teach academic language and at the same time skillfully make use of other modalities. Kopriva and Sexton (2011) specify a number of primary considerations and strategies academic teachers might use to maintain the rigor of formative content assessment for low and mid English proficient ELLs consistent with the challenging cognitive demand of content that is being taught to native speakers. They also argue that English language learner specialists are in a unique position to provide specific guidance to content teachers that goes beyond teaching English because they know the strengths of English learners and how they make meaning. Methods include guidance about how to design and use multi-semiotic contexts and interactional techniques to teach challenging content and evaluate the progress of students not yet proficient in English.

Kopriva and Rasmussen (2010) utilized a number of computer-based mathematics and science assessment examples that were developed using a technology-based assessment methodology called ONPAR to demonstrate several particular techniques that could be easily adapted for use in academic classrooms, using, for instance, hands-on, paper/pencil, and teacher/student dialogue devices. This methodology has been found to be very effective in measuring challenging content knowledge, skills and abilities of English learners in ways that appear to be directly applicable to how teachers can assess, and most likely teach, complex content (see www.onpar.us for examples of classroom testlets and score reports).

The ONPAR approach makes use of dynamic, multi-semiotic representations and carefully planned assessment task designs that result in minimizing construct-irrelevant text. The tasks are

built to provide teachers information about level of student mastery of concepts and skills as well as how and where students might misunderstand or lack essential concepts and abilities. Novel response spaces capture performances and explanatory responses with relatively little language. The text that remains is used judiciously for precision with multiple types of supports for construct-irrelevant words and phrases. Techniques include using multiple modalities to build task-specific problem contexts and surrounds, movement (via animation and simulation in computer-contexts), ongoing interactions between students and stimuli, multiple redundancies, and use of auditory supports.

Three sets of experimental studies and over a hundred cognitive labs suggest that, together, the methods seem to promote focus and involvement for purposes of communicating complex meaning in ways beyond what just text can do, particularly for this population (Kopriva and others, 2009a, 2009b, 2013a, 2013b). For instance, in the study of challenging elementary and middle school science tasks students with low English proficiency were able to access the items and demonstrate what they know using ONPAR to the extent that, holding ability constant, they scored the same as their non-ELL peers. While these ELL students scored significantly lower on the traditional items that measured the same content at the same level of cognitive complexity versus the ONPAR items, the difference in the traditional and ONPAR scores of non- and high-ELL students were non-significant. This suggests that ONPAR methods seem to be allowing low English proficient students access, but not interfering with the assessment of non- and high ELL students using either traditional or ONPAR techniques. Likewise, similar effects were found in the high-school study of ONPAR Biology tasks, except that the English language learners who scored significantly higher on ONPAR versus a version of 'technology-enhanced' traditional items measuring the same constructs were mostly more advanced English proficient ELLs (the

researchers could not locate many low ELLs taking Biology). This could imply that the extent of challenging high school content and/or the typical ELP language skills may not be sufficient for higher English proficient ELLs to access traditional assessment tasks for this subject or grade level, even those tasks that use many of the elements associated with today's technology-enhanced item types. The mathematics study with ONPAR and traditional tasks focused on selected students with disabilities (SwD's) and results were similar for many of these students, as were the results for the selected SwD's in high school Biology.

How does this assessment methodology work and why? Four points seem to stand out that appear to be directly applicable for instructing ELLs in challenging knowledge, skills and abilities. First, careful planning about when and how to utilize multi-semiotic techniques such as those used in ONPAR is an important part of learning how to adapt classroom practices. ONPAR assessment developers focus first on what evidence they need to collect to tell them about student progress. In the same vein content teachers would need to focus on what, specifically, they want students to learn in a given lesson plan. This specificity is key if adaptations are to be clear, targeted, and effective.

Second, the ONPAR methodology seems to work because non-text and non- target supported text are centrally used to communicate essential meanings and not just used to 'supplement' or 'decorate' nuanced concepts, contexts, and questions that are primarily made with language. Many of us have trouble believing that substantive meaning can and does get communicated effectively using such strategies. Initially, the methodology design of ONPAR assessment tasks uses less language because it sets up a rich multi-modal surround using non-text or supported text. This 'storytelling' technique is used for students of all ages. Immersion in the physical environment in in early stages of the problem in

ONPAR assessment (and it would seem in the early stages of the lesson) is used purposefully to encourage students to focus and become engaged with the multiple stimuli associated with the challenging constructs. As in the ONPAR assessments, the story needs to be only as lengthy as it takes to introduce focal material as well as perhaps related but extraneous information useful when cognitive skills such as discriminating, differentiating, synthesizing, or generalizing are part of the learning plan. Many task contexts are actually quite compact in ONPAR assessment. In any case, every aspect of the story needs to be considered beforehand so that the rich contexts can form the basis of teaching more complex concepts, and so teachers can refer to aspects and develop relationships or extensions as they present more challenging concepts, reasoning, and skills. Iteratively, students should be able to mentally track and then extend their understanding using that base as they build targeted concepts, reasoning and skills evolving from it.

ONPAR also makes use of multiple redundancies to get across primary points just as many teachers do. For instance, concepts are demonstrated while language with supports (i.e., pointing to, pictures, acting out) is used, and frequent short interchanges directly and clearly underscore specific facets. ONPAR makes liberal use of several techniques to 'find an excuse' to interact often. These include using rudimentary grounding questions to engage the students early in the tasks, and abstraction framed with multi-semiotic methods that is introduced and clarified as the context unfolds. In the ONPAR assessment tasks, students are invited to 'roll-over' text or other representations to actively find the supports, and something akin to this would seem to keep students engaged in learning as well.

Several multi-semiotic techniques ONPAR uses are known and used by content teachers, but often they are reserved for certain types of more hands-on or performance

lessons. For ELLs at lower or mid levels of English proficiency we argue that these techniques *need* to be used for a broader set of learning opportunities. Content teachers may typically use language as the primary way of communicating meaning in many of these learning situations, and ELL specialists can help explain how and why these methods convey valued learnings here as well.

Third, frequent checks for understanding are essential in both teaching and assessing how well students have learned challenging information. We have found that one of the biggest conundrums for many content teachers is how to ask challenging questions to ELLs with less English language capacity that provide a full, valid response while also keeping the question complexity consistent with the level of complexity asked to native English speakers students in the same situation (see Kopriva & Sexton, 2011). Previous research has found is that multiple choice was not very useful for many lower English proficient ELLs as percentage correct seems to hover around chance levels or just a bit better whether they know the answers or not. Simplifying the language of items measuring basic knowledge helps but this technique doesn't work too well when measuring learning of challenging content. However many lower and mid level ELLs do much better on open-ended questions that allow students to respond with diagrams, pictures, code-switching text, etc. (Kopriva, 2008).

The ONPAR methodology uses the presentation techniques described above to 'set up' the actual questions so they don't include much additional language, and in uses many of these devices to set up accessible response environments. Readers are encouraged to visit www.onpar.us for examples. For instance, the response spaces may encourage students to demonstrate their knowledge through moving stimuli, assembling, and acting

out. They also make use of basic or more sophisticated statement frames and causal chains (see the website for examples) that utilize target text, non-target supported text, pictures, symbols, or numbers. The frames and chains are not used in isolation from the context, but situated within it. ONPAR puts a premium on designing response spaces that take advantage of the richer context and also elicit not information about how students may be behind and why. In the classrooms teachers can make liberal use of clarifying questions to check the teachers understanding of the student's response as well. The key here is that teachers must often adapt response environments that allow for an extended set of venues and modalities so English learners can fully communicate what they know and understand.

Fourth, the ONPAR cognitive lab studies and independent reviews by content experts and cognitive scientists indicate that the ONPAR techniques seem to interact with the brain in a fuller way than when language-focused communication of challenging targeted content is the primary pedagogical method (Kopriva, 2013). The ONPAR approach may lead to the same learning result for students with adequate language and literacy but would seem to be vital for English language learners and others not yet proficient enough to handle the language load as it is typically used in conveying challenging content. Many of the methods appear to activate relevant internal learning maps more akin to how performance-based and hand-on learning and assessment tasks do, even when the content in question is not usually considered for this type of teaching or evaluation. There looks as if there are at least three causal reasons that the approach works for these students. All three can be effective or problematic, so part of the skill is knowing when and how to utilize the methods effectively to not overwhelm, confuse or otherwise negatively impact

the integrity of the target content or the ability of the approach to effectively collect valid data about students' knowledge, skills, and abilities.

The first reason suggests that directness to the latent construct may be enhanced with multi-semiotic methods because the learning or assessment construct can actively evolve for the student in 'live' time rather being limited to abstracting information from secondary explanations. The same holds true as the methodology opens up the response venues so students can produce what they know using communication techniques they can access with more expertise. The second reason points to the increased cognitive density in the ONPAR methodology. As defined here, cognitive density in assessment situations is the amount of cognitive activity that students have to handle to understand the question, solve the problem, and display their answer. The use of multiple stimuli to convey meaning typically adds to the density of the content being targeted—that is, performance items would tend to be more 'dense' than multiple-choice items. Density can be good or bad and has relevant (pertaining to the content target) and irrelevant cognitive aspects. The objective is minimize the dissonant density aspects (construct irrelevant aspects that are not acting as facilitators of the item demands) and modulate the relevant aspects to reflect the targeted cognitive complexity the item is designed to elicit. The third reason focuses on knowing and working with how the internal maps are engaged. The maps can be engaged with such devices as simple questions about basic knowledge or skills handled suitably with plain language techniques, wet labs, demonstrations, interactive discourse, and explanations and representations of meta- cognitive activity using accessible static and dynamic media. It needs to be thought through under what circumstances one choice is

better than another and how different devices interact in the learning or assessment task. In the ONPAR assessment methodology how the test taker engages their cognitive maps can impact the demand in intentional and unintentional ways. As such, item writers have to intentionally select the proper approach that best reflects the target concept, and as appropriate, focus the test taker by intentionally placing some elements in the background or foreground as they relate to the construct. Using the richer environment isn't always or even often better; what is desired is that the item should match the intended complexity of the targeted construct and the cognitive activity of the student.

ONPAR item writers found that the hardest part of making assessment items using the ONPAR methodology was learning to think in a holistic way about how to design accessible products. The techniques aren't unusual, but how they get applied is the key. In the same way, by using this methodology and practicing when and how the devices are implemented, content teachers will have an effective set of tools to help them adapt challenging lesson plans for students whose formal academic language still in the formative stages.