TELE Synthesis: A Comparison of four foundational TELE designs

	T-GEM / Chemland	***Anchored Instruction / Jasper Series***	***SKI / WISE***	***LfU / My World GIS***
Definition	The T-GEM is a model-based inquiry, based on cyclical Generation, Evaluation and Modification of rules and relationships for scientific phenomena.	Anchored Instruction provides realistic problem-rich settings where students can learn the Why, How and When to use particular procedures, concepts, and skills.	The Scaffolded Knowledge Integration framework is based on 4 guiding principles: * Making Thinking Visible * Making Science Accessible *Helping Students Learn from One Another *Promoting Life-long Learning	The Learning-for-Use framework is inquiry-based, using the *Learning Cycle.* It is a goal-directed process for the construction of knowledge for application.
Framework Focus	The framework provides support and guidance in inquiry for students to enrich and refine mental models of scientific phenomena, while building relationships between concepts. It combines scientific procedural and declarative knowledge learning.	Anchored Instruction is based on Constructive learning theory, where generative learning through argumentation and reflection help to overcome scientific misconceptions. Skills should be learned in context, where learning can be applied and the learning setting is cooperative.	The SKI framework design is intended to create cohesion in the conflicting ideas students have towards science phenomena, due to their repertoire of views from external and personal experiences with science.	The framework aims to foster useful conceptual knowledge for relevant application purposes. It is a context-dependent model that combines procedural and declarative knowledge.
Key Ideas	Teacher actions help promote student inquiry, using 3 levels of teaching strategies throughout the process: - major phases of instruction - main teaching methods - specific guidance strategies T-GEM uses abductive reasoning, where students	The Jasper Series allows for sustained exploration by teachers and students in a macrocontext where they can build a collective understanding. The Jasper Series allows for the creation of an authentic problem structure and learning	The 4 principles allow for guided scientific inquiry: **Making Thinking Visible* connects and tests ideas, by creating models, generating feedback, or reflection on the nature of science and one's own metacognitive	The LfU framework has 3 steps: - Motivate (consciously or unconsciously) through demand and curiosity - Knowledge Construction through direct experience to observe relationships, and communicate with peers and teacher

	makes inferences through visual and thinking representations The sustained involvement with this model is intended to increase engagement with scientific inquiry	materials, creating more opportunities for generative learning. The Jasper Series emphasizes the discovery of the Why and When of skill development, using subskills that can be pieced together to engage with the problem. The structured problem solving model encourages errors as a chance for growth, where communication and collaborative create a collective understanding of complex concepts. The framework employs the Guided Generative model of scaffolding, where assistance in learning subskills is given early and phased out as students become independent at utilizing their skillsets.	understanding of scientific concepts **Making Science Accessible* pushes students toward an achievable scope of knowledge and an appropriate level of analysis for their problem, connecting details of their prior learning to broader curricular examples relevant to the students **Helping Students Learn from One Another* utilizes Vygotsky's constructivist approach of the Zone of Proximal Development, as students communicate in pairs, or critique each other's work **Promoting Lifelong Learning* has students regularly working through complex problems using inquiry, to develop persistence and long term thinking about scientific processes	- Knowledge refinement through application and reflection The accessibility of students' learning is dependent on circumstances and use of the content. It is guided by goals and maintained through an inquiry cycle.
Technology Integration	Although the GEM cycle does not utilize tech, the integration at the T-GEM level means technology should be integrated throughout the 3 steps of GEM.	The Jasper Series presents an embedded data design of a video-based problem, where students can manipulate the video (by stopping and starting at various points) to access crucial information throughout	WISE – Web-based Inquiry Science Environment, is a coherent, cohesive, adaptive and flexible environment for teachers and students that scaffolds curriculum inquiry.	Technology using the framework should allow access to real-world applicable data sets (My World GIS, Google Earth, ArcGIS).

	Often T-GEM includes simulations, such as Chemland, to push scientific concepts to extremes and make certain scientific phenomena visible, to enhance the development of relationships within a student's mental model. For effective use of technology with this framework, teachers should have a solid TPCK framework and students need to understand the significance of data sets they are using to properly manipulate the data and evaluate the relationships.	the presentation of the video problem. Videos may also provide opportunities for teachers to have students go deeper with a problem by focusing on a specific aspect or changing the question's specifics. Also, the pairs of adventures allow for extra practice with some concepts, and illustrates analogical thinking. The Narrative with realistic problems are easier to access and remember information. It is also more engaging than a text-based version of the same question.	Students can use technology for online discussion and critique, as well as using virtual models, data sets and project creation.	Technology used should be relevant to the learning goal, allowing for practical application, knowledge construction and refinement. Technology tools with the LfU framework can enhance communication between peers and teacher, application of knowledge or reflection of learning.

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