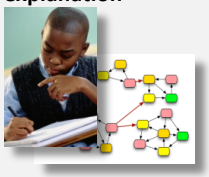
Ambitious Science Teaching (with practices for supporting EL students)

Ambitious Practices	*A progression for analyzing attempts at Ambitious Science Teaching*				*Aim for practices in this direction >>>*
ST Practice 1 **1) Selecting big ideas, treating them as models**  **Selecting major academic language to be developed, practiced, and used in relation to the big idea/model.**	**Missing science content** • Teacher has built unit on topics that are not connected to phenomena in the natural world.	**Focus on topic or "things"** • Teacher has selected concrete or abstract entities (things) to learn about in varying degrees of detail. • Students asked to describe, name, label, identify, using correct vocabulary.	**Focus on observable processes** • Teacher has selected as focus a natural system and "what is changing" in a system or how conditions affect a naturally occurring event. • Teacher has focused on logical relationships among concepts.	**Focus on observable-unobservable** • Teacher has focused on *unobservable* processes, events, or entities, and how these relate to *observable* natural phenomena. • Unit framed around complex, situated phenomenon to be explained.	**Explanation as model** • Teacher has emphasized links between observable and unobservable in order to develop an explanatory model that students will make sense of over time. • Students make links between observable and unobservable content. • Unit framed around complex, situated phenomenon to be explained. • For EL students, Teacher has identified, selected, and explicitly taught key academic language to be developed and used in the lesson(s). Teacher focuses on the purposes of using the focal scientific language and related complex language structures, in addition to content-specific vocabulary.
ST Practice 2 **2) Attending to students' ideas and experiences**  **Attending to the *language* of students' ideas and experiences**	**No access to students' ideas** • No discourse interactions between teachers and students or among students—students' ideas inaccessible to teacher.	**Monitoring for correctness of students' ideas** • Teacher starts by presenting information, then monitors language students use to see if students are developing "correct" conceptions. • Teacher uses IRE in whole class conversations to present more correct conceptions to students.	**Eliciting students' initial & unfolding understandings** • Teacher elicits students' initial and on-going hypotheses, questions, or conceptual frameworks about a scientific idea.	**Referencing students' ideas** • Teacher listens for and acknowledges partial understandings as well as alternative conceptions (without presuming students need to precisely replicate the teacher's line of thinking). • Students' thinking is made visible by teacher through re-voicing or public representations	**Using students' ideas and experiences to adapt instruction** • Teacher elicits and uses students' language, partial understandings, and experiences as building blocks to shape the direction of classroom conversations. • Teacher pursues students' lines of thinking by making their ideas visible and weaving students' lines of reasoning together with scientifically coherent ideas. •For EL students, Teacher clearly differentiates language, according to purpose and register of task For example, in weaving students' lines of reasoning together with scientifically coherent ideas, Teacher points out the difference in language between a more "conversational" or "classroom" language used in students' lines of reasoning and the change in language use when referring to "scientifically coherent ideas." •Teacher makes explicit to the students the language choices (s)he makes for which task and why.

ST Practice 3 **3) Using activity to support on-going changes in reasoning**  **Using activity to support *content comprehension and academic language development* in the science classroom**	**Students not engaged in activity** • There are no observations made, use of 2nd hand data, simulations, or lab work to develop a concept. • Teachers presentations or readings substitute for engagement with science practices.	**Primarily focusing on procedure** • Teacher asks students to describe procedures for activities or experimental set-ups. • Science concepts are played down to allow time to talk about designing observations. • Talk with students is about how to do an activity or about error, validity, reliability, recording data.	**Discovering or Confirming Science Ideas** • Teacher has students "discover" science concepts for themselves without guidance OR has students use an activity as a "proof of concept." • Science is about acquiring accepted facts, principles, or laws. Students collect information to recognize or prove patterns, but not to make sense of underlying causes	**Linking concepts within and across investigations** • Teacher seeds students' thinking with new science concepts (not explanations) and asks students to use these ideas to shape and/or make sense of an investigation. • Science ideas are up for discussion. Public representations of students' ideas change in response to findings from each day. • For EL students, Teacher uses visuals, charts, and other comprehensible input supports to share new science concepts.	**Model-Based Inquiry focus** • Teacher or students highlight gaps in tentative explanatory models as the motivation for investigations. • Teacher builds in background knowledge of underlying (unobservable) science ideas and models before, during, and following an inquiry, but without doing the reasoning for the students. • Students derive explanatory language from activity and use it to reconsider their models. • Science activity is about revising and testing models to synthesize ideas and explain problems. • For EL students, Teacher is explicit about the purpose and register of the language used for a particular task as well as the vocabulary the students are using or can use (e.g. what is "explanatory language?") • Teacher provides multiple English language development supports, such as a number of sentence stems, to support EL students in explaining problems and their models, and synthesizing ideas. • For EL students, teacher explicitly teaches students' language for explaining problems and their models and synthesizing ideas.
ST Practice 4 **4) Pressing for explanation**  **Pressing for explanation and *attention to academic language/language of the science classroom***	**No press for a scientific explanation** • Teacher does not ask students to provide any form of explanation; or teacher uses "explain" to mean "justify" as in justify the existence of an entity or accepted fact. • There is no event or process that is subject to explanation.	**"What happened" explanation** • Teacher asks students to describe relationships between variables, differences between experimental groups, trends over time, or qualitative observations. "Explain what you see in the data."	**"How/ partial why" something happened explanation** • Teacher asks students to hypothesize about reasons for relationships among variables or observations, and how these predict the ways some natural system will behave.	**Causal explanation** • Teacher has students use unobservable events, processes, and entities to construct a causal story of why something happened. (may mean first supporting students through "what" and "how explanations" with goal of working toward "why explanations") • Teacher unpacks learning about the nature of scientific explanations with students, and about "what counts" as evidence. • For EL students, Teacher begins with an open-ended question, slows down the pace of the dialogue and allows more turns by the student to explain or clarify thinking before the Teacher evaluating/recasting. Teacher questions are aimed at understand the *meaning* of what the EL student is contributing. When recasting EL student responses, Teacher models language use. • If needed, Teacher invites the EL student to reference or draw a visual to represent thinking. • Teacher makes explicit what language the students are using and for what purpose.	**Arguing from evidence about an explanatory model** Teacher asks students to use evidence to support key parts of the causal story. • Teacher unpacks learning about "what counts" as evidence with students and scaffolds their use of it. • Students supported in engaging in scientific argument with peers, evaluating their own arguments and those of others. • Teacher creates and makes explicit to the EL students multiple language supports, such as sentence stems, for the students to use in framing and sharing their ideas. • Teacher makes explicit what language the students are using and for what purpose (i.e. language functions). Teacher explicitly teaches language of explanation to EL students

Ambitious Teaching for EL Students

Ambitious Practices	A progression for analyzing attempts at *Ambitious Teaching (for EL Students)* Aim for practices in this direction >>>				
EL Practice 1 **1) Attending to the development of metalinguistic knowledge, such as language register (e.g. Fostering EL students' metacognition of language use, language functions, and language forms for different purposes in different situations)**	**No attention to metalinguistic knowledge** Teacher does not address the use of language in the science classroom.	**Attending to academic vocabulary** Teacher introduces and teaches academic vocabulary related to the science content, but does not embed the vocabulary instruction into the scientific work and discussions in the class. This usually happens at the beginning of the lesson.	**Embedding academic vocabulary instruction** Teacher embeds academic vocabulary instruction related to the science content, within the context of the scientific work and discussions in the class. This mainly happens during or after the sense-making part of the lesson.	**Drawing attention to the language being used in the science classroom and the functions of that language** Teacher draws the students' attention to the scientific functions of language being used in the lesson. Scientific functions of language may include, but are not limited to: explain, predict, hypothesize, or conclude. Teacher draws the students' attention to the structure of scientific language (e.g. using sentence stems to frame scientific explanations).	**Explicit attention to and embedding of metalinguistic knowledge of the science classroom** Teacher explicitly teaches the language being used in the science classroom in the lesson and the purpose of using the language for a particular scientific practice, such as describing a model. Teacher frequently references and returns to the language focus of the lesson throughout the lesson and holds EL students accountable for using more academic-oriented, formalized forms of language in the science classroom. Teacher clearly differentiates the language used according to purpose and register of task. For example, in moving from informal to more formal science talk, Teacher elicits and re-voices students' talk in scientific language, pointing out the difference between the two types of language, and change in language use according to the task (e.g. discussing the content of a scientific idea with peers and moving to more formal scientific language for whole class presentations or writing). Teacher makes explicit to the students the language choices (s)he makes for which situation and why.

EL Practice 2 **2) Creating multiple opportunities for EL students to talk and participate in class activities / discussions with a focus on developing academic language.**	**No opportunities for EL students to talk** Teacher does not include EL students in the class activities nor invite EL students to contribute to discussions (e.g. EL student may be working individually on a computer). Teacher does not set up frequent opportunities for partner or small group talk, nor require EL students to talk with their partner or small group.	**Inviting EL students to make a contribution** Teacher invites EL students to share their thinking around the focal scientific phenomenon. Teacher acknowledges the EL student's contribution, but does not provide an opportunity for the student to visually show or elaborate on the student's thinking.	**Expanding on the EL students' contribution** Teacher re-voices an EL student's contribution or response modeling appropriate academic language. Teacher asks the student one or two questions to make sure Teacher understands the student's contribution. Teacher may ask student to visually show thinking through a model or illustration.	**Setting up and facilitating multiple opportunities for EL students to use the language of the science classroom** Teacher provides multiple partner, small group, and whole group configurations within the lesson. For partner or small group work, Teacher specifically pairs EL students with native English speakers and/or EL students with slightly higher levels of English language proficiency Teacher connects the class model or Teacher's model with what the EL student is sharing. Teacher creates and makes explicit to the EL students language supports, such as one sentence stem, for the students to use in their partner or small group discussions (e.g. "To help you explain your thinking to your partner, you can use _____.")	**Providing language supports for partner, small group, and whole group instruction to build towards EL students showing and expanding their use of the academic language of the science classroom** Teacher collaboratively builds on what students want to say. For example, making use of Teacher Guided Reporting: Teacher opens the conversation with an open-ended question. Teacher slows down the pace of the dialogue and allows more turns by the student to explain or clarify thinking before the Teacher evaluates or recasts what the student says. Teacher questions the student in order to understand the *meaning* of what the EL student is contributing. When recasting EL student responses, Teacher models academic language use. If needed, Teacher invites the EL student to reference or draw a visual to represent thinking during Teacher Guided Reporting. Teacher makes explicit language supports, such as sentence stems, and encourages the use of multiple sentence stems for students to initiate their thinking/modeling/explaining.