

Objective Design and Instructional Alignment



FOUNDATIONS

LEARNER IMPACTS

- Achievement
- Self-regulation

DESCRIPTION

Instructional alignment is an essential characteristic of any effective learning experience. The presence of instructional alignment positively impacts learning. Instructional alignment is also a significant and necessary prerequisite condition for both the pursuit of efficacy and the application of more complex aspects of learning design, such as those related to designing for motivation and adaptive learning.

Instructional alignment refers to a high degree of agreement among the objectives, assessments, and the content in a learning experience (Cohen, 1987). It also includes deriving objectives from and aligning them to sets of relevant external frameworks or standards. Objective design refers to the practice of articulating the objectives, based on relevant sets of standards or external frameworks, for a learning experience such that the objectives reflect the specified measurability attributes while explicitly stating the learning goals. The objectives form the central framework for a learning experience and function as the critical point of reference when designing aligned assessments and content.

The main components of this principle are Pearson's research-based points-of-view on objectives, including their definitions, attributes that support measurability (Anderson, 2001; Dick, Carey, & Carey, 2015; Hattie, 2009; Marzano, 1998; Messick, 1989) and their function and the framework they form (Anderson, 2001; Dick, Carey, & Carey, 2015; Fullan & Langworthy, 2014; Hattie, 2009; Mayer, 2011). The principle also covers the role of standards alignment in the design process as well as an overview of assessment alignment and content alignment.

Design recommendations include:

- Explicitly specify observable knowledge, skills, or attributes a learner will achieve in the learning experience in objective statements.
- Derive these from relevant standards.
- Align all assessments and content to objectives to create aligned learning experiences, which are essential to effective learning experiences and Pearson's efficacy goals.

CAPABILITIES

- Adaptivity: Adaptive remediation
- Instruction: Multimedia active reading
- Management: Learner analytics

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive practice aligned to objectives
- Simple Technology: Objectives informing content design
- Content Support: Showing learners performance by objective



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong use of learning outcomes to define measurable impacts that the learning will have on learners	Some use of learning outcomes to define measurable impacts that the learning will have on learners	Poor use of learning outcomes to define measurable impacts that the learning will have on learners	Does NOT use effectively or is not a related activity	= ____
	Strong use of learning objectives to describe what learners will be able to do at the end of the course	Some use of learning objectives to describe what learners will be able to do at the end of the course	Poor use of learning objectives to describe what learners will be able to do at the end of the course		
	Strong use of enabling objectives to define module or activity level goals	Some use of enabling objectives to define module or activity level goals	Poor use of enabling objectives to define module or activity level goals		
Objectives	Strong use of objectives that are clear, concise, and learner-centered	Some use of objectives that are clear, concise, and learner-centered	Poor use of objectives that are clear, concise, and learner-centered	Does NOT use effectively or is not a related activity	= ____
	Strong use of objectives that are discrete and non-repetitive	Some use of objectives that are discrete and non-repetitive	Poor use of objectives that are discrete and non-repetitive		
	Strong use of objectives that are achievable in the context	Some use of objectives that are achievable in the context	Poor use of objectives that are achievable in the context		
	Strong use of objectives that are observable and measurable	Some use of objectives that are observable and measurable	Poor use of objectives that are observable and measurable		
Alignment	Strong use of appropriate instructional alignment standards to inform design, such as APA, P22, etc.	Some use of appropriate instructional alignment standards to inform design, such as APA, P22, etc.	Poor use of appropriate instructional alignment standards to inform design, such as APA, P22, etc.	Does NOT use effectively or is not a related activity	= ____
	Strong evidence that standards are aligned to learning objectives, thus providing design validation	Some evidence that standards are aligned to learning objectives, thus providing design validation	Poor evidence that standards are aligned to learning objectives, thus providing design validation		
Assessment	Strong application of multiple measurement methods to facilitate the triangulation of data	Some application of multiple measurement methods to facilitate the triangulation of data	Poor application of multiple measurement methods to facilitate the triangulation of data	Does NOT use effectively or is not a related activity	= ____
	Strong use of assessments that are aligned to learning objectives	Some use of assessments that are aligned to learning objectives	Poor use of assessments that are aligned to learning objectives		
	Strong use of feedback that supports improvement towards objectives	Some use of feedback that supports improvement towards objectives	Poor use of feedback that supports improvement towards objectives		

The Assessment Process: Assessment Instrument Design



FOUNDATIONS

DESCRIPTION

Sound assessment item or instrument design, including their development, administration, and ongoing validation practices, are essential to yielding accurate information regarding what learners know, think, and can do at various time points over the course of a learning experience (AERA, APA, & NCME, 2014). As such, assessment design and strategy are critical to supporting student learning and efficacy. The first step of rigorous assessment instrument design involves establishing alignment between any given objective statement and assessment item(s) or instrument(s) developed to elicit the knowledge, skills, or attributes (KSAs) articulated within it. This principle provides a conceptual overview of validity and reliability, and research-based considerations and recommendations for developing assessment items/instruments that adequately and accurately assess objective statements.

CAPABILITIES

- Assessment: Short answer, constructed response
- Assessment: Open-ended assignments (multi-step)
- Assessment: Project

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive/personalized learning experience
- Simple Technology: Self-paced, mastery learning experience
- Content Support: Assessment instrument development and administration

LEARNER IMPACTS

- Achievement
- Motivation
- Self-regulation
- Behavior

The Assessment Process: Assessment Instrument Design SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Objectives	<p>Strong use of objectives that are:</p> <ul style="list-style-type: none"> • Clear • Measurable via multiple methods • Discrete • Achievable • Descriptive of success <p>Strong alignment between objectives, assessments, and learning design</p>	<p>Some use of objectives that are:</p> <ul style="list-style-type: none"> • Clear • Measurable via multiple methods • Discrete • Achievable • Descriptive of success <p>Some alignment between objectives, assessments, and learning design</p>	<p>Poor use of objectives that are:</p> <ul style="list-style-type: none"> • Clear • Measurable via multiple methods • Discrete • Achievable • Descriptive of success <p>Poor alignment between objectives, assessments, and learning design</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Instruments	<p>Strong use of instruments whose validity is supported through evidence and theory</p> <p>Strong use of instruments that are reliable through repeated measures</p>	<p>Some use of instruments whose validity is supported through evidence and theory</p> <p>Some use of instruments that are reliable through repeated measures</p>	<p>Poor use of instruments whose validity is supported through evidence and theory</p> <p>Poor use of instruments that are reliable through repeated measures</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Thinking Skills	<p>Strong use of objectives to specify higher-order thinking skills</p> <p>Strong use of instruments to assess higher-order thinking skills</p> <p>Strong application of activities that are in-depth, complex, and authentic</p>	<p>Some use of objectives to specify higher-order thinking skills</p> <p>Some use of instruments to assess higher-order thinking skills</p> <p>Some application of activities that are in-depth, complex, and authentic</p>	<p>Poor use of objectives to specify higher-order thinking skills</p> <p>Poor use of instruments to assess higher-order thinking skills</p> <p>Poor application of activities that are in-depth, complex, and authentic</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Assessment/ Feedback	<p>Strong application of both formative and summative assessment</p> <p>Strong emphasis on feedback as the purpose of assessment</p> <p>Strong provision of feedback to all relevant stakeholders</p>	<p>Some application of both formative and summative assessment</p> <p>Some emphasis on feedback as the purpose of assessment</p> <p>Some provision of feedback to all relevant stakeholders</p>	<p>Poor application of both formative and summative assessment</p> <p>Poor emphasis on feedback as the purpose of assessment</p> <p>Poor provision of feedback to all relevant stakeholders</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____

Learning Object Design



FOUNDATIONS

LEARNER IMPACTS

- Behavior
- Self-regulation
- Motivation

DESCRIPTION

Learning object design is integral to effective digital learning environments, especially adaptive learning environments. From a learning design perspective, a learning object is the smallest independent structural experience that contains a properly aligned objective, a learning activity, and an assessment that truly measures the stated objective (L'Allier, 1997; Polsani, 2003). Learning objects are described as “appropriately” small (i.e. single sitting), stand alone, and reusable.

Content objects, such as text passages, videos, and assessment items, must be considered through the lens of learner, instructional, and domain models (and UX) before being properly aligned to the stated objective, and before being integrated into the learning object (that is experienced by the learner).

CAPABILITIES

- Instruction: Modularity
- Instruction: Multimedia active reading
- Instruction: Active learning experience

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive scaffolding between problem solving steps
- Simple Technology: Queuing up of relevant study materials
- Content Support: Consistent UX between modules/learning experiences



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<ul style="list-style-type: none"> Strong use of objects that leverage both technical and pedagogical standards Strong structural identification of objects that represent small, independent experiences Strong composition of objects that contain objectives, activities, and assessments 	<ul style="list-style-type: none"> Some use of objects that leverage both technical and pedagogical standards Some structural identification of objects that represent small, independent experiences Some composition of objects that contain objectives, activities, and assessments 	<ul style="list-style-type: none"> Poor use of objects that leverage both technical and pedagogical standards Poor structural identification of objects that represent small, independent experiences Poor composition of objects that contain objectives, activities, and assessments 	Does NOT use effectively or is not a related activity	= ____
Model	<ul style="list-style-type: none"> Strong application of the learner model <ul style="list-style-type: none"> Profiles Education level Strong application of the instructional model <ul style="list-style-type: none"> Objective alignment Assessment strategy Skill levels of objects Objective types Strong application of the domain model <ul style="list-style-type: none"> Rules and reasoning Prerequisites Dependencies Representation Strong application of user experience and usability 	<ul style="list-style-type: none"> Some application of the learner model <ul style="list-style-type: none"> Profiles Education level Some application of the instructional model <ul style="list-style-type: none"> Objective alignment Assessment strategy Skill levels of objects Objective types Some application of the domain model <ul style="list-style-type: none"> Rules and reasoning Prerequisites Dependencies Representation Some application of user experience and usability 	<ul style="list-style-type: none"> Poor application of the learner model <ul style="list-style-type: none"> Profiles Education level Poor application of the instructional model <ul style="list-style-type: none"> Objective alignment Assessment strategy Skill levels of objects Objective types Poor application of the domain model <ul style="list-style-type: none"> Rules and reasoning Prerequisites Dependencies Representation Poor application of user experience and usability 	Does NOT use effectively or is not a related activity	= ____
Design	<ul style="list-style-type: none"> Strong alignment between objects and learning objectives Strong balance between objects that are easily reused and instructionally effective Strong identification of object granularity based on the needs of the context 	<ul style="list-style-type: none"> Some alignment between objects and learning objectives Some balance between objects that are easily reused and instructionally effective Some identification of object granularity based on the needs of the context 	<ul style="list-style-type: none"> Poor alignment between objects and learning objectives Poor balance between objects that are easily reused and instructionally effective Poor identification of object granularity based on the needs of the context 	Does NOT use effectively or is not a related activity	= ____
Assessment	<ul style="list-style-type: none"> Strong alignment between objectives and valid measures Strong evidence that selected objects, activities, and assessments support objectives Strong application of objects that support adaptation and customization of the environment 	<ul style="list-style-type: none"> Some alignment between objectives and valid measures Some evidence that selected objects, activities, and assessments support objectives Some application of objects that support adaptation and customization of the environment 	<ul style="list-style-type: none"> Poor alignment between objectives and valid measures Poor evidence that selected objects, activities, and assessments support objectives Poor application of objects that support adaptation and customization of the environment 	Does NOT use effectively or is not a related activity	= ____

Formative Assessment



FOUNDATIONS

LEARNER IMPACTS

- Achievement
- Motivation
- Self-regulation
- Behavior

DESCRIPTION

Formative assessment is a critical component of a comprehensive assessment strategy as it supports student learning by providing timely, specific feedback to learners and instructors at meaningful points during the learning experience. According to the research, the benefits of formative assessment and the feedback it provides depends on its design and implementation (Bennett, 2011; Shute, 2007). Thus, the focus of this principle is what constitutes effective formative assessment and how this can be implemented within our products to best support student learning. Research-based recommendations focus on addressing the five strategies of effective formative assessment (Wiliam, 2007) and adhering to the standards for educational and psychological testing (AERA, APA, & NCME, 2014).

CAPABILITIES

- Assessment: Open-ended assignments (single step)
- Instruction: Item level hints
- Management: Algorithmically variable assessments

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Utilizing Intelligent Tutoring Systems (ITS) in association with formative assessment instruments
- Simple Technology: Opportunities and capabilities to support self- and peer-assessment
- Content Support: Providing specific, descriptive, and actionable feedback statements in association with assessment instruments



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong integration of formative assessment into a comprehensive assessment system	Some integration of formative assessment into a comprehensive assessment system	Poor integration of formative assessment into a comprehensive assessment system	Does NOT use effectively or is not a related activity	= ____
	Strong use of timely, specific feedback to support students and instructors throughout the learning experience	Some use of timely, specific feedback to support students and instructors throughout the learning experience	Poor use of timely, specific feedback to support students and instructors throughout the learning experience		
Establishing where learners are	Strong use of activities that elicit evidence of learning	Some use of activities that elicit evidence of learning	Poor use of activities that elicit evidence of learning	Does NOT use effectively or is not a related activity	= ____
	Strong assessment of prior knowledge	Some assessment of prior knowledge	Poor assessment of prior knowledge		
	Strong use of pre-training as needed to ensure prerequisites are met	Some use of pre-training as needed to ensure prerequisites are met	Poor use of pre-training as needed to ensure prerequisites are met		
Establishing where learners are going	Strong use of criteria to clarify the conditions for success	Some use of criteria to clarify the conditions for success	Poor use of criteria to clarify the conditions for success	Does NOT use effectively or is not a related activity	= ____
	Strong use of continual peer and instructor communication to support progress	Some use of continual peer and instructor communication to support progress	Poor use of continual peer and instructor communication to support progress		
	Strong use of hints, tips, instructions, or related measures to facilitate the discussion of course standards	Some use of hints, tips, instructions, or related measures to facilitate the discussion of course standards	Poor use of hints, tips, instructions, or related measures to facilitate the discussion of course standards		
Establishing how learners are going to get there	Strong use of feedback to propel learners towards the objectives	Some use of feedback to propel learners towards the objectives	Poor use of feedback to propel learners towards the objectives	Does NOT use effectively or is not a related activity	= ____
	Strong use of peers and collaboration to work towards goals	Some use of peers and collaboration to work towards goals	Poor use of peers and collaboration to work towards goals		
	Strong use of self-regulated learning (SRL) strategies to work towards goals	Some use of SRL strategies to work towards goals	Poor use of SRL strategies to work towards goals		

Supporting Student Learning with Feedback



FOUNDATIONS

LEARNER IMPACTS

- Achievement
- Motivation
- Self-regulation
- Behavior

DESCRIPTION

Feedback is “information provided [as ‘a consequence of performance’] by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one’s performance and understanding” (Hattie & Timperley, 2007). Research suggests that feedback provided to learners and instructors in a formative context should adhere to certain characteristics in order to positively impact learner performance and achievement (Shute, 2007). This principle provides an overview of the formative assessment feedback literature and provides research-based recommendations for providing feedback to both learners and instructors that has the potential to support student learning (i.e., feedback that is corrective/addresses misconception[s], motivating, and facilitates self-regulation). Recommendations include providing feedback statements to learners that are understandable, descriptive, specific, and actionable (Lipnevich & Smith, 2009; Nicol & MacFarlane-Dick, 2006; Shute, 2007) and providing specific, timely performance reporting and recommendations to instructors to inform intervention (Bennett, 2011; Wiliam, 2007).

CAPABILITIES

- Adaptivity: Local “targeted” feedback
- Instruction: Software simulation
- Instruction: Item leveled hints

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Utilizing Intelligent Tutoring Systems (ITS) in association with formative assessment instruments
- Simple Technology: Providing access to specific, targeted resources based on performance
- Content Support: Providing specific, descriptive, and actionable feedback statements in association with assessment instruments

Supporting Student Learning with Feedback

SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<ul style="list-style-type: none"> Strong integration of formative assessment into a comprehensive assessment system Strong use of timely, specific feedback to support students and instructors throughout the learning experience 	<ul style="list-style-type: none"> Some integration of formative assessment into a comprehensive assessment system Some use of timely, specific feedback to support students and instructors throughout the learning experience 	<ul style="list-style-type: none"> Poor integration of formative assessment into a comprehensive assessment system Poor use of timely, specific feedback to support students and instructors throughout the learning experience 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____
Establishing where learners are	<ul style="list-style-type: none"> Strong use of activities that elicit evidence of learning Strong assessment of prior knowledge Strong use of pre-training as needed to ensure prerequisites are met 	<ul style="list-style-type: none"> Some use of activities that elicit evidence of learning Some assessment of prior knowledge Some use of pre-training as needed to ensure prerequisites are met 	<ul style="list-style-type: none"> Poor use of activities that elicit evidence of learning Poor assessment of prior knowledge Poor use of pre-training as needed to ensure prerequisites are met 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____
Establishing where learners are going	<ul style="list-style-type: none"> Strong use of criteria to clarify the conditions for success Strong use of continual peer and instructor communication to support progress Strong use of hints, tips, instructions, or related measures to facilitate the discussion of course standards 	<ul style="list-style-type: none"> Some use of criteria to clarify the conditions for success Some use of continual peer and instructor communication to support progress Some use of hints, tips, instructions, or related measures to facilitate the discussion of course standards 	<ul style="list-style-type: none"> Poor use of criteria to clarify the conditions for success Poor use of continual peer and instructor communication to support progress Poor use of hints, tips, instructions, or related measures to facilitate the discussion of course standards 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____
Establishing how learners are going to get there	<ul style="list-style-type: none"> Strong use of feedback to propel learners towards the objectives Strong use of peers and collaboration to work towards goals Strong use of self-regulated learning (SRL) strategies to work towards goals 	<ul style="list-style-type: none"> Some use of feedback to propel learners towards the objectives Some use of peers and collaboration to work towards goals Some use of SRL strategies to work towards goals 	<ul style="list-style-type: none"> Poor use of feedback to propel learners towards the objectives Poor use of peers and collaboration to work towards goals Poor use of SRL strategies to work towards goals 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____

Learner Attributes



FOUNDATIONS

LEARNER IMPACTS

- Behavior

DESCRIPTION

Learner attributes are the various pieces of data that inform us about who our learners are. These attributes may provide valuable insights about how learners learn and how we can individualize their instruction to better suit those attributes. Attributes are generally joined together to form a learner profile (Le, 2009) which can be used to support diagnosing learner needs and providing a treatment to assist them (Herold, 2014). Though research into certain parts of learner profiles, such as aptitude treatment interaction and learning styles, has shown little effect on learning (Pashler, McDaniel, Rohrer, & Bjork, 2008), certain attributes as well as dynamic monitoring of attributes have been shown to have increased impact on student learning (Arroyo, Mehranian, & Woolf, 2010). This principle will look at the large array of different attributes we may collect and how we could utilize the data.

CAPABILITIES

- Management: Cross-course portfolio/analytics/profile
- Management: Learning analytics

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Content personalization to individual attributes
- Simple Technology: Diagnostics for understanding learner prior knowledge
- Content Support: Metatagging of content to enable attribute tracking



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p>Strong collection of relevant learner data from multiple sources</p> <p>Strong application of data towards the adaptation of products to learners</p>	<p>Some collection of relevant learner data from multiple sources</p> <p>Some application of data towards the adaptation of products to learners</p>	<p>Poor collection of relevant learner data from multiple sources</p> <p>Poor application of data towards the adaptation of products to learners</p>	Does NOT use effectively or is not a related activity	= ____
Model	<p>Strong application of the two-step approach built upon an initial learner profile that adapts over time based on data collection</p> <p>Strong robustness of analysis design that does not rely on a single imperfect source, such as ATI or learning styles alone</p>	<p>Some application of the two-step approach built upon an initial learner profile that adapts over time based on data collection</p> <p>Some robustness of analysis design that does not rely on a single imperfect source, such as ATI or learning styles alone</p>	<p>Poor application of the two-step approach built upon an initial learner profile that adapts over time based on data collection</p> <p>Poor robustness of analysis design that does not rely on a single imperfect source, such as ATI or learning styles alone</p>	Does NOT use effectively or is not a related activity	= ____
Design	<p>Strong consideration of appropriate attributes in the design of the learner profile</p> <ul style="list-style-type: none"> Demographic Cognitive Motivational Interactive Metacognitive <p>Strong consideration of how the learner profile will adapt over time through the collection, analysis, and adaptation from these attributes</p>	<p>Some consideration of appropriate attributes in the design of the learner profile</p> <ul style="list-style-type: none"> Demographic Cognitive Motivational Interactive Metacognitive <p>Some consideration of how the learner profile will adapt over time through the collection, analysis, and adaptation from these attributes</p>	<p>Poor consideration of appropriate attributes in the design of the learner profile</p> <ul style="list-style-type: none"> Demographic Cognitive Motivational Interactive Metacognitive <p>Poor consideration of how the learner profile will adapt over time through the collection, analysis, and adaptation from these attributes</p>	Does NOT use effectively or is not a related activity	= ____
Data	<p>Strong use of triangulated data from multiple sources, such as demographics, achievement, diagnostics, self-assessment, and user interactions</p> <p>Strong use of metacognitive, motivational, and self-explanation data to improve learning</p>	<p>Some use of triangulated data from multiple sources, such as demographics, achievement, diagnostics, self-assessment, and user interactions</p> <p>Some use of metacognitive, motivational, and self-explanation data to improve learning</p>	<p>Poor use of triangulated data from multiple sources, such as demographics, achievement, diagnostics, self-assessment, and user interactions</p> <p>Poor use of metacognitive, motivational, and self-explanation data to improve learning</p>	Does NOT use effectively or is not a related activity	= ____

Metacognition



FOUNDATIONS

LEARNER IMPACTS

- Behavior
- Self-regulation
- Motivation

DESCRIPTION

Metacognition is “...thinking about the contents and processes of one’s mind.” (Winne & Azevedo, 2014, p. 126). Metacognitive awareness as a function of metacognitive regulation is a strong predictor of academic performance and achievement as it increases students’ ability to transfer their learning to new contexts and tasks and continually become more strategic learners (Bransford, Brown, & Cocking, 2000; Azevedo, R. & Cromley, J. G., 2004; Schraw, 2008; Tobias & Everson, 2009).

Design recommendations focus on supporting and scaffolding metacognitive awareness and self regulation to help students be strategic learners as they become more aware of the status of their knowing, understanding, and executing, as well as increase in self-regulated learning skill and will by accepting greater accountability for their learning processes and outcomes (Lee, Lim, & Grabowski, 2010; Pintrich, 2004; Pintrich & Groot, 1990; Zimmerman, 1990).

CAPABILITIES

- Assessment: Short answer constructed response
- Cognitive Tools: Peer review
- Cognitive Tools: Planning/outlining

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive scaffolds
- Simple Technology: Notifications/prompts
- Content Support: Instruction/practice monitoring learning



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Supports all of: self-awareness of learning, active use of learning strategies, accountability for learning	Supports two of: self-awareness of learning, active use of learning strategies, accountability for learning	Supports one of: self-awareness of learning, active use of learning strategies, accountability for learning	Supports none of: self-awareness of learning, active use of study strategies, accountability for learning	= ____
Model	Supports knowledge development in all of these forms: declarative, procedural, conditional Supports thinking development in all of these forms: monitoring, control, self-regulated learning (SRL)	Supports knowledge development in two of these forms: declarative, procedural, conditional Supports thinking development in two of these forms: monitoring, control, SRL	Supports knowledge development in one of these forms: declarative, procedural, conditional Supports thinking development in one of these forms: monitoring, control, SRL	Supports knowledge development in none of these forms: declarative, procedural, conditional Supports thinking development in none of these forms: monitoring, control, SRL	= ____
Design	Supports and scaffolds metacognition by means of four or more of: realistic feedback, constructive feedback, suitable task difficulty, task autonomy, outcome attribution Supports SRL by all of: minimizing cognitive load, providing adaptive scaffolding, training, practice and reflection on SRL skills	Supports metacognition by means of three or more of: realistic feedback, constructive feedback, suitable task difficulty, task autonomy, outcome attribution Supports SRL by two of: minimizing cognitive load, providing adaptive scaffolding, training, practice and reflection on SRL skills	Supports metacognition by means of two or more of: realistic feedback, constructive feedback, suitable task difficulty, task autonomy, outcome attribution Supports SRL by one of: minimizing cognitive load, providing adaptive scaffolding, training, practice and reflection on SRL skills	Supports metacognition by means of one or fewer of: realistic feedback, constructive feedback, suitable task difficulty, task autonomy, outcome attribution Does not support SRL by any of: minimizing cognitive load, providing adaptive scaffolding, training on SRL skills	= ____
Validation	Triangulates data among at least three sources Validates data by all of the following means: ensuring behaviors match conditions, evaluating how well strategies were executed, determining if/why strategies/features were not used	Relies upon at least two different data sources Validates data by two of the following means: ensuring behaviors match conditions, evaluating how well strategies were executed, determining if/why strategies/features were not used	Relies upon a single data source Validates data by one of the following means: ensuring behaviors match conditions, evaluating how well strategies were executed, determining if/why strategies/features were not used	Metacognition is not measured	= ____

Scaffolding



FOUNDATIONS

LEARNER IMPACTS

- Behavior
- Motivation
- Self-regulation

DESCRIPTION

Scaffolding enables not only the performance of a task more complex than the learner could handle alone, but enables learning to come from that experience (Reiser & Tabak, 2014). It also facilitates critical thinking skills, metacognition, and content understanding (which in turn impact motivation and achievement).

Scaffolding occurs when work is shared between the learner and a more knowledgeable other or agent such as contingency, fading, and transfer of responsibility (van de Pol et al., 2010). Design recommendations center around managing the learning process so that learners can engage in (often simplified) elements of disciplinary work in real problem contexts. Instructors focus learner attention and regularly prompt learners to explain and reflect on their work.

CAPABILITIES

- Instruction: Scaffolded worked example
- Cognitive Tools: Bibliography/citation creation
- Cognitive Tools: Planning/outlining

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive scaffolded practice
- Simple Technology: Student input capabilities for shared explanations and reflections
- Content Support: Focus learner's attention on aspects of the problem they may take for granted



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<p> The product strategy is aligned to scaffolding as a core principle of a learner-centered product.</p> <p> The product strategy currently integrates the use of an evidence-based model of scaffolding.</p>	<p> The product team is exploring scaffolding as a core LDP for creating a more learner-centered product.</p> <p> The product team is exploring integrating an evidence-based model for the scaffolding.</p>	<p> The product team considers scaffolding to be an important LDP for creating a more learner-centered product.</p> <p> The product strategy considers scaffolding at a high level but does not currently align to an evidence-based model.</p>	<p> The scaffolding LDP does NOT align to the product strategy and is not necessary to explore further.</p>	= ____
Scaffolding Application	<p> The product uses a combination of learning strategy recommendations, and embedding of scaffolding in the design of scaffolding applications.</p>	<p> Principle is applied only to a specific area of the product and more focus on enhancing the scaffolding of instructional content is needed to improve principle application.</p>	<p> Product team thinks applying this principle would add value to their product strategy.</p> <p> Product team has applied similar principles to their product strategy.</p>	<p> This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.</p>	= ____
Delivery	<p> Scaffolding of instructional content on a capability or service aligned to this principle has been gathered/ reported on.</p>	<p> Product team is in early discussions about partnering with LD team to validate this principle with learners.</p> <p> Product team has specific capabilities they need to validate this principle with.</p>	<p> Product team needs more information about how this principle might be tested with learners using LD's validation services.</p>	<p> This principle does NOT need to be validated in order to inform product design & development.</p>	= ____
Learner Characteristics	<p> Design & development are currently using validation reports to further align the principle and the product strategy.</p>	<p> Product team is currently exploring how validation results and recommendations could be used in product design & development.</p>	<p> Product team feels there is time in the schedule to include validation data to inform product design & development.</p> <p> Product team needs a consultation to learn more about validation services and results reports.</p>	<p> Validation data will NOT be used to inform product design & development.</p>	= ____
Formative/Summative Applications	<p> The formative and summative applications make proper use of scaffolding LDP recommendations for creating assessments.</p>	<p> Product team is currently exploring how recommendations on designing assessments with scaffolding of instructional content in mind could be used in product design & development.</p>	<p> Product team feels there is time in the schedule to include time spent on assessment application design & development.</p> <p> Product team needs a consultation to learn more about designing assessments based on this LDP.</p>	<p> Formative/summative applications will NOT be used to inform product design & development.</p>	= ____

Self-Regulated Learning

(Motivation and Learning Strategies)



THE NATURE
OF KNOWLEDGE

DESCRIPTION

Self regulated learning (SRL) is made up of instructional processes and learning strategies aligned to supporting both the will and skill elements of students' abilities to manage and improve their own learning process.

SRL is guided by metacognition (thinking about learning), strategic action (planning, monitoring, regulating, reflecting), and motivation to learn, and is predictive of higher learning achievement (Flavell, 1979; Pintrich, 2004). Design recommendations focus on scaffolding SRL in digital learning environments to help students be more aware of their learning progress, accountable for knowledge and skill development, and strategic in their use of learning tools and other efforts related to managing time and monitoring learning progress. (Azevedo, et al., 2004; Zimmerman, 1990)

LEARNER IMPACTS

- Attitudes
- Behavior
- Motivation
- Self-regulation

CAPABILITIES

- Adaptivity: Adaptive remediation
- Instruction: Multimedia active reading
- Management: Learner analytics

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive practice aligned to learning goals
- Simple Technology: Learning planning and monitoring tools
- Content Support: Instruction/practice of SRL skill building

Self-Regulated Learning (Motivation and Learning Strategies) SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<p> Supports all of: self-awareness of learning, active use of learning strategies, accountability for learning</p> <p> Supports all of: planning, monitoring, regulating, reflecting across at least one of: cognition, affect, behavior, context</p>	<p> Supports two of: self-awareness of learning, active use of learning strategies, accountability for learning</p> <p> Supports three of: planning, monitoring, regulating, reflecting across at least one of: cognition, affect, behavior, context</p>	<p> Supports one of: self-awareness of learning, active use of learning strategies, accountability for learning</p> <p> Supports two of: planning, monitoring, regulating, reflecting across at least one of: cognition, affect, behavior, context</p>	<p> Supports none of: self-awareness of learning, active use of learning strategies, accountability for learning</p> <p> Supports one or fewer of: planning, monitoring, regulating, reflecting across one or fewer of: cognition, affect, behavior, context</p>	<p>= ____</p>
Scaffolding and Feedback Instructional Strategies	<p> Scaffolding and feedback designed to support at least four of: clarify performance, facilitate reflecting, deliver high-quality information, encourage dialogue, encourage positive motivation, close performance gap, provide improvement information to teachers</p>	<p> Scaffolding and feedback designed to support at least three of: clarify performance, facilitate reflecting, deliver high-quality information, encourage dialogue, encourage positive motivation, close performance gap, provide improvement information to teachers</p>	<p> Scaffolding and feedback designed to support at least two of: clarify performance, facilitate reflecting, deliver high-quality information, encourage dialogue, encourage positive motivation, close performance gap, provide improvement information to teachers</p>	<p> Scaffolding and feedback designed to support one or fewer of: clarify performance, facilitate reflecting, deliver high-quality information, encourage dialogue, encourage positive motivation, close performance gap, provide improvement information to teachers</p>	<p>= ____</p>
Digital Design Applications	<p> Students trained on SRL prior to learning</p> <p> Complex topics scaffolded well</p> <p> Interactive elements used to support SRL</p> <p> SRL behavior analyzed to support interventions</p> <p> Digital elements, like wikis, journals, discussion forums, used effectively to support SRL</p>	<p> Students trained on SRL after learning</p> <p> Complex topics poorly scaffolded</p> <p> Elements used to support SRL, but not making full use of interactivity</p> <p> Behavior analysis exists, but not used to support SRL interventions</p> <p> Digital elements, like wikis, journals, discussion forums used, but not to support SRL</p>	<p> Students trained on SRL, but poorly</p> <p> Complex topics not scaffolded</p> <p> Elements do not support SRL</p> <p> Behavior analysis not used</p> <p> Digital elements, like wikis, journals, discussion forums not used</p>	<p> Not applicable to the design of this tool/capability</p>	<p>= ____</p>

Critical Thinking



THE NATURE
OF KNOWLEDGE

DESCRIPTION

Critical thinking is "...purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of...the considerations upon which that judgment is based..." (Facione, 1990, p. 2). Critical thinking is of increasing importance to learner achievement and employability as it requires the cultivation and application of higher-order thinking skills (e.g., analysis, evaluation, and/or creation) and dispositions (e.g., open-mindedness, curiosity) across various contexts. This principle provides an overview of the critical thinking literature and focuses on research-based recommendations for course design that supports the development and application of generic and domain-specific critical thinking skills and dispositions. Recommendations include providing explicit instruction aligned to critical thinking objective statements, incorporating authentic or anchored instruction and opportunities for dialogue and mentoring, and providing content and assessment that appropriately model and scaffold critical thinking skills and dispositions (Abrami et al., 2014; Halpern, 1998; Lai, 2011; Liu, Frankel, & Roohr, 2014; Nilson, 2013).

LEARNER IMPACTS

- Achievement
- Attitudes
- Behavior

CAPABILITIES

- Adaptivity: Adaptive remediation
- Instruction: Multimedia active reading
- Management: Learner analytics

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive practice aligned to objectives
- Simple Technology: Objectives informing content design
- Content Support: Showing learners performance by objective



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<p> The product strategy is aligned to critical thinking as a core principle of a learner-centered product.</p> <p> The product strategy currently integrates the use of knowledge creation tools as a means to engage learners in critical thinking.</p>	<p> The product team is exploring critical thinking as a core LDP for creating a more learner-centered product.</p> <p> The product team is exploring integrating an evidence-based critical-thinking model.</p>	<p> The product team considers critical thinking to be an important LDP for creating a more learner-centered product.</p> <p> The product strategy considers critical thinking at a high level but does not currently align to an evidence-based model.</p>	<p> The critical thinking LDP does NOT align to the product strategy and is not necessary to explore further.</p>	= ____
Critical Thinking Application	<p> The product uses a combination of domain specific and explicit critical thinking instruction.</p> <p> Higher-order Bloom's Taxonomy skills are used to determine how to best apply this principle to improve product design.</p>	<p> Principle is applied only to a specific area of the product and more focus on enhancing critical thinking skills is needed to improve principle application.</p>	<p> Product team thinks applying this principle would add value to their product strategy.</p> <p> Product team has applied similar principles to their product strategy.</p>	<p> This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.</p>	= ____
Critical Thinking Delivery	<p> Critical thinking on a capability or service aligned to this principle has been gathered/reported on.</p>	<p> Product team is in early discussions about partnering with LD team to validate this principle with learners.</p> <p> Product team has specific capabilities they need to validate this principle with.</p>	<p> Product team needs more information about how this principle might be tested with learners using LD's validation services.</p>	<p> This principle does NOT need to be validated in order to inform product design & development.</p>	= ____
Learner Characteristics	<p> Design & development are currently using validation reports to further align the principle and the product strategy.</p>	<p> Product team is currently exploring how validation results and recommendations could be used in product design & development.</p>	<p> Product team feels there is time in the schedule to include validation data to inform product design & development.</p> <p> Product team needs a consultation to learn more about validation services and results reports.</p>	<p> Validation data will NOT be used to inform product design & development.</p>	= ____

Video in Instruction and Assessment



THE NATURE
OF KNOWLEDGE

DESCRIPTION

Digital videos can be used for both instruction and at various points in the assessment process. The following areas are well-supported by educational research:

- Video in instruction (e.g. Clark & Mayer, 2011; Mayer, 2009)
- Video peer review (e.g. Falchikov & Goldfinch, 2000; Kavas & Ozdener, 2012; Wu & Kao, 2008)
- Video for reflection and self-assessment (e.g. Hartsell, 2013; Hirschel, Yamamoto, & Lee, 2012; Koole et al., 2012)
- Student video creation (e.g. Kearney & Schuck, 2008; Guo, Kim, & Rubin, 2014)
- Video for feedback and assessment (e.g. Tochon, 2001; Turner & West, 2013)
- Vicarious learning via video for changing affective states and attitudes (e.g. Martin & Briggs, 1986; Wetzel, Radtke, & Stern, 1994; Zimbardo & Leippe, 1991)

Yet, simply including videos in these situations does not positively impact learning unless the activities and/or content are explicitly aligned to well-articulated learning objectives (Clark & Mayer, 2011). Furthermore, there is little to no research support for instructional videos whose sole purpose is to interest or motivate learners. However, videos that both align with learning objectives AND provide interesting content CAN both motivate and impact learning.

CAPABILITIES

- Assessment: Project
- Cognitive Tools: Synchronous social learning: audio/video based
- Cognitive Tools: Timestamped video comments

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Video peer review system; collaborative online video editing
- Simple Technology: Standalone instructional videos with assessment items
- Content Support: Instructional videos aligned with learning objectives

LEARNER IMPACTS

- Attitudes
- Behavior
- Motivation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p> Videos integrate multimodal elements, such as images, sound, narration, and animation</p> <p> Videos are used to support assessment, feedback, demonstration, reflection, and/or interaction</p>	<p> Videos fail to integrate several multimodal elements</p> <p> Videos are underutilized to support multiple potential benefits</p>	<p> Videos only utilize a single multimedia element</p> <p> Videos only support a single potential benefit</p>	<p> Does NOT leverage multiple benefits of video usage</p>	<p>= ____</p>
Model	<p> Videos are used to support authentic learning through a participation model in a real-world context</p>	<p> Videos are used to support authentic learning through the simulation model with realistic activities</p>	<p> Videos are poorly or unclearly used to support authentic learning</p>	<p> Does NOT leverage the benefits of authentic learning through video</p>	<p>= ____</p>
Design	<p> Strong use of technology to enhance students' ability to communicate around video</p> <p> Videos are made with a brief time-frame in mind, such as 5-10 minutes</p> <p> Strong alignment between authentic environment and video-based activities</p>	<p> Some use of technology to enhance students' ability to communicate around video</p> <p> Videos are chunked into shorter sessions of 30-60 minutes</p> <p> Some alignment between authentic environment and video-based activities</p>	<p> Poor use of technology to enhance students' ability to communicate around video</p> <p> Videos are longer than is ideal and should be broken down further</p> <p> Poor alignment between authentic environment and video-based activities</p>	<p> Does NOT use design effectively</p>	<p>= ____</p>
Assessment	<p> Strong use of criteria and/or standardized instruments to support peer review</p> <p> Strong alignment between learning objectives and assessment techniques</p> <p> Strong use of constructive feedback to guide and support effective learning strategies</p>	<p> Some use of criteria and/or standardized instruments to support peer review</p> <p> Some alignment between learning objectives and assessment techniques</p> <p> Some use of constructive feedback to guide and support effective learning strategies</p>	<p> Poor use of technology to enhance students ability to communicate around video</p> <p> Videos are longer than is ideal and should be broken down further</p> <p> Poor alignment between authentic environment and video-based activities</p>	<p> Does NOT assess effectively or not an assessment-based activity</p>	<p>= ____</p>

Sequencing and the Repetition of Content



THE NATURE
OF KNOWLEDGE

DESCRIPTION

Sequencing is the efficient ordering of content in such a way as to help the learner achieve the objectives. Sequencing of instruction is important because it directly impacts how we learn and how we feel about learning. It affects the way information is processed and retained and, from a product development perspective, it helps to avoid inconsistencies and duplication of content (Morrison, Ross, & Kemp, 2004).

There is no one-size-fits all model to sequencing, but there are some proven approaches that have been found to be effective:

1. Learner-Related: Considers learner characteristics such as prior experience, cognitive development, and motivation
2. World-Related: Considers sequencing based on the characteristics of the learning material itself
3. Concept-Related: Related concepts are presented together

With repetition, we're talking about the way we repeat information and practice it as a way to learn and remember it. Specific approaches to repetition/practice, namely distributed practice (when studying and/or practice is spread over multiple sessions over time) and interleaving (when learners study completely different examples of a given concept or topic that are spaced across time), have been found to improve learning (Taylor & Rohrer, 2010).

LEARNER IMPACTS

- Behavior
- Motivation
- Self-regulation

CAPABILITIES

- Cognitive Tools: Flash card and concept map creation
- Instruction: Multimedia active reading
- Instruction: Modularity

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive software
- Simple Technology: Spaced practice
- Content Support: Opportunities for repeated practice

Sequencing and the Repetition of Content

SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<p> The product strategy is aligned to sequence as a core principle of a learner-centered product.</p> <p> The product strategy is aligned to repetition as a core principle of a learner-centered product.</p> <p> The product strategy currently integrates the use of an evidence-based model of sequencing instruction.</p>	<p> The product team is exploring sequencing of instructional content and repetition as a core LDP for creating a more learner-centered product.</p> <p> The product strategy is exploring integrating an evidence-based model for the sequencing of instruction.</p> <p> The product strategy is exploring integrating a recommended evidence-based approach to repetition of content.</p>	<p> The product team considers sequence and repetition to be an important LDP for creating a more learner-centered product.</p> <p> The product strategy considers sequence and repetition at a high level but does not currently align to an evidence-based model.</p>	<p> The sequence and repetition LDP does NOT align to the product strategy and is not necessary to explore further.</p>	= ____
Sequence and Repetition Application	<p> The product uses a combination of domain specific and explicit sequence and repetition instruction.</p> <p> Higher-order Bloom's Taxonomy skills are used to determine how to best apply this principle to improve product design.</p>	<p> Principle is applied only to a specific area of the product and more focus on enhancing the sequence and repetition of instructional content is needed to improve principle application.</p>	<p> Product team thinks applying this principle would add value to their product strategy.</p> <p> Product team has applied similar principles to their product strategy.</p>	<p> This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.</p>	= ____
Instructional Delivery	<p> Sequencing and repetition of instructional content on a capability or service aligned to this principle has been gathered/reported on.</p>	<p> Product team is in early discussions about partnering with LD team to validate this principle with learners.</p> <p> Product team has specific capabilities they need to validate this principle with.</p>	<p> Product team needs more information about how this principle might be tested with learners using LD's validation services.</p>	<p> This principle does NOT need to be validated in order to inform product design & development.</p>	= ____
Instructional Validation	<p> Design & development are currently using validation reports to further align the principle and the product strategy.</p>	<p> Product team is currently exploring how validation results and recommendations could be used in product design & development.</p>	<p> Product team feels there is time in the schedule to include validation data to inform product design & development.</p> <p> Product team needs a consultation to learn more about validation services and results reports.</p>	<p> Validation data will NOT be used to inform product design & development.</p>	= ____

Memory and Learning



THE NATURE OF KNOWLEDGE

LEARNER IMPACTS

- Achievement
- Behavior
- Self-regulation

DESCRIPTION

"Memory is the means by which we draw on our past experiences in order to use this information in the present." (Sternberg, 1999). "Human memory is the continuously active system that receives, modifies, stores, retrieves, and acts upon information." (Klatzky, 1980). The Memory and Learning LDP uses research from Anderson; Baddeley; Bruning, Schraw, Norby, & Ronning and others to show why understanding how learners encode, retrieve, store, modify, and make use of information is important when discussing the design and development of learning environments.

The LDP presents research on memory to provide insights on the following:

- Limits on memory
- Memory capacity
- What causes information to be lost from memory
- What happens when information is lost from memory

Recommendations include:

- Leveraging instructional design strategies for memory
- Applying the principles of metacognition and self-regulated learning
- Designing learning activities and environments to:
 - Help students organize new information into meaningful chunks
 - Make information processing easier by distributing it within working memory
 - Have students connect procedural knowledge to real-life contextualized situations by practicing and integrating new skills into complex problems
 - Distribute practice and retrieval

CAPABILITIES

- Cognitive Tools: Flash card and concept map creation
- Assessment: Selected response
- Assessment: Short answer, constructed response

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Design for encoding, retrieval, storing, and modifying learned material
- Simple Technology: Foundation for metacognition, authentic learning, self-regulated learning
- Content Support: Visuals, prior knowledge activation, analogies



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<p> The product strategy is aligned to memory and retention as a core principle of a learner-centered product.</p> <p> The product strategy currently integrates the use of educational technology tools as a means to maximize memory and retention.</p>	<p> The product team is exploring memory/retention as a core LDP for creating a more learner-centered product.</p> <p> The product strategy is exploring integrating an evidence-based model of memory/retention.</p>	<p> The product team considers memory and/or retention to be an important LDP for creating a more learner-centered product.</p> <p> The product strategy considers memory and/or retention at a high level but does not currently align to an evidence-based model.</p>	<p> The memory LDP does NOT align to the product strategy and is not necessary to explore further.</p>	<p>= ____</p>
Memory Application	<p> The product uses a computational cognitive model of memory to facilitate long-term retention.</p> <p> A form of distributed practice is used to maximize retention.</p>	<p> Principle is applied only to a specific area of the product and more focus on enhancing memory is needed to improve principle application.</p>	<p> Product team thinks applying this principle would add value to their product strategy.</p> <p> Product team has applied similar principles to their product strategy.</p>	<p> This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.</p>	<p>= ____</p>
Delivery	<p> Memory/retention on a capability or service aligned to this principle has been gathered/reported on.</p>	<p> Product team is in early discussions about partnering with LD team to validate this principle with learners.</p> <p> Product team has specific capabilities they need to validate this principle with.</p>	<p> Product team needs more information about how this principle might be tested with learners using LD's validation services.</p>	<p> This principle does NOT need to be validated in order to inform product design & development.</p>	<p>= ____</p>
Learner Characteristics	<p> Design & development are currently using validation reports to further align the principle and the product strategy.</p>	<p> Product team is currently exploring how validation results and recommendations could be used in product design & development.</p>	<p> Product team feels there is time in the schedule to include validation data to inform product design & development.</p> <p> Product team needs a consultation to learn more about validation services and results reports.</p>	<p> Validation data will NOT be used to inform product design & development.</p>	<p>= ____</p>

Creative Thinking



THE NATURE
OF KNOWLEDGE

DESCRIPTION

Creative thinking can be defined as a metacognitive process of thinking about and generating novel or useful associations or ideas with the purpose of producing a plan, generating a solution, or identifying a model, pattern, process, structure, or product not clearly present before. Creative thinking is also known in the literature as divergent thinking (Hargrove, 2013).

Creative thinking must be supported by critical thinking in order for learners to increase the ability to refine creative ideas and hone solutions by using judgments to make decisions, solve problems, and take action, as appropriate (American Management Association, 2012).

CAPABILITIES

- Assessment: Open-ended assignments (file upload)
- Assessment: Project
- Assessment: Work sample/e-portfolio

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Student generated videos detailing business strategy pitches
- Simple Technology: Concept mapping a story
- Content Support: Problem-based instruction with student generated solution

LEARNER IMPACTS

- Attitudes
- Behavior



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong support of novelty in the ideation and problem-solving process	Some support of novelty in the ideation and problem-solving process	Poor support of novelty in the ideation and problem-solving process	Does NOT qualify according to definition	= ____
	Strong support of utility in the ideation and problem-solving process	Some support of utility in the ideation and problem-solving process	Poor support of utility in the ideation and problem-solving process		
	Strong emphasis on metacognitive strategies to support creative thinking	Some emphasis on metacognitive strategies to support creative thinking	Poor emphasis on metacognitive strategies to support creative thinking		
Core Process	Strong support of idea generation through brainstorming, problems, constraints, or exploration	Some support of idea generation through brainstorming, problems, constraints, or exploration	Poor support of idea generation through brainstorming, problems, constraints, or exploration	Does NOT apply the process effectively	= ____
	Strong support of self-regulated learning (SRL) planning, monitoring, and evaluating to reflect upon and improve ideas	Some support of SRL planning, monitoring, and evaluating to reflect upon and improve ideas	Poor support of SRL planning, monitoring, and evaluating to reflect upon and improve ideas		
	Strong support of attitudes that are flexible, motivated, and confident	Some support of attitudes that are flexible, motivated, and confident	Poor support of attitudes that are flexible, motivated, and confident		
	Strong communication of goals to produce context-relevant and applicable concepts	Some communication of goals to produce context-relevant and applicable concepts	Poor communication of goals to produce context-relevant and applicable concepts		
Design	Strong support of metacognition through the design of activities	Some support of metacognition through the design of activities	Poor support of metacognition through the design of activities	Does NOT use design effectively	= ____
	Strong support of creative thinking at both the individual and group levels	Some support of creative thinking at both the individual and group levels	Poor support of creative thinking at both the individual and group levels		
	Strong application of relevant strategies from the literature	Some application of relevant strategies from the literature	Poor application of relevant strategies from the literature		
Assessment	Strong use of creative thinking rubrics and assessment that is tightly tied to the context	Some use of creative thinking assessment that is tightly tied to the context	Poor use of creative thinking assessment that is tightly tied to the context	Does NOT use effectively or is not a related activity	= ____
	Strong application of metacognition/self-regulation in the assessment process	Some application of metacognition/self-regulation in the assessment process	Poor application of metacognition/self-regulation in the assessment process		
	Strong consideration of individual differences	Some consideration of individual differences	Poor consideration of individual differences		

Competency-Based Learning



THE NATURE
OF KNOWLEDGE

LEARNER IMPACTS

- Achievement
- Motivation

DESCRIPTION

Competency-based education (CBE) is an education model that “focuses on the demonstration and application of learning, rather than on the time spent taking courses” or generally any approach that “substitutes the [direct] assessment of student learning for time-based measures” (“Experimental Sites,” 2014, p. 5). When developed and implemented correctly, CBE can be a reliable, valid indicator of learning and proficiency in regard to designated competencies. Furthermore, it can provide a more learner-centered, personalized, and efficient way of learning and demonstrating proficiency. This principle defines and describes models of CBE and provides research-based recommendations in the way of best practices in CBE curriculum design and implementation. Recommendations include adhering to principles of backward design, engaging in curriculum mapping, and the rigorous development, administration, and ongoing validation of direct assessment of learner competencies via formative and summative knowledge- and performance-based assessment (“Experimental Sites,” 2014; McClarty & Gaertner, 2015).

CAPABILITIES

- Assessment: Project
- Assessment: Work sample/e-portfolio
- Management: Prerequisites

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive instruction and assessment capabilities
- Simple Technology: Synchronous or asynchronous collaboration features/capabilities
- Content Support: Development and administration of performance-based assessment



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/ Model	<p>The product strategy is aligned to competency-based learning as a core principle of a learner-centered product.</p>	<p>The product team is exploring competency-based learning as a core LDP for creating a more learner-centered product.</p> <p>The product strategy is exploring integrating an evidence-based model of competency-based learning.</p>	<p>The product team considers competency-based learning to be an important LDP for creating a more learner-centered product.</p> <p>The product strategy considers competency-based learning at a high level but does not currently align to an evidence-based model.</p>	<p>The competency-based learning LDP does NOT align to the product strategy and is not necessary to explore further.</p>	= ____
Competency-based Learning Application	<p>The product uses empirical-based recommendations concerning competency-based learning.</p>	<p>Principle is applied only to a specific area of the product and more learner feedback is needed to improve principle application.</p>	<p>Product team thinks applying this principle would add value to their product strategy.</p> <p>Product team has applied similar principles to their product strategy.</p>	<p>This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.</p>	= ____
Competency-based Learning Delivery	<p>The impact on a capability or service aligned to this principle has been gathered/reported on.</p>	<p>Product team is in early discussions about partnering with LD team to validate this principle with learners.</p> <p>Product team has specific capabilities they need to validate this principle with.</p>	<p>Product team needs more information about how this principle might be tested with learners using LD's validation services.</p>	<p>This principle does NOT need to be validated in order to inform product design & development.</p>	= ____
Learner Characteristics	<p>Design & development are currently using validation reports to further align the principle and the product strategy.</p>	<p>Product team is currently exploring how validation results and recommendations could be used in product design & development.</p>	<p>Product team feels there is time in the schedule to include validation data to inform product design & development.</p> <p>Product team needs a consultation to learn more about validation services and results reports.</p>	<p>Validation data will NOT be used to inform product design & development.</p>	= ____
Formative/ Summative Applications	<p>The formative and summative applications make proper use of competency-based learning LDP recommendations for creating assessments.</p>	<p>Product team is currently exploring how recommendations for designing assessments for competency-based learning could be used in product design & development.</p>	<p>Product team feels there is time in the schedule to include time spent on assessment application design & development.</p> <p>Product team needs a consultation to learn more about designing competency-based learning assessments.</p>	<p>Formative/summative applications will NOT be used to inform product design & development.</p>	= ____

Data Visualization



THE NATURE
OF KNOWLEDGE

DESCRIPTION

Exploratory data visualizations can be used to identify curves, lines, trends, and outliers, to reveal new information about the data. Explanatory data visualizations can be used to present information visually from data that could not be seen otherwise. If used properly, explanatory data visualizations can reduce and/or manage cognitive load by offloading information into the visual/pictorial channel. The data visualization principle includes Ware's *Attributes of Preattentive Processing*, the *Gestalt Principles of Visual Perception*, a list of common visual properties used to encode data, a graph selection matrix, and best practices/examples of common visualizations.

CAPABILITIES

- Management: Discussion analytics
- Management: Learning analytics
- Instruction: Multimedia active reading

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Dashboard performance visualization/notification
- Simple Technology: Dynamic data visualizations with student input
- Content Support: Instruction/practice of designing instructional data

LEARNER IMPACTS

- Attitudes
- Behavior
- Self-regulation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong basis in qualitative or quantitative data	Some basis in qualitative or quantitative data	Poor basis in qualitative or quantitative data	Does NOT qualify according to definition	= ____
	Strong representation of associated data	Some representation of associated data	Poor representation of associated data		
	Strong readability that communicates data to users	Some readability that communicates data to users	Poor readability that communicates data to users		
Development	Strong use of iterative revisions to improve visualization	Some use of iterative revisions to improve visualization	Poor use of iterative revisions to improve visualization	Does NOT apply the development process effectively	= ____
	Strong use of research questions to drive data collection	Some use of research questions to drive data collection	Poor use of research questions to drive data collection		
		Some consideration of the costs and benefits of using different formats and styles	Poor consideration of the costs and benefits of using different formats and styles		
Design	Strong use of simplification to reduce distraction and improve clarity	Some use of simplification to reduce distraction and improve clarity	Poor use of simplification to reduce distraction and improve clarity	Does NOT use design effectively	= ____
	Strong use of emphasis to direct attention to the most important information	Some use of emphasis to direct attention to the most important information	Poor use of emphasis to direct attention to the most important information		
	Strong application of the taxonomy of visual effectiveness	Some application of the taxonomy of visual effectiveness	Poor application of the taxonomy of visual effectiveness		
Type Selection	Strong consideration of the costs and benefits of using different formats and styles	Some consideration of the costs and benefits of using different formats and styles	Poor consideration of the costs and benefits of using different formats and styles	Does NOT make appropriate considerations	= ____
	Strong consideration of many potential visualization types, as well as multiple types together, to convey message	Some consideration of many potential visualization types, as well as multiple types together, to convey message	Poor consideration of many potential visualization types, as well as multiple types together, to convey message		

Online Information Literacy



THE NATURE
OF KNOWLEDGE

DESCRIPTION

Information literacy (IL) is the ability to recognize when information is needed and having the ability to locate, evaluate, and effectively use the needed information. "The availability of information is extensive and offered through a variety of sources including libraries, media, and, increasingly, the Internet." Hence, online information literacy concerns information literacy in regard to Internet sources (Williams, 2010). The OIL principle uses research from Williams; ACRL, Taylor, & Dalal; and others to address the importance of online literacy.

Online literacy:

- Forms the basis for lifelong learning
- Is common to all disciplines, all learning environments, and all levels of education
- Enables learners to master content
- Sharpens critical thinking
- Aids in learners becoming more self directed and assuming greater control over their own learning
- Provides the necessary tools for learners to discern information found through various sources of Internet information.

Recommendations include:

- Creating learner outcomes that address online literacy across disciplines
- Creating objectives that address online literacy across courses
- Include online literacy opportunities in assignments and assessments
- Include guideline rubrics to help instruct students on the importance of sources

LEARNER IMPACTS

- Attitudes
- Behavior
- Self-regulation

CAPABILITIES

- Cognitive Tools: Bibliography/citation creation
- Cognitive Tools: Asynchronous social learning: document based
- Cognitive Tools: Asynchronous social learning: text based

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Incorporate information literacy standards with accreditation standards
- Simple Technology: Comparison rubrics within implementation strategies
- Content Support: Incorporate online literacy into assessments/assignments



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong support of student capacity to locate, evaluate, and effectively use the needed information	Some support of student capacity to locate, evaluate, and effectively use the needed information	Poor support of student capacity to locate, evaluate, and effectively use the needed information	Does NOT apply or use effectively	= ____
Source Evaluation	Strong evaluation of course materials for currency, relevance, authority, accuracy, and purpose	Some evaluation of course materials for currency, relevance, authority, accuracy, and purpose	Poor evaluation of course materials for currency, relevance, authority, accuracy, and purpose	Does NOT apply or use effectively	= ____
	Strong usage of CRAAP (currency, relevance, authority, accuracy, purpose) test to inform students on the importance of source evaluation, where appropriate	Some usage of CRAAP test to inform students on the importance of source evaluation, where appropriate	Poor usage of CRAAP test to inform students on the importance of source evaluation, where appropriate		
Design	Strong consideration of training options, such as a dedicated course vs. one-time training, vs. integration with existing course and teacher, vs. librarian instruction	Some consideration of training options, such as a dedicated course vs. one-time training, vs. integration with existing course and teacher, vs. librarian instruction	Poor consideration of training options, such as a dedicated course vs. one-time training, vs. integration with existing course and teacher, vs. librarian instruction	Does NOT apply or use effectively	= ____
	Strong application of multiple potential methods to instruct online literacy, as appropriate to context	Some application of multiple potential methods to instruct online literacy, as appropriate to context	Poor application of multiple potential methods to instruct online literacy, as appropriate to context		
Wikipedia	Strong use of objective criteria, such as CRAAP, when determining the quality of information	Some use of objective criteria, such as CRAAP, when determining the quality of information	Poor use of objective criteria, such as CRAAP, when determining the quality of information	Does NOT apply or use effectively	= ____
	Strong active participation in the wiki creation process to support literacy	Some active participation in the wiki creation process to support literacy	Poor active participation in the wiki creation process to support literacy		

Learning Transfer



THE NATURE
OF KNOWLEDGE

LEARNER IMPACTS

- Behavior
- Achievement

DESCRIPTION

Transfer refers to how past learning influences current and future learning, and how past or current learning is applied or adapted to similar or novel situations (Haskell, 2001). Transfer is the ultimate aim of education, as ensuring that the facts and skills learners learn are going to be usable in a variety of situations is the point of learning (Mckeough, Lupart, & Marini, 1995). Covering a spectrum of different forms of learning transfer, this LDP explores different learning strategies to increase transfer, how, when, and where transfer takes place, conditions and mechanisms for transfer, and assessment of transfer. Some examples of ways to maximize transfer include making it explicit to learners, modeling transfer to learners, and providing a broad variety of contexts to learners to learn and apply their understanding.

CAPABILITIES

- Instruction: Active learning experience
- Assessment: Software simulation
- Assessment: Project

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Cross course linkage to identify transfer
- Simple Technology: Assessment engine providing variety in application
- Content Support: Contextually diverse example sets



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/ Model	The product strategy is aligned to learning transfer as a core principle of a learner-centered product.	The product team is exploring learning transfer as a core LDP for creating a more learner-centered product. The product strategy is exploring integrating an evidence-based learning transfer model.	The product team considers learning transfer to be an important LDP for creating a more learner-centered product. The product strategy considers learning transfer at a high level but does not currently align to an evidence-based model.	The learning transfer LDP does NOT align to the product strategy and is not necessary to explore further.	= ____
Learning Transfer Application	The product uses empirically-based recommendations concerning learning transfer feedback.	Principle is applied only to a specific area of the product and more focus on learning transfer is needed to improve principle application.	Product team thinks applying this principle would add value to their product strategy. Product team has applied similar principles to their product strategy.	This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.	= ____
Learning Transfer Delivery	Learning transfer on a capability or service aligned to this principle has been gathered/reported on.	Product team is in early discussions about partnering with LD team to validate this principle with learners. Product team has specific capabilities they need to validate this principle with.	Product team needs more information about how this principle might be tested with learners using LD's validation services.	This principle does NOT need to be validated in order to inform product design & development.	= ____
Learner Characteristics	Design & development are currently using validation reports to further align the principle and the product strategy.	Product team is currently exploring how validation results and recommendations could be used in product design & development.	Product team feels there is time in the schedule to include validation data to inform product design & development. Product team needs a consultation to learn more about validation services and results reports.	Validation data will NOT be used to inform product design & development.	= ____
Formative/ Summative Applications	The formative and summative applications make proper use of learning transfer LDP recommendations for creating assessments.	Product team is currently exploring how recommendations for designing assessments for learning transfer could be used in product design & development.	Product team feels there is time in the schedule to include time spent on assessment application design & development. Product team needs a consultation to learn more about designing learning transfer assessments.	Formative/summative applications will NOT be used to inform product design & development.	= ____

Cognitive Load and Multimedia 2 (Intrinsic)



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

LEARNER IMPACTS

- Self-regulation
- Achievement

DESCRIPTION

Cognitive load theory relates to the capacity of working memory and its effect on long-term memory schema acquisition. Cognitive load is divided into three categories: intrinsic load, extraneous load, and germane load. Intrinsic cognitive load stresses the capacity of learners' working memory. Since this type of cognitive load is dependent on the content to be learned, it cannot be reduced without reducing learning. It can, however, be managed. The following multimedia instructional methods outlined in *Digital design to manage intrinsic cognitive load* are both tested and actionable (Mayer, 2009).

1. Segmenting
2. Pre-training
3. Modality

The cognitive theory of multimedia learning has three underlying assumptions: the dual channel assumption (Clark & Paivio, 1991; Paivio, 1986, 2006; Baddeley, 1992, 1999); the limited capacity assumption (Baddeley, 1992, 1999; Sweller, 1994, 2005; Chandler & Sweller, 1991); and the active-processing assumption (Chambliss & Calfee, 1998; Cook & Mayer, 1980).

CAPABILITIES

- Assessment: Software simulation
- Instruction: Player + item
- Instruction: Multimedia active reading

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Software simulation
- Simple Technology: Standalone instructional multimedia with assessment items
- Content Support: Instruction/practice of designing multimedia



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong application of multimedia methods to manage or reduce stress on the working memory capacity of learners	Some application of multimedia methods to manage or reduce stress on the working memory capacity of learners	Poor application of multimedia methods to manage or reduce stress on the working memory capacity of learners	Does NOT use effectively or is not a related activity	= ____
	Strong use of objective multimedia instructional methods	Some use of objective multimedia instructional methods	Poor use of objective multimedia instructional methods		
Segmenting	Strong presentation of multimedia in appropriately sized chunks	Some presentation of multimedia in appropriately sized chunks	Poor presentation of multimedia in appropriately sized chunks	Does NOT use effectively or is not a related activity	= ____
	Strong presentation of multimedia in user-paced segments	Some presentation of multimedia in user-paced segments	Poor presentation of multimedia in user-paced segments		
Pre-training	Strong pre-training on the names of main concepts	Some pre-training on the names of main concepts	Poor pre-training on the names of main concepts	Does NOT use effectively or is not a related activity	= ____
	Strong pre-training on the characteristics of main concepts	Some pre-training on the characteristics of main concepts	Poor pre-training on the characteristics of main concepts		
Modality	Strong presentation of audiovisuals together, rather than text with visuals	Some presentation of audiovisuals together, rather than text with visuals	Poor presentation of audiovisuals together, rather than text with visuals	Does NOT use effectively or is not a related activity	= ____
	Strong presentation of narrated animations, rather than text with animations	Some presentation of narrated animations, rather than text with animations	Poor presentation of narrated animations, rather than text with animations		
	Strong presentation of audiovisuals that capitalize on multiple sensory channels, rather than overloading any one channel	Some presentation of audiovisuals that capitalize on multiple sensory channels, rather than overloading any one channel	Poor presentation of audiovisuals that capitalize on multiple sensory channels, rather than overloading any one channel		

Cognitive Load and Multimedia 1 (Extraneous)



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Cognitive load theory relates to the capacity of working memory and its effect on long-term memory schema acquisition. Cognitive load is divided into three categories: intrinsic load, extraneous load, and germane load. Extraneous cognitive load stresses the capacity of learners' working memory. Since this type of cognitive load is caused by poor instructional design, it can be reduced with multimedia instructional methods. The following multimedia instructional methods outlined in *Digital design to reduce extraneous cognitive load* are both tested and actionable (Mayer, 2009).

1. Coherence
2. Signaling
3. Redundancy
4. Spatial contiguity
5. Temporal contiguity

The cognitive theory of multimedia learning has three underlying assumptions: the dual channel assumption (Clark & Paivio, 1991; Paivio, 1986, 2006; Baddeley, 1992, 1999); the limited capacity assumption (Baddeley, 1992, 1999; Sweller, 1994, 2005; Chandler & Sweller, 1991); and the active-processing assumption (Chambliss & Calfee, 1998; Cook & Mayer, 1980).

CAPABILITIES

- Assessment: Software simulation
- Instruction: Player + item
- Instruction: Multimedia active reading

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Software simulation
- Simple Technology: Standalone instructional multimedia with assessment items
- Content Support: Instruction/practice of designing multimedia

LEARNER IMPACTS

- Self-regulation
- Achievement



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Coherence	Strong application of coherence in multimedia design	Some application of coherence in multimedia design	Poor application of coherence in multimedia design	Does NOT use effectively or is not a related activity	= ____
	Strong use of only relevant audio-visuals	Some use of only relevant audio-visuals	Poor use of only relevant audio-visuals		
	Strong use of concise text	Some use of concise text	Poor use of concise text		
Signaling	Strong application of signaling in multimedia design	Some application of signaling in multimedia design	Poor application of signaling in multimedia design	Does NOT use effectively or is not a related activity	= ____
	Strong use of cues to highlight the organization of material	Some use of cues to highlight the organization of material	Poor use of cues to highlight the organization of material		
	Strong use of cues to prioritize the most important material	Some use of cues to prioritize the most important material	Poor use of cues to prioritize the most important material		
Redundancy	Strong application of redundancy in multimedia design	Some application of redundancy in multimedia design	Poor application of redundancy in multimedia design	Does NOT use effectively or is not a related activity	= ____
	Strong use of video that contains visuals with narration only OR text with visuals only	Some use of video that contains visuals with narration only OR text with visuals only	Poor use of video that contains visuals with narration only OR text with visuals only		
Contiguity	Strong application of contiguity in multimedia design	Some application of contiguity in multimedia design	Poor application of contiguity in multimedia design	Does NOT use effectively or is not a related activity	= ____
	Strong presentation of adjacent graphics and text	Some presentation of adjacent graphics and text	Poor presentation of adjacent graphics and text		
	Strong presentation of corresponding audiovisuals in a synchronized format	Some presentation of corresponding audiovisuals in a synchronized format	Poor presentation of corresponding audiovisuals in a synchronized format		

Universal Design for Learning



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Universal Design for Learning (UDL) is a set of guidelines for developing need meeting goals, methods, materials, and assessments in learning, customizing and adjusting to individual learner needs, reducing barriers to learning, and optimizing levels of challenge and support for all learners. UDL is an important set of guidelines to consider as it enables the development of learning environments that create a level playing field for all learners. Covering a broad swathe of different topic areas within content representation, system/learner actions and expressions, and engagement, different aspects focus on identifying the best design recommendations to optimize the learning environment in said categories.

LEARNER IMPACTS

- Behavior
- Self-regulation

CAPABILITIES

- Assessment: Work sample/e-portfolio
- Instruction: Multimedia active reading
- Cognitive Tools: Asynchronous social learning: text based

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Learner customizable learning environment
- Simple Technology: Visual adjustments to help learner view material optimally
- Content Support: Various alternatives for visual and auditory content



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong application of research-based practices to support learning outcomes	Some application of research-based practices to support learning outcomes	Poor application of research-based practices to support learning outcomes	Does NOT use effectively or is not a related activity	= ____
	Strong application of design principles across recognition, strategic, and affective networks	Some application of design principles across recognition, strategic, and affective networks	Poor application of design principles across recognition, strategic, and affective networks		
Recognition	Strong provision of multiple options for perception	Some provision of multiple options for perception	Poor provision of multiple options for perception	Does NOT use effectively or is not a related activity	= ____
	Strong provision of multiple options for languages and symbols	Some provision of multiple options for languages and symbols	Poor provision of multiple options for languages and symbols		
	Strong provision of multiple options for comprehension	Some provision of multiple options for comprehension	Poor provision of multiple options for comprehension		
Strategic	Strong provision of multiple options for physical action	Some provision of multiple options for physical action	Poor provision of multiple options for physical action	Does NOT use effectively or is not a related activity	= ____
	Strong provision of multiple options for expression and communication	Some provision of multiple options for expression and communication	Poor provision of multiple options for expression and communication		
	Strong provision of multiple options for executive functions	Some provision of multiple options for executive functions	Poor provision of multiple options for executive functions		
Affective	Strong provision of multiple options for recruiting interest	Some provision of multiple options for recruiting interest	Poor provision of multiple options for recruiting interest	Does NOT use effectively or is not a related activity	= ____
	Strong provision of multiple options for sustaining effort and persistence	Some provision of multiple options for sustaining effort and persistence	Poor provision of multiple options for sustaining effort and persistence		
	Strong provision of multiple options for self-regulation	Some provision of multiple options for self-regulation	Poor provision of multiple options for self-regulation		

Readability



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Readability involves much more than a grade level. When designed and implemented correctly, readability can increase learners' comprehension, increase learners' level of engagement, and decrease learners' extraneous cognitive load. When we think of readability from a Learning Design perspective, it's helpful to break it down into four basic elements: content, style, structure, and design. A lot of these topics cross over from learning design into the areas of UX, visual design, and product development. (Clark & Mayer, 2011)

Readability can be improved by:

- Including navigation tools that inform the learner of their location
- Using clear and concise headings
- Removing extraneous content, images, links

CAPABILITIES

- Instruction: Multimedia active reading
- Assessment: Selected response
- Instruction: Item level hints

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Navigation, search tools
- Simple Technology: Hyperlinks that support objectives
- Content Support: Inclusion of clear headings

LEARNER IMPACTS

- Behavior
- Motivation
- Self-regulation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p>Strong application of readability across vital areas, such as learning design, visual design, and user experience design</p> <p>Strong evidence that readability design increases comprehension and engagement, while decreasing cognitive load</p>	<p>Some application of readability across vital areas, such as learning design, visual design, and user experience design</p> <p>Some evidence that readability design increases comprehension and engagement, while decreasing cognitive load</p>	<p>Poor application of readability across vital areas, such as learning design, visual design, and user experience design</p> <p>Poor evidence that readability design increases comprehension and engagement, while decreasing cognitive load</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Model	<p>Strong content consideration, including propositions, organization, coherence</p> <p>Strong style consideration, including semantic elements, syntactic elements</p> <p>Strong design consideration, including typography, format, illustrations</p> <p>Strong structure consideration, including chapters, headings, navigation</p>	<p>Some content consideration, including propositions, organization, coherence</p> <p>Some style consideration, including semantic elements, syntactic elements</p> <p>Some design consideration, including typography, format, illustrations</p> <p>Some structure consideration, including chapters, headings, navigation</p>	<p>Poor content consideration, including propositions, organization, coherence</p> <p>Poor style consideration, including semantic elements, syntactic elements</p> <p>Poor design consideration, including typography, format, illustrations</p> <p>Poor structure consideration, including chapters, headings, navigation</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Design	<p>Strong application of coherence to align objectives and exclude extraneous content</p> <p>Strong application of redundancy to present graphics with narration or text, but not both</p> <p>Strong application of personalization by presenting in a conversational style</p> <p>Strong application of contiguity by synchronizing verbal and non-verbal information</p>	<p>Some application of coherence to align objectives and exclude extraneous content</p> <p>Some application of redundancy to present graphics with narration or text, but not both</p> <p>Some application of personalization by presenting in a conversational style</p> <p>Some application of contiguity by synchronizing verbal and non-verbal information</p>	<p>Poor application of coherence to align objectives and exclude extraneous content</p> <p>Poor application of redundancy to present graphics with narration or text, but not both</p> <p>Poor application of personalization by presenting in a conversational style</p> <p>Poor application of contiguity by synchronizing verbal and non-verbal information</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Online Strategies	<p>Strong use of navigation and search tools to improve online usability</p> <p>Strong use of concise, descriptive headings to identify sections and priorities</p> <p>Strong use of interactives and graphics that support objectives and minimize negative impact on comprehension</p> <p>Strong segmentation of content into small chunks</p>	<p>Some use of navigation and search tools to improve online usability</p> <p>Some use of concise, descriptive headings to identify sections and priorities</p> <p>Some use of interactives and graphics that support objectives and minimize negative impact on comprehension</p> <p>Some segmentation of content into small chunks</p>	<p>Poor use of navigation and search tools to improve online usability</p> <p>Poor use of concise, descriptive headings to identify sections and priorities</p> <p>Poor use of interactives and graphics that support objectives and minimize negative impact on comprehension</p> <p>Poor segmentation of content into small chunks</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____

Goal Setting in Student Progress



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Goal setting has been shown to have a strong impact on successful performance in learning environments. Through creating challenging goals for learners and allowing learners to incorporate their own goals into the learning process, learner motivation may be greatly increased, which can positively influence learner achievement (Locke & Latham, 2002). By using an achievement approach-based goal where learners attempt to better themselves, rather than to not do worse than they or others did previously, task engagement can be more efficient and effective (Elliot, Shell, Henry, & Maier, 2005).

CAPABILITIES

- Management: Badging
- Management: Learning analytics
- Cognitive Tools: Visualized task completion

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Individualized goal setting system
- Simple Technology: Notification for supporting goal achievement
- Content Support: Media elements enable multiple ways to meet goals

LEARNER IMPACTS

- Attitudes
- Behavior
- Self-regulation

Goal Setting in Student Progress

SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<ul style="list-style-type: none"> Goals strongly support the achievement of specific objectives Goals are set for short-term and long-term objectives 	<ul style="list-style-type: none"> Goals and objectives are somewhat unclear Goals are set for short-term or long-term objectives 	<ul style="list-style-type: none"> Goals and objectives are poorly linked Goals are poorly utilized based on timing 	<ul style="list-style-type: none"> Does NOT apply goals well to achieve objectives 	= ____
Model	<ul style="list-style-type: none"> Capability structure provides strong support for achievement and approach oriented goals Strong support for setting specific, challenging, attainable goals with deadlines 	<ul style="list-style-type: none"> Capability structure provides some support for achievement and approach oriented goals Some support for setting specific, challenging, attainable goals with deadlines 	<ul style="list-style-type: none"> Capability structure provides poor support for achievement and approach oriented goals Poor support for setting specific, challenging, attainable goals with deadlines 	<ul style="list-style-type: none"> Does NOT leverage the benefits of the utilized platform 	= ____
Design	<ul style="list-style-type: none"> Strong alignment between theoretical approach and instructional design Strong use of training to support goal and planning activities Strong alignment between personal and collective goals with appropriate team sizes Strong use of automated notifications for reminders, deadlines, activities, and other just-in-time purposes 	<ul style="list-style-type: none"> Some alignment between theoretical approach and instructional design Some use of training to support goal and planning activities Some alignment between personal and collective goals with appropriate team sizes Some use of automated notifications for reminders, deadlines, activities, and other just-in-time purposes 	<ul style="list-style-type: none"> Poor alignment between theoretical approach and instructional design Poor use of training to support goal and planning activities Poor alignment between personal and collective goals with appropriate team sizes Poor use of automated notifications for reminders, deadlines, activities, and other just-in-time purposes 	<ul style="list-style-type: none"> Does NOT use design effectively 	= ____
Assessment	<ul style="list-style-type: none"> Strong use of feedback to support a self-improvement orientation Strong alignment between learning objectives and assessment techniques Strong use of constructive feedback to guide and support effective learning strategies 	<ul style="list-style-type: none"> Some use of feedback to support a self-improvement orientation Some alignment between learning objectives and assessment techniques Some use of constructive feedback to guide and support effective learning strategies 	<ul style="list-style-type: none"> Poor use of feedback to support a self-improvement orientation Poor alignment between learning objectives and assessment techniques Poor use of constructive feedback to guide and support effective learning strategies 	<ul style="list-style-type: none"> Does NOT assess effectively or not an assessment-based activity 	= ____

Worked Examples



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Worked examples provide novice learners with an expert's solution to a problem. Typically, the solution is presented as a step-by-step problem-solving process that can be applied to similar future problems. Worked examples consist of a problem formulation, solution steps, and the final solution itself. The Worked Examples LDP presents research by Atkinson, Ward, & Sweller, and others, to demonstrate why worked examples are important and design principles should be used when creating worked examples.

Cognitive load theory (CLT) suggests that all people have a limited capacity for processing real-time information. Thus, instructional design should focus learners' attention and avoid overburdening learners with unnecessary information. Worked examples is an instructional method that reduces cognitive load, and makes complex problem-solving activities more accessible to novice learners. Worked examples are especially suited to complex problem-solving activities that can be broken down into steps to achieve a series of goals or subgoals.

Recommendations include:

- Optimize intra-example features, inter-example features, and individual differences to enhance the effectiveness of worked examples.
- Minimize any split attention effects and reduce cognitive load by integrating modalities into a unified experience and presenting material in simple and intuitive ways.
- Use variability effectively by providing a limited range of different types of examples and problems.
- Consider the audience carefully, since novices benefit greatly from worked examples, whereas experienced/expert learners may not need them at all.

CAPABILITIES

- Assessment: Worked examples
- Instruction: Scaffolded worked examples
- Cognitive Tools: Asynchronous social learning: item based

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Formation of declarative knowledge structures
- Simple Technology: Formation of early schema
- Content Support: Complex problem-solving activities

LEARNER IMPACTS

- Behavior
- Motivation
- Self-regulation

Worked Examples

SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong choice of context that requires complex problem-solving to justify the use of worked examples	Some choice of context that requires complex problem-solving to justify the use of worked examples	Poor choice of context that requires complex problem-solving to justify the use of worked examples	Does NOT qualify as a worked example	= ____
	Strong presentation of expert knowledge through a step-by-step problem-solving process	Some presentation of expert knowledge through a step-by-step problem-solving process	Poor presentation of expert knowledge through a step-by-step problem-solving process		
Model	Strong integration of information to reduce split attention	Some integration of information to reduce split attention	Poor integration of information to reduce split attention	Does NOT address design from a cognitive load theory perspective	= ____
	Strong focus that avoids overwhelming learners with too many sources of information	Some focus that avoids overwhelming learners with too many sources of information	Poor focus that avoids overwhelming learners with too many sources of information		
Design	Strong coupling of modalities (text, audio, visual, etc.) into a unified experience to reduce cognitive load	Some coupling of modalities (text, audio, visual, etc.) into a unified experience to reduce cognitive load	Poor coupling of modalities (text, audio, visual, etc.) into a unified experience to reduce cognitive load	Does NOT use design effectively	= ____
	Strong breakdown of steps or goals to meaningfully represent salient chunks in the worked process	Some breakdown of steps or goals to meaningfully represent salient chunks in the worked process	Poor breakdown of steps or goals to meaningfully represent salient chunks in the worked process		
	Strong emphasis on identifying and applying the structure of successful problem-solving processes	Some emphasis on identifying and applying the structure of successful problem-solving processes	Poor emphasis on identifying and applying the structure of successful problem-solving processes		
Assessment	Strong consideration of prior knowledge to appropriately match activities to abilities	Some consideration of prior knowledge to appropriately match activities to abilities	Poor consideration of prior knowledge to appropriately match activities to abilities	Does NOT assess effectively or not an assessment-based activity	= ____
	Strong consideration of individual differences to appropriately match activities to abilities	Some consideration of individual differences to appropriately match activities to abilities	Poor consideration of individual differences to appropriately match activities to abilities		

Mastery Learning



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Mastery refers to the ability of a learner to demonstrate understanding in a domain as well as the process of incorporating corrective scaffolds such as feedback into the learning environment to help bring about that understanding in learners. By taking a mastery approach to learning, gauging and reporting of learner understanding can be done more regularly and to greater effect, as it can effectively be used as a way to improve cognitive and achievement outcomes, student self-efficacy, attendance, engagement, and participation with learners within adaptive learning systems (Guskey, 2007). Through alignment with specific learning objectives with assessment, instruction, and prescription (Gentile & Lalley, 2003), mastery may be utilized in a broad range of subjects to influence learner models to provide individualized learning environments (Baker & Siemens, 2014).

LEARNER IMPACTS

- Achievement

CAPABILITIES

- Adaptivity: Mastery + confidence based adaptivity
- Adaptivity: Adaptive study plan
- Management: Prerequisites

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Mastery based adaptive learning algorithms
- Simple Technology: Spaced practice to prevent forgetting mastered concepts
- Content Support: Large content libraries of variety of material



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	The product strategy is aligned to mastery learning as a core principle of a learner-centered product.	The product team is exploring mastery learning as a core LDP for creating a more learner-centered product. The product strategy is exploring integrating an evidence-based model of mastery learning.	The product team considers mastery learning to be an important LDP for creating a more learner-centered product. The product strategy considers mastery learning at a high level but does not currently align to an evidence-based model.	The mastery learning LDP does NOT align to the product strategy and is not necessary to explore further.	= ____
Mastery Learning Application	The product uses empirically-based recommendations concerning mastery learning.	Principle is applied only to a specific area of the product and more learner feedback is needed to improve principle application.	Product team thinks applying this principle would add value to their product strategy. Product team has applied similar principles to their product strategy.	This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.	= ____
Mastery Learning Delivery	The impact on a capability or service aligned to this principle has been gathered/reported on.	Product team is in early discussions about partnering with LD team to validate this principle with learners. Product team has specific capabilities they need to validate this principle with.	Product team needs more information about how this principle might be tested with learners using LD's validation services.	This principle does NOT need to be validated in order to inform product design & development.	= ____
Learner Characteristics	Design & development are currently using validation reports to further align the principle and the product strategy.	Product team is currently exploring how validation results and recommendations could be used in product design & development.	Product team feels there is time in the schedule to include validation data to inform product design & development. Product team needs a consultation to learn more about validation services and results reports.	Validation data will NOT be used to inform product design & development.	= ____
Formative/Summative Applications	The formative and summative applications make proper use of mastery learning LDP recommendations for creating assessments.	Product team is currently exploring how recommendations for designing assessments for mastery learning could be used in product design & development.	Product team feels there is time in the schedule to include time spent on assessment application design & development. Product team needs a consultation to learn more about designing mastery learning assessments.	Formative/summative applications will NOT be used to inform product design & development.	= ____

Problem-Based Learning



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Problem-based learning is the active approach to learning in which learners collaborate in understanding and solving complex, ill-structured problems (Barrows, 2000; Savery, 2006).

Problem-based learning (PBL) requires learners to share their current knowledge, negotiate among alternative ideas, search for information, and construct principled arguments to support their proposed solutions (Lu, Bridges, & Hmelo-Silver, 2014). PBL addresses a large range of cognitive and affective dimensions, with studies indicating that PBL students are more motivated and engage in deep approaches to learning and problem solving.

1. As students engage with ill-structured problems, they develop skills in creativity, reasoning, and self-directed learning
2. Compared to traditional forms of instruction, PBL can enhance students' ability to transfer knowledge to new problems and to achieve more coherent understanding

CAPABILITIES

- Assessment: Open-ended assignments (multi-step)
- Assessment: Project
- Instruction: Active learning experience

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Apply problem-based writing assignments with automated scoring techniques
- Simple Technology: Apply problem-based assignments that require instructor grading (e.g., using MediaShare)
- Content Support: Problem-based assignments aligned to learning objectives

LEARNER IMPACTS

- Attitudes
- Behavior
- Motivation
- Self-regulation

Problem-Based Learning

SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	The product strategy is aligned to problem-based learning as a core principle of a learner-centered product.	The product team is exploring problem-based learning as a core LDP for creating a more learner-centered product. The product strategy is exploring integrating an evidence-based model of problem-based learning.	The product team considers problem-based learning to be an important LDP for creating a more learner-centered product. The product strategy considers problem-based learning at a high level but does not currently align to an evidence-based model.	The problem-based learning LDP does NOT align to the product strategy and is not necessary to explore further.	= ____
Problem-based Learning Application	The product uses empirically-based recommendations concerning problem-based learning.	Principle is applied only to a specific area of the product and more learner feedback is needed to improve principle application.	Product team thinks applying this principle would add value to their product strategy. Product team has applied similar principles to their product strategy.	This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.	= ____
Project-based Learning Delivery	The impact on a capability or service aligned to this principle has been gathered/reported on.	Product team is in early discussions about partnering with LD team to validate this principle with learners. Product team has specific capabilities they need to validate this principle with.	Product team needs more information about how this principle might be tested with learners using LD's validation services.	This principle does NOT need to be validated in order to inform product design & development.	= ____
Learner Characteristics	Design & development are currently using validation reports to further align the principle and the product strategy.	Product team is currently exploring how validation results and recommendations could be used in product design & development.	Product team feels there is time in the schedule to include validation data to inform product design & development. Product team needs a consultation to learn more about validation services and results reports.	Validation data will NOT be used to inform product design & development.	= ____
Formative/ Summative Applications	The formative and summative applications make proper use of problem-based learning LDP recommendations for creating assessments.	Product team is currently exploring how recommendations for designing assessments for problem-based learning could be used in product design & development.	Product team feels there is time in the schedule to include time spent on assessment application design & development. Product team needs a consultation to learn more about designing problem-based learning.	Formative/summative applications will NOT be used to inform product design & development.	= ____

Grit



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Grit is “perseverance and passion for long-term goals” that occurs in a person at the trait level (i.e. a relatively stable characteristic rather than a temporary mood) (Duckworth & Quinn, 2009, p. 166). Although research on grit itself and its role in educational and/or professional contexts is in the preliminary stages, there is research to suggest that some aspects positively impact learner achievement (Duckworth & Quinn, 2009; Hochanadel & Finamore, 2015). This principle provides an overview of the existing research, as well as additional research that relates to and informs the aspects of grit, and research-based recommendations to inform aspects of course design hypothesized to cultivate the positive aspects of grit within learners. Recommendations include assessing grit via validated assessment methods and/or utilizing motivation research to inform characteristics of product design that bolster intrinsic motivation and growth mindset within learners (Christensen, 2014; Duckworth et al., 2007; Duckworth et al., 2011; Hochandel & Finamore, 2015; Yeager, Paunesku, Walton, & Dweck, 2013).

LEARNER IMPACTS

- Attitudes
- Behavior
- Self-regulation
- Achievement

CAPABILITIES

- Cognitive Tools: Planning/outlining
- Cognitive Tools: Visualized task completion
- Instruction: Scaffolded worked example
- Adaptivity: Adaptive remediation

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Brief, targeted interventions to bolster growth mindset based on performance or self-reported levels of grit
- Simple Technology: Goal setting and learning strategy prompts/scaffolds
- Content Support: Feedback statements that encourage intrinsic motivation and growth mindset



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p> Strong support of consistent interests over time</p> <p> Strong support of perseverance and effort</p> <p> Strong support of setting long-term goals and plans to pursue them</p>	<p> Some support of consistent interests over time</p> <p> Some support of perseverance and effort</p> <p> Some support of setting long-term goals and plans to pursue them</p>	<p> Poor support of consistent interests over time</p> <p> Poor support of perseverance and effort</p> <p> Poor support of setting long-term goals and plans to pursue them</p>	<p> Does NOT use effectively or is not a related activity</p>	<p>= ____</p>
Model	<p> Strong support of self-approach mindset to foster growth and persistence</p> <p> Strong consideration of task goals, team structure, competition, and other designs that may influence learner mindsets</p>	<p> Some support of self-approach mindset to foster growth and persistence</p> <p> Some consideration of task goals, team structure, competition, and other designs that may influence learner mindsets</p>	<p> Poor support of self-approach mindset to foster growth and persistence</p> <p> Poor consideration of task goals, team structure, competition, and other designs that may influence learner mindsets</p>	<p> Does NOT use effectively or is not a related activity</p>	<p>= ____</p>
Design	<p> Strong consideration of developmental stage of target audience</p> <p> Strong evidence-based application of interventions, reward structures, goal structures, or other related elements</p>	<p> Some consideration of developmental stage of target audience</p> <p> Some evidence-based application of interventions, reward structures, goal structures, or other related elements</p>	<p> Poor consideration of developmental stage of target audience</p> <p> Poor evidence-based application of interventions, reward structures, goal structures, or other related elements</p>	<p> Does NOT use effectively or is not a related activity</p>	<p>= ____</p>
Assessment	<p> Strong use of feedback and goal structure to support positive learning mindsets</p> <p> Strong use of a validated scale for measuring grit</p>	<p> Some use of feedback and goal structure to support positive learning mindsets</p> <p> Some use of a validated scale for measuring grit (e.g. modified scale)</p>	<p> Poor use of feedback and goal structure to support positive learning mindsets</p> <p> Poor use of a validated scale for measuring grit (e.g. untested scale)</p>	<p> Does NOT use effectively or is not a related activity</p>	<p>= ____</p>

DESCRIPTION

Inquiry-Based Learning



PRACTICES THAT FOSTER EFFECTIVE LEARNING

LEARNER IMPACTS

- Behavior
- Achievement
- Self-regulation

"Inquiry-based learning describes an environment in which learning is driven by a process of inquiry owned by the student. Starting with a scenario and with the guidance of a facilitator, students identify their own issues and questions. They then examine the resources they need to research the topic, thereby acquiring the requisite knowledge. Knowledge so gained is more readily retained because it has been acquired by experience and relation to a real problem" (Center for Excellence in Enquiry-Based Learning, 2010). The inquiry-based learning approach includes problem-based learning, project-based learning, and design-based learning. Inquiry-based learning "allows students to progress from simply holding and finding factual information to being able to apply new knowledge in novel and different ways" (Coffman, 2009). Unsurprisingly, research (Hattie, 2008) indicates that inquiry-based learning provides a significant, positive learning impact on process-based outcomes (e.g. tasks involving critical thinking, problem-solving, etc.). In contrast, inquiry-based learning has a much smaller—but still positive—impact on content-based outcomes (e.g. tasks involving memorization and conceptual knowledge). In short, inquiry-based learning is a robust, well-suited approach for process-based outcomes, particularly outcomes related to critical thinking, self-regulated/self-directed learning, problem-solving/problem-based learning, 21st century skills, scaffolding, metacognition, and collaborative learning. Best practices for designing and implementing inquiry-based learning include:

- Make use of concept mapping and brainstorming to assist in exploring big idea questions
- Include scaffolding during inquiry activities
- Based on learning objectives, embed the digital tools necessary for learners to gather, analyze, and interpret data
- Use databases, raw data, primary source documents, images, and films to support inquiry activities
- Include interactive simulations and models that allow for inquiry to take place
- Use journaling to capture information on learning changes
- Provide a digital repository for the collection of portfolio pieces
- Embed rubrics and checklists prominently within inquiry activities
- Provide feedback continually throughout the process
- Collect log data from learner interaction with simulations and interactive models

For collaborative inquiry-based learning, additional best practices include:

- Tools for synchronous communication between learners and experts in the field to get a real-world perspective on an issue or concept
- Wikis, cloud computing, and other asynchronous and synchronous tools should also be used to support collaboration

CAPABILITIES

- Assessment: Open-ended assignment (multi-step)
- Assessment: Project
- Assessment: Active learning experience

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive/personalized, content-agnostic software for collaborative inquiry
- Simple Technology: Asking students to research an open-ended problem
- Content Support: Content focused on supporting the inquiry process



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/ Model	The product strategy is aligned to inquiry-based learning as a core principle of a learner-centered product.	The product team is exploring inquiry-based learning as a core LDP for creating a more learner-centered product. The product strategy is exploring integrating an evidence-based model of inquiry-based learning.	The product team considers inquiry-based learning to be an important LDP for creating a more learner-centered product. The product strategy considers inquiry-based learning at a high level but does not currently align to an evidence-based model.	The inquiry-based learning LDP does NOT align to the product strategy and is not necessary to explore further.	= ____
Inquiry-based Learning Application	The product uses empirically-based recommendations concerning inquiry-based learning.	Principle is applied only to a specific area of the product and more learner feedback is needed to improve principle application.	Product team thinks applying this principle would add value to their product strategy. Product team has applied similar principles to their product strategy.	This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.	= ____
Inquiry-based Learning Delivery	The impact on a capability or service aligned to this principle has been gathered/reported on.	Product team is in early discussions about partnering with LD team to validate this principle with learners. Product team has specific capabilities they need to validate this principle with.	Product team needs more information about how this principle might be tested with learners using LD's validation services.	This principle does NOT need to be validated in order to inform product design & development.	= ____
Learner Characteristics	Design & development are currently using validation reports to further align the principle and the product strategy.	Product team is currently exploring how validation results and recommendations could be used in product design & development.	Product team feels there is time in the schedule to include validation data to inform product design & development. Product team needs a consultation to learn more about validation services and results reports.	Validation data will NOT be used to inform product design & development.	= ____
Formative/ Summative Applications	The formative and summative applications make proper use of inquiry-based learning LDP recommendations for creating assessments.	Product team is currently exploring how recommendations for designing assessments for inquiry-based learning could be used in product design & development.	Product team feels there is time in the schedule to include time spent on assessment application design & development. Product team needs a consultation to learn more about designing inquiry-based learning assessments.	Formative/summative applications will NOT be used to inform product design & development.	= ____

Writing to Learn



**PRACTICES
THAT FOSTER
EFFECTIVE LEARNING**

DESCRIPTION

Writing to learn encompasses an instructional method for evoking self-regulated learning, critical thinking, and, depending on the implementation, collaborative learning. Writing to learn essentially involves a well-constructed writing task that prompts learners to execute higher order thinking skills to synthesize multiple factual or conceptual elements of a domain. When learners extend cognitive effort to think critically during a writing to learn task, they externalize ideas and may make new inferences while rereading or revising their response. In addition to well-constructed writing prompts, a writing to learn activity may also include a rubric for self- or peer-evaluation of a written response.

Design recommendations focus on the appropriate tools and task time. For example, if the task involves peer review, then a rubric can ensure a critical review of writing. If the task is collaborative (with multiple authors) then adequate tools for collaboration need to be used, such as a wiki page. Additionally, learners must be given appropriate time to collect thoughts and review/revise responses before submission.

Writing to learn as a learning principle was first discussed by Emig (1997) and Britton et al. (1975). Varieties and examples of writing to learn activities can be found in Comer, Clark, & Canelas (2014).

CAPABILITIES

- Assessment: Essay
- Cognitive Tools: Asynchronous social learning: document based
- Cognitive Tools: Planning/outlining

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Collaborative writing space and toolset for peer reviews
- Simple Technology: Short answer or journaling activities
- Content Support: Well-constructed prompts that provide topic(s) to write about as well as critical thinking guidance

LEARNER IMPACTS

- Motivation
- Self-regulation
- Achievement



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong emphasis across all of the planning, translating, and reviewing phases of the writing process	Some emphasis across all of the planning, translating, and reviewing phases of the writing process	Poor emphasis across all of the planning, translating, and reviewing phases of the writing process	Does NOT qualify as a worked example	= ____
	Strong emphasis on effective communication through written works	Some emphasis on effective communication through written works	Poor emphasis on effective communication through written works		
Model	Strong use of planning to support recall, organized outlining, and communication goals	Some use of planning to support recall, organized outlining, and communication goals	Poor use of planning to support recall, organized outlining, and communication goals	Does NOT address design from a cognitive load theory perspective	= ____
	Strong use of translating to apply appropriate grammar, tone, style, etc. to support communication goals	Some use of translating to apply appropriate grammar, tone, style, etc. to support communication goals	Poor use of translating to apply appropriate grammar, tone, style, etc. to support communication goals		
	Strong use of reviewing to detect errors, correct errors, and revise written works	Some use of reviewing to detect errors, correct errors, and revise written works	Poor use of reviewing to detect errors, correct errors, and revise written works		
Design	Strong use of evidence-based strategies to support high-quality writing and domain-specific knowledge modelling	Some use of evidence-based strategies to support high-quality writing and domain-specific knowledge modelling	Poor use of evidence-based strategies to support high-quality writing and domain-specific knowledge modelling	Does NOT use design effectively	= ____
	Strong use of technology to facilitate the writing and peer review processes	Some use of technology to facilitate the writing and peer review processes	Poor use of technology to facilitate the writing and peer review processes		
	Strong use of scaffolds, prompts, and other guidance techniques to support strategy development as individual differences dictate	Some use of scaffolds, prompts, and other guidance techniques to support strategy development as individual differences dictate	Poor use of scaffolds, prompts, and other guidance techniques to support strategy development as individual differences dictate		
Assessment	Strong application of peer review as part of the assessment process	Some application of peer review as part of the assessment process	Poor application of peer review as part of the assessment process	Does NOT assess effectively or not an assessment-based activity	= ____
	Strong application of self-assessment	Some application of self-assessment	Poor application of self-assessment		
	Strong use of feedback to support formative development over time	Some use of feedback to support formative development over time	Poor use of feedback to support formative development over time		

Collaborative Learning



LEARNING
TOGETHER

DESCRIPTION

Research clearly demonstrates that the outcomes of collaborative learning are superior to cooperative, competitive, and individualistic learning (Goodyear, Jones, & Thompson, 2014; Hattie, 2008; Johnson & Johnson, 1999, 2008; Slavin, 1990; Webb & Palincsar, 1996). Additionally, according to Chi's ICAP Framework (2009), *interactive* activities (which involve social interaction) provide a more impactful learning experience than *constructive* activities (writing or creating an artifact), which in turn are most likely better than *active* activities (clicking to manipulate or advance media; multiple choice items), which are most likely better than *passive* activities (reading text, viewing images and/or videos).

Collaboration can be synchronous and/or asynchronous, as well as face-to-face, fully online, or a model blending face-to-face and online activities (Stahl, Koschmann, & Suthers, 2014), and all models can benefit learning if the activities are aligned to clearly articulated learning objectives. Best practices for designing collaborative learning include:

1. Clear, appropriate outcomes
2. Participation
3. Social grounding
4. Active learning conversation
5. Performance analysis and group processing
6. Promotive interaction with peers (Lou, Abrami, & D'Apollonia, 2001; Soller, 2001)

One well-supported strategy for incorporating many of these best practices is collaboration scripting (Goodyear, Jones, & Thompson, 2014).

CAPABILITIES

- Management: Performance based grouping
- Cognitive Tools: Synchronous social learning: audio/video based
- Cognitive Tools: Asynchronous social learning: learning document based
- Cognitive Tools: Peer review

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Content-agnostic, adaptive system for synchronous, scaffolded group meaning-making
- Simple Technology: Class/course wiki
- Content Support: Collaboration scripting

LEARNER IMPACTS

- Achievement
- Attitudes
- Self-regulation
- Motivation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p>Strong application of group work based on empirical evidence</p> <p>Strong use of social contexts that place learners in the zone of proximal development (ZPD)</p> <p>Strong use of authentic tasks that allow learners to socially construct meaning</p>	<p>Some application of group work based on empirical evidence</p> <p>Some use of social contexts that place learners in the ZPD</p> <p>Some use of authentic tasks that allow learners to socially construct meaning</p>	<p>Poor application of group work based on empirical evidence</p> <p>Poor use of social contexts that place learners in the ZPD</p> <p>Poor use of authentic tasks that allow learners to socially construct meaning</p>	Does NOT use effectively or is not a related activity	= ____
Model	<p>Strong applications of the Four Ts model in making design decisions</p> <ul style="list-style-type: none"> • Tasks: nature, scope, sequence • Team: division of labor, structure, interactions • Time: constraints • Tools: needs and availabilities 	<p>Some applications of the Four Ts model in making design decisions</p> <ul style="list-style-type: none"> • Tasks: nature, scope, sequence • Team: division of labor, structure, interactions • Time: constraints • Tools: needs and availabilities 	<p>Poor applications of the Four Ts model in making design decisions</p> <ul style="list-style-type: none"> • Tasks: nature, scope, sequence • Team: division of labor, structure, interactions • Time: constraints • Tools: needs and availabilities 	Does NOT use effectively or is not a related activity.	= ____
Design	<p>Strong encouragement of social interactions and discussion</p> <p>Strong alignment between learning outcomes and social design</p> <p>Strong alignment between group size and activity type</p>	<p>Some encouragement of social interactions and discussion</p> <p>Some alignment between learning outcomes and social design</p> <p>Some alignment between group size and activity type</p>	<p>Poor encouragement of social interactions and discussion</p> <p>Poor alignment between learning outcomes and social design</p> <p>Poor alignment between group size and activity type</p>	Does NOT use effectively or is not a related activity	= ____
Assessment	<p>Strong articulation of outcomes and expectations</p> <p>Strong provision of feedback at both the individual, group, and peer levels</p>	<p>Some articulation of outcomes and expectations</p> <p>Some provision of feedback at both the individual, group, and peer levels</p>	<p>Poor articulation of outcomes and expectations</p> <p>Poor provision of feedback at both the individual, group, and peer levels</p>	Does NOT use effectively or is not a related activity	= ____

Peer Tutoring



LEARNING
TOGETHER

DESCRIPTION

Peer tutoring refers to the act of a learner or learners engaging in prescribed role taking as tutor or tutee to facilitate peer learning (Salkind, 2008). Upon appropriate implementation, there is evidence to suggest peer tutoring positively impacts student attitudinal, developmental, and academic outcomes (Topping, 2005). This principle provides an overview of peer tutoring practices and research literature, and research-based recommendations in the way of course design to facilitate best practices in peer tutoring implementation. Recommendations include ensuring alignment between peer tutoring strategies employed and objective statements, providing the appropriate training, monitoring, and/or structured protocols to support appropriate peer tutoring practices, and utilizing technology to facilitate asynchronous and synchronous interactions between peers.

LEARNER IMPACTS

- Attitudes
- Behavior
- Motivation
- Self-regulation

CAPABILITIES

- Management: Performance based grouping
- Cognitive Tools: Synchronous social learning: item based
- Cognitive Tools: Peer review

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Personalized learning environment
- Simple Technology: Targeted study aids
- Content Support: Extensive content flexibility



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<p>The product strategy is aligned to peer tutoring and assessment as a core principle of a learner-centered product.</p> <p>The product strategy currently integrates an evidence-based model for peer tutoring and/or assessment.</p> <p>The product strategy currently integrates the use of an evidence-based model of peer tutoring and assessment.</p>	<p>The product team is exploring peer tutoring and/or assessment as a core LDP for creating a more learner-centered product.</p> <p>The product strategy is exploring integrating an evidence-based model for peer tutoring and/or assessment.</p> <p>The product strategy is exploring integrating a recommended evidence-based approach to peer tutoring and/or assessment.</p>	<p>The product team considers peer tutoring and/or assessment to be an important LDP for creating a more learner-centered product.</p> <p>The product strategy considers peer tutoring and/or assessment at a high level but does not currently align to an evidence-based model.</p>	<p>The peer tutoring and assessment LDP does NOT align to the product strategy and is not necessary to explore further.</p>	= ____
Peer Tutoring and Assessment Application	<p>The product uses research-supported strategies of peer tutoring and/or assessment.</p> <p>The application applies digital design recommendations for peer tutoring and/or assessments.</p>	<p>Principle is applied only to a specific area of the product and more focus on enhancing the application and implementation of peer tutoring and/or assessment is needed to improve principle application.</p>	<p>Product team thinks applying this principle would add value to their product strategy.</p> <p>Product team has applied similar principles to their product strategy.</p>	<p>This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product.</p>	= ____
Delivery	<p>Information on the effect of peer tutoring and/or assessment on a capability or service aligned to this principle has been gathered/ reported on.</p>	<p>Product team is in early discussions about partnering with LD team to validate this principle with learners.</p> <p>Product team has specific capabilities they need to validate this principle with.</p>	<p>Product team needs more information about how this principle might be tested with learners using LD's validation services.</p>	<p>This principle does NOT need to be validated in order to inform product design & development.</p>	= ____
Learner Characteristics	<p>Design & development are currently using validation reports to further align the principle and the product strategy.</p>	<p>Product team is currently exploring how validation results and recommendations could be used in product design & development.</p>	<p>Product team feels there is time in the schedule to include validation data to inform product design & development.</p> <p>Product team needs a consultation to learn more about validation services and results reports.</p>	<p>Validation data will NOT be used to inform product design & development.</p>	= ____
Formative/ Summative Applications	<p>The formative and summative applications make proper use of peer tutoring and/or assessment LDP recommendations for creating assessments.</p>	<p>Product team is currently exploring how recommendations on designing assessments with peer tutoring and/or assessment in mind could be used in product design & development.</p>	<p>Product team feels there is time in the schedule to include time spent on assessment application design & development.</p> <p>Product team needs a consultation to learn more about designing assessments based on this LDP.</p>	<p>Formative/summative applications will NOT be used to inform product design & development.</p>	= ____

Pedagogical Agents



LEARNING
TOGETHER

DESCRIPTION

Pedagogical agents are life-like animated characters that are embedded in instructional applications to support learning. Agents may be used to help stimulate social interactions with learners in a way that facilitates learning through collaboration, sharing of tasks, providing information, and encouraging learners (Kim & Baylor, 2006). This principle will explore the many design considerations that need to be taken into account when developing pedagogical agents such as how the agent is represented, the role the agent plays, down to detail levels of what an agent's age, weight, and personality should be (Heidig & Clarebout, 2011).

CAPABILITIES

- Instruction: Active learning experience

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Personal one-on-one artificial tutor
- Simple Technology: Learning guide that provides feedback and basic cues
- Content Support: Instructional content to show learners

LEARNER IMPACTS

- Self-regulation
- Motivation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p> Strong application of empirical evidence in the design of agents</p> <p> Strong application of a life-like character who is embedded into the instructional environment</p>	<p> Some application of empirical evidence in the design of agents</p> <p> Some application of a life-like character who is embedded into the instructional environment</p>	<p> Poor application of empirical evidence in the design of agents</p> <p> Poor application of a life-like character who is embedded into the instructional environment</p>	<p> Does NOT apply effectively or is not a related activity</p>	= ____
Model	<p> Strong application of a coherent design process, such as pedagogical agents levels of design (PALD) model, to justify agent design</p> <p> Strong specification of the global, medium, and detail levels of agent design to support learning goals</p>	<p> Some application of a coherent design process, such as PALD model, to justify agent design</p> <p> Some specification of the global, medium, and detail levels of agent design to support learning goals</p>	<p> Poor application of a coherent design process, such as PALD model, to justify agent design</p> <p> Poor specification of the global, medium, and detail levels of agent design to support learning goals</p>	<p> Does NOT apply effectively or is not a related activity</p>	= ____
Design	<p> Strong alignment between learning theory and pedagogical agent design</p> <p> Strong usage of instructional benefits of agents, as identified by the literature</p>	<p> Some alignment between learning theory and pedagogical agent design</p> <p> Some usage of instructional benefits of agents, as identified by the literature</p>	<p> Poor alignment between learning theory and pedagogical agent design</p> <p> Poor usage of instructional benefits of agents, as identified by the literature</p>	<p> Does NOT apply effectively or is not a related activity</p>	= ____
Assessment	<p> Strong consideration of individual differences, such as prior knowledge, in the assessment of performance</p> <p> Strong use of clear feedback</p> <p> Strong provision of assistance to learners to ensure they can utilize feedback messages</p>	<p> Some consideration of individual differences, such as prior knowledge, in the assessment of performance</p> <p> Some use of clear feedback</p> <p> Some provision of assistance to learners to ensure they can utilize feedback messages</p>	<p> Poor consideration of individual differences, such as prior knowledge, in the assessment of performance</p> <p> Poor use of clear feedback</p> <p> Poor provision of assistance to learners to ensure they can utilize feedback messages</p>	<p> Does NOT apply effectively or is not a related activity</p>	= ____

Arguing to Learn



LEARNING
TOGETHER

DESCRIPTION

Argumentation is the means by which we rationally resolve questions, issues, and disputes, and solve problems. Embedding and fostering argumentative activities in learning environments promotes productive ways of thinking, conceptual change, and problem solving (Jonassen & Kim, 2010). Although science educators have focused on the roles of argumentation more extensively than other disciplines, argumentation is an essential way of thinking about any discipline including history, sociology, and mathematics.

We can encourage argumentation in our courses by supporting the development of good reasoning skills, using case studies, role play scenarios, and similar authentic activities to encourage students to develop arguments, and using web-based argumentation templates to facilitate the performance and usage of argumentation (Walker & Sampson, 2013; Andriessen & Baker, 2014).

CAPABILITIES

- Assessment: Essay
- Management: Discussion analytics
- Cognitive Tools: Asynchronous social learning: text based

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Argument simulations
- Simple Technology: Scaffolded argumentation
- Content Support: Rubrics

LEARNER IMPACTS

- Behavior



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong emphasis of the requirement of arguments having at least a claim that is supported by reasons	Some emphasis of the requirement of arguments having at least a claim that is supported by reasons	Poor emphasis of the requirement of arguments having at least a claim that is supported by reasons	Does NOT use effectively or is not a related activity	= ____
	Strong emphasis that counterargument should address the pros/cons of the original claim and the counterclaim	Some emphasis that counterargument should address the pros/cons of the original claim and the counterclaim	Poor emphasis that counterargument should address the pros/cons of the original claim and the counterclaim		
Model	Strong application of the steps of argument-driven inquiry (ADI) guide the instructional design of activities	Some application of the steps of ADI guide the instructional design of activities	Poor application of the steps of ADI guide the instructional design of activities	Does NOT use effectively or is not a related activity	= ____
	Strong emphasis of Toulmin's argument pattern (TAP) components model what students should include in good arguments	Some emphasis of TAP components model what students should include in good arguments	Poor emphasis of TAP components model what students should include in good arguments		
Design	Strong application of empirical methods for supporting argumentation in learning environments	Some application of empirical methods for supporting argumentation in learning environments	Poor application of empirical methods for supporting argumentation in learning environments	Does NOT use effectively or is not a related activity	= ____
	Strong consideration of existing methods to determine a good fit per the context	Some consideration of existing methods to determine a good fit per the context	Poor consideration of existing methods to determine a good fit per the context		
Assessment	Strong statement of clear assessment criteria provided to students	Some statement of clear assessment criteria provided to students	Poor statement of clear assessment criteria provided to students	Does NOT use effectively or is not a related activity	= ____
	Strong consideration of individual differences	Some consideration of individual differences	Poor consideration of individual differences		

Student-Centered Learning



LEARNING
TOGETHER

DESCRIPTION

SCL is an “environment that allows learners to take some real control over their educational experience and encourages them to make important choices about what and how they will learn” (Doyle, 2008. p. xv).

An SCL approach examines teaching actions (method, assignment, and/or assessment) in regard to the question: “Given the context of the learner, the course, and the delivery method, will this teaching action optimize the learner’s opportunity to learn?” (Doyle, n.d). The Student-Centered Learning LDP uses research from Doyle; Hirumi; Olson; and others to illustrate how SCL impacts the digital learning environment through 1) the design of learning and 2) the implementation of learning.

The most impact that can be made on SCL is a change in attitude to refocus a learner’s attitude from one of a fixed mindset to a growth mindset, and to refocus an instructor’s role from that of a teacher to a facilitator of learning through essential elements.

The essential elements of SCL include:

- Complex, interesting tasks
- Identification of resources to address tasks
- Discussion with peers and the teacher
- Reflection and refinement based on feedback
- Self-guided objectives, activity, and assessment
- Teachers working as facilitators

Recommendations include:

- Use SCL approaches to change instructor and learner attitudes
- Incorporate direct instruction with components of SCL
- Incorporate SCL implementation components in implementation guidelines
- Design to support components of SCL
 - *Complex, interesting tasks*
 - *Identification of resources to address tasks*
 - *Discussion with peers and the teacher*
 - *Reflection and refinement based on feedback*
 - *Reflection of objectives, activity, and assessment to personal goals*

LEARNER IMPACTS

- Attitudes
- Behavior
- Motivation
- Self-regulation

CAPABILITIES

- Assessment: Project
- Cognitive Tools: Peer review
- Adaptivity: Mastery + confidence based adaptivity

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Authentic learning opportunities through simulations and scenarios
- Simple Technology: Feedback for constructed response items through rubrics
- Content Support: Tie learner personal goals to objectives



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p>Strong support of the essential elements of SCL</p> <ul style="list-style-type: none"> • Complex, interesting tasks • Identification of resources to address tasks • Discussion with peers and the teacher • Reflection and refinement based on feedback • Self-guided objectives, activity, and assessment • Teachers work as facilitators 	<p>Some support of the essential elements of SCL</p>	<p>Poor support of the essential elements of SCL</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Model	<p>Strong consideration for the differences between teacher-orientated and student-centered environments</p> <p>Strong application of the 8 events of SCL in the design of course activities</p>	<p>Some consideration for the differences between teacher-orientated and student-centered environments</p> <p>Some application of the 8 events of SCL in the design of course activities</p>	<p>Poor consideration for the differences between teacher-orientated and student-centered environments</p> <p>Poor application of the 8 events of SCL in the design of course activities</p>	<p>Does NOT use effectively or is not a related activity.</p>	= ____
Design	<p>Strong alignment between SCL assumptions and functions</p> <p>Strong use of evidence-based design approaches, such as scaffolding, multimodal representations, and personal relevance</p>	<p>Some alignment between SCL assumptions and functions</p> <p>Some use of evidence-based design approaches, such as scaffolding, multimodal representations, and personal relevance</p>	<p>Poor alignment between SCL assumptions and functions</p> <p>Poor use of evidence-based design approaches, such as scaffolding, multimodal representations, and personal relevance</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Adoption	<p>Strong consideration of student and teacher attitudes towards SCL</p> <p>Strong application of strategies to address adoption challenges</p>	<p>Some consideration of student and teacher attitudes towards SCL</p> <p>Some application of strategies to address adoption challenges</p>	<p>Poor consideration of student and teacher attitudes towards SCL</p> <p>Poor application of strategies to address adoption challenges</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____

Foundations of Adaptive Learning (Personalized Learning)



LEARNING ENVIRONMENTS

LEARNER IMPACTS

- Self-regulation
- Achievement
- Motivation

DESCRIPTION

Research into adaptive learning has shown positive impact on learning, especially within micro-adaptive systems which have been demonstrated to be almost as effective as a human tutor (VanLehn, 2011). Adaptive learning technologies provide an environment that can intelligently adjust to individual learner needs by presenting appropriate information, instructional materials, scaffolds, feedback, and recommendations based on learner characteristics and particular situation.

Adaptive learning is broken up into five different categories:

1. Analytics: The base functionality that supports other forms of adaptive learning but may also be used to display important information to learners and instructors so they may adapt their own learning (Baker & Siemens, 2014).
2. Local: Targeted feedback, hints, and remedial content (Durlach & Ray, 2011).
3. Dispositional: Adaptation based on individual student variables such as aptitudes (Pashler, McDaniel, Rohrer, & Bjork, 2008).
4. Macro: Individualized task selection based on learner understanding (Lee & Park, 2008).
5. Micro: Individualized scaffolding mechanisms to assist learning (Corbett, Koedinger, & Anderson, 1997).

Such categories may be combined to provide greater levels of adaptive learning to support individual learners.

CAPABILITIES

- Adaptivity: Adaptive spacing
- Adaptivity: Adaptive study plan
- Adaptivity: Mastery and confidence based adaptivity

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Personalized learning environment
- Simple Technology: Targeted study aids
- Content Support: Extensive content flexibility

Foundations of Adaptive Learning (Personalized Learning) SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p>Strong consideration for diversity in learners, methods, modes, media, and other factors</p> <p>Strong use of technology to facilitate the adaptation of learning experiences to individuals</p>	<p>Some consideration for diversity in learners, methods, modes, media, and other factors</p> <p>Some use of technology to facilitate the adaptation of learning experiences to individuals</p>	<p>Poor consideration for diversity in learners, methods, modes, media, and other factors</p> <p>Poor use of technology to facilitate the adaptation of learning experiences to individuals</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Model	<p>Strong alignment between learning objectives and potential types of adaptivity, such as content agnostic, content level, and intelligent</p> <p>Strong implementation of micro, macro, and local adaptivity where appropriate in the learning design</p>	<p>Some alignment between learning objectives and potential types of adaptivity, such as content agnostic, content level, and intelligent</p> <p>Some implementation of micro, macro, and local adaptivity where appropriate in the learning design</p>	<p>Poor alignment between learning objectives and potential types of adaptivity, such as content agnostic, content level, and intelligent</p> <p>Poor implementation of micro, macro, and local adaptivity where appropriate in the learning design</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____
Design	<p>Strong application of key adaptive learning principles:</p> <ul style="list-style-type: none"> • Misconception identification • Masterly learning • Varied feedback • Spaced practice • Self-regulated learning (SRL) • Shared control • Affective elements • Application variety • Segmented content • Signaling 	<p>Some application of key adaptive learning principles:</p> <ul style="list-style-type: none"> • Misconception identification • Masterly learning • Varied feedback • Spaced practice • SRL • Shared control • Affective elements • Application variety • Segmented content • Signaling 	<p>Poor application of key adaptive learning principles:</p> <ul style="list-style-type: none"> • Misconception identification • Masterly learning • Varied feedback • Spaced practice • SRL • Shared control • Affective elements • Application variety • Segmented content • Signaling 	<p>Does NOT use effectively or is not a related activity</p>	= ____
Assessment	<p>Strong use of timely and relevant feedback to facilitate learner improvement</p> <p>Strong use of data collection methods to support adaptivity, assessment, and feedback</p>	<p>Some use of timely and relevant feedback to facilitate learner improvement</p> <p>Some use of data collection methods to support adaptivity, assessment, and feedback</p>	<p>Poor use of timely and relevant feedback to facilitate learner improvement</p> <p>Poor use of data collection methods to support adaptivity, assessment, and feedback</p>	<p>Does NOT use effectively or is not a related activity</p>	= ____

Mobile Learning: Learner Affordances



LEARNING ENVIRONMENTS

LEARNER IMPACTS

- Attitude
- Behavior
- Motivation
- Self-regulation

DESCRIPTION

Mobile learning is defined as supports for people learning on the move in personal learning settings, such as on a phone or tablets, as well as in public learning settings, such as museums. The mobile context permits deeper constructivist, “learning by doing” approaches to be employed, as well more contextual learning, as it is now possible to take the learning process out of the classroom into authentic, real-world environments. (McQuiggan, Kosturko, McQuiggan, & Sabourin, 2015).

The mobile learning environment also provides the learner with more control over which devices and support apps they choose to best enable their personal learning process.

CAPABILITIES

- Instruction: Multimedia active reading
- Management: Learner analytics
- Cognitive Tools: Timestamped video comments

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Identifying tree species with LeafSnap.com
- Simple Technology: Notifications and prompts
- Content Support: Mobile flashcards



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/ Model	<ul style="list-style-type: none"> The product strategy is aligned to mobile learning as a core principle of a learner-centered product. 	<ul style="list-style-type: none"> The product team is exploring mobile learning as a core LDP for creating a more learner-centered product. The product strategy is exploring integrating an evidence-based model of mobile learning. 	<ul style="list-style-type: none"> The product team considers mobile learning to be an important LDP for creating a more learner-centered product. The product strategy considers mobile learning at a high level but does not currently align to an evidence-based model. 	<ul style="list-style-type: none"> The mobile learning LDP does NOT align to the product strategy and is not necessary to explore further. 	= ____
Mobile Learning Application	<ul style="list-style-type: none"> The product uses empirically-based recommendations concerning mobile learning. 	<ul style="list-style-type: none"> Principle is applied only to a specific area of the product and more learner feedback is needed to improve principle application. 	<ul style="list-style-type: none"> Product team thinks applying this principle would add value to their product strategy. Product team has applied similar principles to their product strategy. 	<ul style="list-style-type: none"> This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product. 	= ____
Mobile Learning Delivery	<ul style="list-style-type: none"> The impact on a capability or service aligned to this principle has been gathered/reported on. 	<ul style="list-style-type: none"> Product team is in early discussions about partnering with LD team to validate this principle with learners. Product team has specific capabilities they need to validate this principle with. 	<ul style="list-style-type: none"> Product team needs more information about how this principle might be tested with learners using LD's validation services. 	<ul style="list-style-type: none"> This principle does NOT need to be validated in order to inform product design & development. 	= ____
Learner Characteristics	<ul style="list-style-type: none"> Design & development are currently using validation reports to further align the principle and the product strategy. 	<ul style="list-style-type: none"> Product team is currently exploring how validation results and recommendations could be used in product design & development. 	<ul style="list-style-type: none"> Product team feels there is time in the schedule to include validation data to inform product design & development. Product team needs a consultation to learn more about validation services and results reports. 	<ul style="list-style-type: none"> This principle does NOT need to be validated in order to inform product design & development. 	= ____
Formative/ Summative Applications	<ul style="list-style-type: none"> The formative and summative applications make proper use of mobile learning LDP recommendations for creating assessments. 	<ul style="list-style-type: none"> Product team is currently exploring how recommendations for designing assessments for mobile learning could be used in product design & development. 	<ul style="list-style-type: none"> Product team feels there is time in the schedule to include time spent on assessment application design & development. Product team needs a consultation to learn more about designing mobile learning assessments. 	<ul style="list-style-type: none"> Formative/summative applications will NOT be used to inform product design & develop. 	= ____

Motivation Design



LEARNING ENVIRONMENTS

LEARNER IMPACTS

- Achievement
- Attitudes
- Behavior
- Self-regulation

DESCRIPTION

Learner motivation can impact multiple dimensions of a learning experience, including the quality of learning, academic performance, involvement in activities, task choices, and persistence (Eccles, 1983; Pintrich, 2003). Thus, leveraging empirical research on motivation and learning stands to foster positive, productive learning environments. A vast body of research suggests the following best practices:

- Fostering intrinsic motivation for a task is more advantageous for learning than extrinsic motivation (Deci & Ryan, 2000)
- Giving learners autonomy and choice in their learning paths/tasks is more motivating than forcing them to follow one learning path/task (Deci & Ryan, 2000; Pintrich, 2003; Zuckerman, Porac, Lathin, Smith, & Deci, 1978)
- Positive feedback that is based on a learner's competency or mastery is more motivating than negative feedback (Boggiano & Ruble, 1979; Deci, 1971; Deci & Cascio, 1972; Fisher, 1978; Ryan, 1982)
- Learning environments that help learners increase their self-efficacy in a certain domain, skill, or task are more advantageous than those that do not (Bandura, 1977)
- Illustrating to learners that they are able to change and improve their skills and abilities—called “incremental self-theory”—yields more positive results than environments that emphasize unchangeable inborn/natural abilities (Dweck, 1999)
- Learning environments that attribute learner success to their own efforts and persistence have more positive learning impacts than environments attributing success to unchangeable or external factors such as the learner's intelligence, luck, or ease/difficulty of tasks (Weiner, 1974)
- Focusing learners on pursuing both mastery and performance goals is more likely to have a positive impact than focusing on only one or neither (Pintrich, 2003; Plante, O'Keefe, Théorêt, 2012; Senko, Hulleman, & Harackiewicz, 2011)
- When learners view a task as important, interesting, or useful, positive outcomes are more likely than when learners view a task as unimportant, uninteresting, or useless (Eccles, 1983; Pintrich, 2003)

CAPABILITIES

- Adaptivity: Mastery + confidence based adaptivity
- Instruction: Active learning experience
- Management: Badging
- Management: Learner analytics

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Adaptive engines tracking mastery and performance
- Simple Technology: Feedback attributing a high score to student skill/persistence
- Content Support: Personally relevant/interesting content



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p>Strong application of motivation as a process, rather than a product</p> <p>Strong use of goal-driven actions in activities that are physical or mental</p> <p>Strong applications of techniques that both instigate and sustain motivation</p>	<p>Some application of motivation as a process, rather than a product</p> <p>Some use of goal-driven actions in activities that are physical or mental</p> <p>Some applications of techniques that both instigate and sustain motivation</p>	<p>Poor application of motivation as a process, rather than a product</p> <p>Poor use of goal-driven actions in activities that are physical or mental</p> <p>Poor applications of techniques that both instigate and sustain motivation</p>	Does NOT use effectively or is not a related activity	= ____
Expectancy-Value	<p>Strong emphasis on fostering intrinsic motivation in activities, but not at the exclusion of extrinsic motivation</p> <p>Strong emphasis on fostering realistic expectations for success</p> <p>Strong use of methods that foster intrinsic motivation and realistic expectations, such as:</p> <ul style="list-style-type: none"> • Choices • Suitable difficulty • Informational constraints • Transparent evaluation • Self-regulated learning (SRL) strategies 	<p>Some emphasis on fostering intrinsic motivation in activities, but not at the exclusion of extrinsic motivation</p> <p>Some emphasis on fostering realistic expectations for success</p> <p>Some use of methods that foster intrinsic motivation and realistic expectations, such as:</p> <ul style="list-style-type: none"> • Choices • Suitable difficulty • Informational constraints • Transparent evaluation • SRL strategies 	<p>Poor emphasis on fostering intrinsic motivation in activities, but not at the exclusion of extrinsic motivation</p> <p>Poor emphasis on fostering realistic expectations for success</p> <p>Poor use of methods that foster intrinsic motivation and realistic expectations, such as:</p> <ul style="list-style-type: none"> • Choices • Suitable difficulty • Informational constraints • Transparent evaluation • SRL strategies 	Does NOT use effectively or is not a related activity	= ____
Goal Orientations	<p>Strong emphasis on fostering incremental views of intelligence</p> <p>Strong emphasis on fostering mastery goals in activities, but not at the exclusion of performance goals</p> <p>Strong application of learning environment to allow learners with different goals to succeed</p>	<p>Some emphasis on fostering incremental views of intelligence</p> <p>Some emphasis on fostering mastery goals in activities, but not at the exclusion of performance goals</p> <p>Some application of learning environment to allow learners with different goals to succeed</p>	<p>Poor emphasis on fostering incremental views of intelligence</p> <p>Poor emphasis on fostering mastery goals in activities, but not at the exclusion of performance goals</p> <p>Poor application of learning environment to allow learners with different goals to succeed</p>	Does NOT use effectively or is not a related activity	= ____
Assessment	<p>Strong application of multiple methods for measuring and assessing motivation to triangulate data</p> <p>Strong use of transparent, positive feedback that matches student achievement</p> <p>Strong application of one or more of the following measurement techniques:</p> <ul style="list-style-type: none"> • Task choice • Involvement • Persistence • Achievement 	<p>Some application of multiple methods for measuring and assessing motivation to triangulate data</p> <p>Some use of transparent, positive feedback that matches student achievement</p> <p>Some application of one or more of the following measurement techniques:</p> <ul style="list-style-type: none"> • Task choice • Involvement • Persistence • Achievement 	<p>Poor application of multiple methods for measuring and assessing motivation to triangulate data</p> <p>Poor use of transparent, positive feedback that matches student achievement</p> <p>Poor application of one or more of the following measurement techniques:</p> <ul style="list-style-type: none"> • Task choice • Involvement • Persistence • Achievement 	Does NOT use effectively or is not a related activity	= ____

Simulations



LEARNING ENVIRONMENTS

LEARNER IMPACTS

- Attitude
- Behavior
- Motivation
- Self-regulation

DESCRIPTION

Over the past 25 years the use of simulations has been found to be engaging as learning and assessment tools (Behrens, DiCerbo, & Ferrara, 2012; Gegenfurtner, Quesada-Pallarès, & Knogler, 2014; Mitchell & Savell-Smith, 2004; Pai-Hsing Wu et al., 2014; Quellmalz et al., 2012; Shute & Ventura, 2013). A digital simulation can be defined as a technology modeling a system or a process where a user can manipulate parameters in the system (De Jong & Van Joolingen, 1998). In a simulation, processes, systems, and functions of real-life phenomena are simulated in real time in an authentic and complex manner, which in turn helps learners to critically engage with the learning material (Holladay & Quiñones, 2003). Common examples of simulations involve pilot training in flight simulators (Jacobs, Prince, Hays & Salas, 1990; Wong, Meyer, Timson, Perfect, & White, 2012), decision making in business simulations (Lainema & Nurmi, 2006; Siewiorek & Gegenfurtner, 2010), medical diagnosis using simulated patients (Consorti, Mancuso, Nocioni, & Piccolo, 2012; Cook, Erwin, & Triola, 2010; Iseli, Koenig, Lee, & Wainess, 2010), and physics learning in 2D physics simulation environments (Shute & Ventura, 2013). Digital simulations are becoming increasingly popular in professional training for developing complex cognitive skills (Helle et al., 2011; Mayer, Dale, Fraccastoro, & Moss, 2011; Rogers, 2011; Siewiorek, Gegenfurtner, Lainema, Saarinen, & Lehtinen, 2013; Tynjälä, Häkkinen, & Hämäläinen, 2014; Wang & Wu, 2008).

Best practices for designing simulations for learning include:

- Match simulations to learning goals
- Make learning essential to simulation progress
- Build in proven instructional strategies
- Build in guidance and structure
- Manage complexity
- Make relevance salient

CAPABILITIES

- Assessment: Software simulation
- Instruction: Active learning experience

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Flight simulator
- Simple Technology: 2D physics simulations in a digital environment
- Content Support: Using the Evidence-Centered Design (ECD) approach



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong application of technology to model a system or process	Some application of technology to model a system or process	Poor application of technology to model a system or process	Does NOT use effectively or is not a related activity	= ____
	Strong integration of user control to manipulate the simulation	Some integration of user control to manipulate the simulation	Poor integration of user control to manipulate the simulation		
	Strong use of simulation to engage learners in an authentic context	Some use of simulation to engage learners in an authentic context	Poor use of simulation to engage learners in an authentic context		
Model	Strong use of simulation to foster experimentation, discovery, construction, and collaboration	Some use of simulation to foster experimentation, discovery, construction, and collaboration	Poor use of simulation to foster experimentation, discovery, construction, and collaboration	Does NOT use effectively or is not a related activity	= ____
	Strong use of simulation to conduct authentic tasks within a situated environment	Some use of simulation to conduct authentic tasks within a situated environment	Poor use of simulation to conduct authentic tasks within a situated environment		
Design	Strong selection of an appropriate simulation type for the context <ul style="list-style-type: none"> Virtual world Virtual modeling Experimental sandbox Reactive branching Adaptive branching 	Some selection of an appropriate simulation type for the context <ul style="list-style-type: none"> Virtual world Virtual modeling Experimental sandbox Reactive branching Adaptive branching 	Poor selection of an appropriate simulation type for the context <ul style="list-style-type: none"> Virtual world Virtual modeling Experimental sandbox Reactive branching Adaptive branching 	Does NOT use effectively or is not a related activity	= ____
	Strong evaluation of design risks to optimize the simulation	Some evaluation of design risks to optimize the simulation	Poor evaluation of design risks to optimize the simulation		
	Strong use of evidence-based principles to design the simulation	Some use of evidence-based principles to design the simulation	Poor use of evidence-based principles to design the simulation		
Assessment	Strong application of assessment within the simulation environment	Some application of assessment within the simulation environment	Poor application of assessment within the simulation environment	Does NOT use effectively or is not a related activity	= ____
	Strong evidence of value-added validity beyond traditional assessments	Some evidence of value-added validity beyond traditional assessments	Poor evidence of value-added validity beyond traditional assessments		
	Strong use of both product and process data for assessment and feedback	Some use of both product and process data for assessment and feedback	Poor use of both product and process data for assessment and feedback		

Games and Virtual Worlds



LEARNING ENVIRONMENTS

LEARNER IMPACTS

- Attitude
- Behavior
- Self-regulation
- Achievement

DESCRIPTION

Well-designed games include features that make them intrinsically motivating and thus engaging (Fullerton, 2008; Malone & Lepper, 1987; Shute, Rieber, & Van Eck, 2011). Some of the features of good games include adaptive challenges, goals, and rules, interactive problem solving, control (of learning and the game environment), ongoing feedback, and sensory stimuli. There is growing evidence of video games and simulations supporting learning (Coller & Scott, 2009; Tobias & Fletcher, 2011; for a review see Wilson et al., 2009). An additional advantage of using video games and simulations in education is the vast amount of data that can be used for assessment purposes (Dede, 2005; DiCerbo & Behrens, 2012; Quellmalz, Timms, Silbergliitt, & Buckley, 2012; Shute & Ventura, 2013). Formative assessments embedded within a video game can enable us to more accurately provide feedback and change gameplay to maximize learning according to the ability level of the player.

CAPABILITIES

- Instruction: Active learning experience

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Online 3D virtual worlds
- Simple Technology: 2D HTML games
- Content Support: Using the Evidence-Centered Design (ECD) approach



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<ul style="list-style-type: none"> The product strategy is aligned to game-based learning as a core principle of a learner-centered product 	<ul style="list-style-type: none"> The product team is exploring game-based learning as a core LDP for creating a more learner-centered product The product strategy is exploring integrating an evidence-based model of game-based learning 	<ul style="list-style-type: none"> The product team considers game-based learning to be an important LDP for creating a more learner-centered product The product strategy considers game-based learning at a high level but does not currently align to an evidence-based model 	<ul style="list-style-type: none"> The game-based learning LDP does NOT align to the product strategy and is not necessary to explore further 	= ____
Game-based Learning Application	<ul style="list-style-type: none"> The product uses empirically-based recommendations concerning game-based learning 	<ul style="list-style-type: none"> Principle is applied only to a specific area of the product and more learner feedback is needed to improve principle application 	<ul style="list-style-type: none"> Product team thinks applying this principle would add value to their product strategy Product team has applied similar principles to their product strategy 	<ul style="list-style-type: none"> This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product 	= ____
Game-based Learning Delivery	<ul style="list-style-type: none"> The impact on a capability or service aligned to this principle has been gathered/reported on 	<ul style="list-style-type: none"> Product team is in early discussions about partnering with LD team to validate this principle with learners. Product team has specific capabilities they need to validate this principle with 	<ul style="list-style-type: none"> Product team needs more information about how this principle might be tested with learners using LD's validation services 	<ul style="list-style-type: none"> This principle does NOT need to be validated in order to inform product design & development 	= ____
Learner Characteristics	<ul style="list-style-type: none"> Design & development are currently using validation reports to further align the principle and the product strategy 	<ul style="list-style-type: none"> Product team is currently exploring how validation results and recommendations could be used in product design & development 	<ul style="list-style-type: none"> Product team feels there is time in the schedule to include validation data to inform product design & development Product team needs a consultation to learn more about validation services and results reports 	<ul style="list-style-type: none"> Validation data will NOT be used to inform product design & development 	= ____
Formative/Summative Applications	<ul style="list-style-type: none"> The formative and summative applications make proper use of game-based learning LDP recommendations for creating assessments. 	<ul style="list-style-type: none"> Product team is currently exploring how recommendations for designing assessments for game-based learning could be used in product design & development 	<ul style="list-style-type: none"> Product team feels there is time in the schedule to include time spent on assessment application design & development Product team needs a consultation to learn more about designing game-based learning assessments 	<ul style="list-style-type: none"> Formative/summative applications will NOT be used to inform product design & development 	= ____

Authentic Learning



LEARNING ENVIRONMENTS

LEARNER IMPACTS

- Behavior
- Motivation

DESCRIPTION

Authentic learning involves using real-world problems to encourage open-ended inquiry, and social and self-directed learning. It results in something that can stand alone as a valuable product in its own right. Authentic learning may be more important than ever as it clearly supports the 4Cs of 21st century skills—collaboration, critical thinking, communication, and creativity (Lombardi, 2007). Research shows that active engagement in authentic disciplinary practices results in enhanced learning outcomes (Sawyer, 2014).

Authentic learning environments provide authentic contexts and activities, access to expert performances, provide multiple roles and perspectives, promote reflection and articulation, provide coaching and scaffolding, and support collaborative construction of knowledge (Herrington & Oliver, 2000).

Learners do not naturally know how to engage in authentic practices. We must carefully structure the learning environment and activities in ways that are accessible and that follow a developmental progression. Using methods such as modeling, coaching, scaffolding, and fading can help facilitate skill development.

CAPABILITIES

- Assessment: Project
- Assessment: Work sample/e-portfolio
- Assessment: Software simulation

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Simulation
- Simple Technology: Online portfolio
- Content Support: Online discussion forum



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<ul style="list-style-type: none"> Strong use of real-world problems that mimic the work of professionals Strong support of open-ended inquiry, thinking skills, and metacognition Strong engagement of students in discourse and social learning in a community of learners Strong empowerment through student choice to direct learning in relevant project work 	<ul style="list-style-type: none"> Some use of real-world problems that mimic the work of professionals Some support of open-ended inquiry, thinking skills, and metacognition Some engagement of students in discourse and social learning in a community of learners Some empowerment through student choice to direct learning in relevant project work 	<ul style="list-style-type: none"> Poor use of real-world problems that mimic the work of professionals Poor support of open-ended inquiry, thinking skills, and metacognition Poor engagement of students in discourse and social learning in a community of learners Poor empowerment through student choice to direct learning in relevant project work 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____
Design	<ul style="list-style-type: none"> Strong application of the characteristics of authentic learning design Strong application of the elements of situated learning design Strong application of the step-by-step process from the framework for authentic constructivist learning environments 	<ul style="list-style-type: none"> Some application of the characteristics of authentic learning design Some application of the elements of situated learning design Some application of the step-by-step process from the framework for authentic constructivist learning environments 	<ul style="list-style-type: none"> Poor application of the characteristics of authentic learning design Poor application of the elements of situated learning design Poor application of the step-by-step process from the framework for authentic constructivist learning environments 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____
Digital Learning	<ul style="list-style-type: none"> Strong consideration of alternative technologies, such as found in prior implementations, mobile learning, and wikis Strong support of collaboration and student-centered learning through technology 	<ul style="list-style-type: none"> Some consideration of alternative technologies, such as found in prior implementations, mobile learning, and wikis Some support of collaboration and student-centered learning through technology 	<ul style="list-style-type: none"> Poor consideration of alternative technologies, such as found in prior implementations, mobile learning, and wikis Poor support of collaboration and student-centered learning through technology 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____
Assessment	<ul style="list-style-type: none"> Strong emphasis on authentic assessment as evaluating student knowledge that is put into practice Strong use of supporting techniques, such as peer review, self assessment, and instructor feedback simultaneously Strong application of existing tools and processes, such as authentic self and peer assessment for learning (ASPAL) and wikis 	<ul style="list-style-type: none"> Some emphasis on authentic assessment as evaluating student knowledge that is put into practice Some use of supporting techniques, such as peer review, self assessment, and instructor feedback simultaneously Some application of existing tools and processes, such as ASPAL and wikis 	<ul style="list-style-type: none"> Poor emphasis on authentic assessment as evaluating student knowledge that is put into practice Poor use of supporting techniques, such as peer review, self assessment, and instructor feedback simultaneously Poor application of existing tools and processes, such as ASPAL and wikis 	<ul style="list-style-type: none"> Does NOT use effectively or is not a related activity 	= ____

Mobile Learning: Device and Collaboration



LEARNING ENVIRONMENTS

LEARNER IMPACTS

- Attitude
- Behavior
- Motivation
- Self-regulation

DESCRIPTION

The near ubiquity of mobile devices in the general population has provided the technological tools to support seamless, just-in-time, lifelong learning applications. Mobile learning is a response to the proliferation of these devices and has led to an ongoing convergence between learning and technology (Kosturko, McQuiggan, & Saborurin, 2015). Design recommendations center on aligning mobile learning implementations to learning goals and objectives and leveraging activities that take advantage of the hardware and software affordances of mobile devices.

Learning while interacting with instructors and peers is an integral part of the mobile learning experience with the potential to develop collective cognitive responsibility and enhance 21st century communication and collaboration skills. (Dolan 2005; see also Bransford, et al., 1999; Churchill, et al., 2001; Dillenbourg, 1999; Zurita, et al., 2003; Zurita & Nussbaum, 2004).

CAPABILITIES

- Management: Performance based grouping
- Cognitive Tools: Synchronous social learning: audio/video based
- Cognitive Tools: Flashcard and concept map creation

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Context-aware augmented reality field trips
- Simple Technology: Notifications and prompts
- Content Support: Culture and language learning practice scenarios



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Purpose/Model	<ul style="list-style-type: none"> The product strategy is aligned to mobile learning as a core principle of a learner-centered product. 	<ul style="list-style-type: none"> The product team is exploring mobile learning as a core LDP for creating a more learner-centered product. The product strategy is exploring integrating an evidence-based model of mobile learning. 	<ul style="list-style-type: none"> The product team considers mobile learning to be an important LDP for creating a more learner-centered product. The product strategy considers mobile learning at a high level but does not currently align to an evidence-based model. 	<ul style="list-style-type: none"> The mobile learning LDP does NOT align to the product strategy and is not necessary to explore further. 	= ____
Mobile Learning Application	<ul style="list-style-type: none"> The product uses empirically-based recommendations concerning mobile learning. 	<ul style="list-style-type: none"> Principle is applied only to a specific area of the product and more learner feedback is needed to improve principle application. 	<ul style="list-style-type: none"> Product team thinks applying this principle would add value to their product strategy. Product team has applied similar principles to their product strategy. 	<ul style="list-style-type: none"> This principle is NOT currently being applied to any area of the product and is NOT needed to improve the product. 	= ____
Mobile Learning Delivery	<ul style="list-style-type: none"> The impact on a capability or service aligned to this principle has been gathered/reported on. 	<ul style="list-style-type: none"> Product team is in early discussions about partnering with LD team to validate this principle with learners. Product team has specific capabilities they need to validate this principle with. 	<ul style="list-style-type: none"> Product team needs more information about how this principle might be tested with learners using LD's validation services. 	<ul style="list-style-type: none"> This principle does NOT need to be validated in order to inform product design & development. 	= ____
Learner Characteristics	<ul style="list-style-type: none"> Design & development are currently using validation reports to further align the principle and the product strategy. 	<ul style="list-style-type: none"> Product team is currently exploring how validation results and recommendations could be used in product design & development. 	<ul style="list-style-type: none"> Product team feels there is time in the schedule to include validation data to inform product design & development. Product team needs a consultation to learn more about validation services and results reports. 	<ul style="list-style-type: none"> This principle does NOT need to be validated in order to inform product design & development. 	= ____
Formative/Summative Applications	<ul style="list-style-type: none"> The formative and summative applications make proper use of mobile learning LDP recommendations for creating assessments. 	<ul style="list-style-type: none"> Product team is currently exploring how recommendations for designing assessments for mobile learning could be used in product design & development. 	<ul style="list-style-type: none"> Product team feels there is time in the schedule to include time spent on assessment application design & development. Product team needs a consultation to learn more about designing mobile learning assessments. 	<ul style="list-style-type: none"> Formative/summative applications will NOT be used to inform product design & develop. 	= ____

Global Learning



MOVING LEARNING SCIENCES RESEARCH INTO THE CLASSROOM

DESCRIPTION

As products developed in one locale get used in another, we have to carefully think through how this impacts the learning experience. Global learning design ensures products are built on well-researched learning principles, links learning to learners' prior knowledge and contextualizes it within their lives, helps measure learning efficacy and impact on a global scale, and provides a framework for adaptive, custom, and modular learning to meet local needs.

Global learning design requires:

1. Developing from global learning principles
 - a. New learning builds on prior knowledge
 - b. Learning builds from foundational facts to organized concepts
 - c. Memory is the residue of thought and requires more than just "time-on-task"
 - d. Formative assessment is essential, since it helps learners to explore, explain, extend, and evaluate their progress
 - e. Learning depends on the interaction of learners' developmental level with the social, emotional, and intellectual climate of the course
2. Globalizing: Internationalizing + localizing or customizing
 - a. User experience (language, text/formatting, layout, color)
 - b. Content (graphics, translation, examples, metaphor)
 - c. Implementation (bandwidth, mobile use, implementation preference, policy)
 - d. Educational culture (time, assessment/grading, competition/collaboration, error focus, source of knowledge, communication, ICT competency)
3. Validating ecologically

For best globalization design, we recommend creating a locale reference guide that describes the learning scenario of the target audience culture/country, analyzing the product for areas of potential conflicts with that target locale, and then determining whether the change will require light localization, deep localization, customization, or whether the market may need further preparation to be ready for the product.

CAPABILITIES

- Instruction: Multimedia active reading
- Instruction: Active learning experience
- Instruction: Player + item

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: User- (instructor, student, GEO) customizable authoring environment to make content, theme, and implementation modifications
- Simple Technology: Regional variations with slight modifications for things like sizes of buttons, icons, layout, language, brand, etc.
- Content Support: Segmented content to allow swappable localization (pictures, colors, examples); integration with user-uploaded content

LEARNER IMPACTS

- Achievement
- Attitudes
- Motivation
- Self-regulation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p> Strong incorporation of well-researched learning principles</p> <p> Strong use of contextualized learning linked to learners' prior knowledge</p> <p> Strong application of modular and open learning resources</p>	<p> Some incorporation of well-researched learning principles</p> <p> Some use of contextualized learning linked to learners' prior knowledge</p> <p> Some application of modular and open learning resources</p>	<p> Poor incorporation of well-researched learning principles</p> <p> Poor use of contextualized learning linked to learners' prior knowledge</p> <p> Poor application of modular and open learning resources</p>	Does NOT use effectively or is not a related activity	= ____
Model	<p> Strong application of the three-stage process for global design</p> <ul style="list-style-type: none"> • Develop • Globalize • Validate <p> Strong application of global design principles</p> <p> Strong globalization through internationalization and localization</p> <p> Strong ecological validation through research and evaluation</p>	<p> Some application of the three-stage process for global design</p> <ul style="list-style-type: none"> • Develop • Globalize • Validate <p> Some application of global design principles</p> <p> Some globalization through internationalization and localization</p> <p> Some ecological validation through research and evaluation</p>	<p> Poor application of the three-stage process for global design</p> <ul style="list-style-type: none"> • Develop • Globalize • Validate <p> Poor application of global design principles</p> <p> Poor globalization through internationalization and localization</p> <p> Poor ecological validation through research and evaluation</p>	Does NOT use effectively or is not a related activity	= ____
Design	<p> Strong application of design principles</p> <p> Strong adaptation of context to different cultures and locales</p> <p> Strong evidence that design has achieved ecological validity</p>	<p> Some application of design principles</p> <p> Some adaptation of context to different cultures and locales</p> <p> Some evidence that design has achieved ecological validity</p>	<p> Poor application of design principles</p> <p> Poor adaptation of context to different cultures and locales</p> <p> Poor evidence that design has achieved ecological validity</p>	Does NOT use effectively or is not a related activity	= ____
Assessment	<p> Strong use of formative assessment to evaluate and improve learning</p> <p> Strong use of feedback on the instructor, peer, and self levels</p> <p> Strong use of metacognitive instructional strategies to help instructors assist students</p>	<p> Some use of formative assessment to evaluate and improve learning</p> <p> Some use of feedback on the instructor, peer, and self levels</p> <p> Some use of metacognitive instructional strategies to help instructors</p>	<p> Poor use of formative assessment to evaluate and improve learning</p> <p> Poor use of feedback on the instructor, peer, and self levels</p> <p> Poor use of metacognitive instructional strategies to help instructors assist students</p>	Does NOT use effectively or is not a related activity	= ____

Pedagogical Implementation Model



**MOVING LEARNING
SCIENCES RESEARCH
INTO THE CLASSROOM**

DESCRIPTION

According to Fullan & Langworthy (2014), “the foundation of [instructor] quality is [an instructor’s] pedagogical capacity—their repertoire of teaching strategies and their ability to form partnerships with students in mastering the process of learning” (p.3).

The Pedagogical Implementation Model LDP addresses the aspects of learning sciences researched implementation practices that are within an instructor’s purview. The model provides examples of how product teams may utilize these implementation practices to bolster their product implementation. The LDP presents research that addresses four components of implementation; delivery, communication, assessment, and specific areas of focus.

CAPABILITIES

- Cognitive Tools: Synchronous social learning: text based
- Cognitive Tools: Peer review
- Management: Group formation

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Just-in-time instructor implementation tips
- Simple Technology: Elaboration of instructor-learner communication methods
- Content Support: Learning science based areas of focus

LEARNER IMPACTS

- Attitudes
- Behavior
- Motivation

Pedagogical Implementation Model

SELF-ASSESSMENT INSTRUMENT



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong leverage of a repertoire of teaching strategies	Some leverage of a repertoire of teaching strategies	Poor leverage of a repertoire of teaching strategies	Does NOT use effectively or is not a related activity	= ____
	Strong support for instructor to form partnerships with students in mastering the learning process	Some support for instructor to form partnerships with students in mastering the learning process	Poor support for instructor to form partnerships with students in mastering the learning process		
Model	Strong application of the pedagogical implementation model	Some application of the pedagogical implementation model	Poor application of the pedagogical implementation model	Does NOT use effectively or is not a related activity	= ____
	Strong application within the levels of the pedagogical implementation model • Delivery methods • Instructor-learner communication • Assessment strategy • Area of focus	Some application within the levels of the pedagogical implementation model • Delivery methods • Instructor-learner communication • Assessment strategy • Area of focus	Poor application within the levels of the pedagogical implementation model • Delivery methods • Instructor-learner communication • Assessment strategy • Area of focus		
Design	Strong contextual consideration for different delivery methods, such as online, face to face, and hybrid	Some contextual consideration for different delivery methods, such as online, face to face, and hybrid	Poor contextual consideration for different delivery methods, such as online, face to face, and hybrid	Does NOT use effectively or is not a related activity	= ____
	Strong use of communication-oriented activities to support student performance	Some use of communication-oriented activities to support student performance	Poor use of communication-oriented activities to support student performance		
	Strong balance between instructor's managerial, social, instructive, and technical roles	Some balance between instructor's managerial, social, instructive, and technical roles	Poor balance between instructor's managerial, social, instructive, and technical roles		
Assessment	Strong emphasis on feedback as the purpose of assessment	Some emphasis on feedback as the purpose of assessment	Poor emphasis on feedback as the purpose of assessment	Does NOT use effectively or is not a related activity	= ____
	Strong use of assessment at multiple points throughout the learning process	Some use of assessment at multiple points throughout the learning process	Poor use of assessment at multiple points throughout the learning process		
	Strong application of formative and summative assessment	Some application of formative and summative assessment	Poor application of formative and summative assessment		
	Strong use of multiple measures, peer evaluation, rubrics, and exemplars, where appropriate	Some use of multiple measures, peer evaluation, rubrics, and exemplars, where appropriate	Poor use of multiple measures, peer evaluation, rubrics, and exemplars, where appropriate		

Learning Strategies



MOVING LEARNING SCIENCES RESEARCH INTO THE CLASSROOM

DESCRIPTION

Learning strategies are the intentional use of one or more cognitive processes to accomplish a particular learning task. Tools and capabilities can be used to apply learning strategies appropriately and consistently. Research indicates that learners need to be able to determine the appropriate way of cognitively processing the material to be learned (Ormrod, 2012).

Research shows that learners who can apply learning strategies effectively

- Are less likely to drop out of online courses
- Are more likely to increase levels of self-efficacy
- May increase their levels of comprehension
- May improve their test scores
- May improve their GPA

Issues arise because learners do not always know

- How to apply a learning strategy
- What learning strategy to apply
- When to apply the learning strategy

The Learning Strategies LDP presents research by Ormrod; Lee, Choi, & Kim; Mueller & Oppenheimer, and others to illustrate seven specific learning strategies that may have an impact on learners, discussing when and how these strategies can be applied in a digital environment.

CAPABILITIES

- Instruction: Multimedia active reading
- Cognitive Tools: Annotating/highlighting
- Cognitive Tools: Flashcard and concept map creation
- Assessment: Open ended assignment (single step)

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Digital calendaring, concept maps, and constructed flashcards
- Simple Technology: Highlighting, notetaking, underlining
- Content Support: Objectives, content headings, key terms/vocabulary

LEARNER IMPACTS

- Behavior
- Self-regulation
- Motivation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	<p> Strong encouragement of multiple strategy use by learners during the educational process</p> <p> Strong use of appropriate tools and capabilities to support learning strategies</p>	<p> Some encouragement of multiple strategy use by learners during the educational process</p> <p> Some use of appropriate tools and capabilities to support learning strategies</p>	<p> Poor encouragement of multiple strategy use by learners during the educational process</p> <p> Poor use of appropriate tools and capabilities to support learning strategies</p>	<p> Does NOT use effectively or is not a related activity</p>	= ____
Model	<p> Strong consideration of information processes through information processing theory (IPT) theory</p> <ul style="list-style-type: none"> • Sensory memory • Working memory • Long-term memory <p> Strong support for self-regulated learning (SRL) processes</p> <ul style="list-style-type: none"> • Planning • Monitoring • Regulating • Reflecting 	<p> Some consideration of information processes through IPT theory</p> <ul style="list-style-type: none"> • Sensory memory • Working memory • Long-term memory <p> Some support for SRL processes</p> <ul style="list-style-type: none"> • Planning • Monitoring • Regulating • Reflecting 	<p> Poor consideration of information processes through IPT theory</p> <ul style="list-style-type: none"> • Sensory memory • Working memory • Long-term memory <p> Poor support for SRL processes</p> <ul style="list-style-type: none"> • Planning • Monitoring • Regulating • Reflecting 	<p> Does NOT use effectively or is not a related activity</p>	= ____
Design	<p> Strong use of scaffolding to align learner capabilities with activities</p> <p> Strong incorporation of learning strategy opportunities across activities</p> <ul style="list-style-type: none"> • Time management • Elaboration • Note taking • Identifying information • Summarizing • Comprehension monitoring • Mnemonics <p> Strong use of writing prompts to facilitate strategy use</p> <p> Strong use of scheduling to facilitate time management</p>	<p> Some use of scaffolding to align learner capabilities with activities</p> <p> Some incorporation of learning strategy opportunities across activities</p> <ul style="list-style-type: none"> • Time management • Elaboration • Note taking • Identifying information • Summarizing • Comprehension monitoring • Mnemonics <p> Some use of writing prompts to facilitate strategy use</p> <p> Some use of scheduling to facilitate time management</p>	<p> Poor use of scaffolding to align learner capabilities with activities</p> <p> Poor incorporation of learning strategy opportunities across activities</p> <ul style="list-style-type: none"> • Time management • Elaboration • Note taking • Identifying information • Summarizing • Comprehension monitoring • Mnemonics <p> Poor use of writing prompts to facilitate strategy use</p> <p> Poor use of scheduling to facilitate time management</p>	<p> Does NOT use effectively or is not a related activity</p>	= ____
Assessment	<p> Strong alignment between learning design, learning strategy expectations, and assessments</p> <p> Strong use of learners' strategy artifacts as part of performance assessment, feedback, and remediation</p>	<p> Some alignment between learning design, learning strategy expectations, and assessments</p> <p> Some use of learners' strategy artifacts as part of performance assessment, feedback, and remediation</p>	<p> Poor alignment between learning design, learning strategy expectations, and assessments</p> <p> Poor use of learners' strategy artifacts as part of performance assessment, feedback, and remediation</p>	<p> Does NOT use effectively or is not a related activity</p>	= ____

21st Century Skills



**MOVING LEARNING
SCIENCES RESEARCH
INTO THE CLASSROOM**

DESCRIPTION

21st century learning is focused on helping learners develop the broad set of knowledge, skills, work habits, and character traits necessary to succeed in the 21st century. A 2013 Pearson Foundation study found that students with high 21st century skill development are twice as likely to have higher work quality compared to those who had low 21st century skill development. Several 21C Skills frameworks exist, but all emphasize the importance of non-cognitive skill development (i.e. collaboration, communication, creativity, and critical thinking).

The Partnership for 21st Century Skills (P21) suggests incorporating these six key design elements to foster 21st century learning:

1. Emphasize core subjects
2. Emphasize learning skills
3. Use 21st century tools to develop learning skills
4. Teach and learn in a 21st century context
5. Teach and learn 21st century content
6. Use 21st century assessments that measure 21st century skills

CAPABILITIES

- Cognitive Tools: Synchronous social learning: text based
- Cognitive Tools: Bibliography/citation
- Cognitive Tools: Planning/outlining
- Cognitive Tools: Timestamped video comments

SAMPLE DESIGN IMPLEMENTATIONS

- Robust Technology: Collaborative scenario-based games/simulations
- Simple Technology: Learner-created videos
- Content Support: Inclusion of open-ended or ill-structured tasks

LEARNER IMPACTS

- Attitudes
- Behavior
- Self-regulation



Principle Criteria	Integration (4-5 points)	Exploration (2-3 points)	Consideration (1 point)	Not Applicable (0 Points)	Total Points
Definition	Strong support of key 21st century skills, including collaboration, digital literacy, critical thinking, and problem solving	Some support of key 21st century skills, including collaboration, digital literacy, critical thinking, and problem solving	Poor support of key 21st century skills, including collaboration, digital literacy, critical thinking, and problem solving	Does NOT use effectively or is not a related activity	= ____
Model	Strong use of an evidence-based model to guide learning design, such as P21, ISTE, ETS	Some use of an evidence-based model to guide learning design, such as P21, ISTE, ETS	Poor use of an evidence-based model to guide learning design, such as P21, ISTE, ETS	Does NOT use effectively or is not a related activity	= ____
Design	Strong application of the Three Rs (reading, writing, arithmetic) in learning activities	Some application of the Three Rs (reading, writing, arithmetic) in learning activities	Poor application of the Three Rs (reading, writing, arithmetic) in learning activities	Does NOT use effectively or is not a related activity	= ____
	Strong application of the Four Cs (collaboration, communication, creativity, critical thinking) in learning activities	Some application of the Four Cs (collaboration, communication, creativity, critical thinking) in learning activities	Poor application of the Four Cs (collaboration, communication, creativity, critical thinking) in learning activities		
Assessment	Strong use of an evidence based assessment framework to guide learning design, such as CWRA, PISA, Key Stage 3	Some use of an evidence based assessment framework to guide learning design, such as CWRA, PISA, Key Stage 3	Poor use of an evidence based assessment framework to guide learning design, such as CWRA, PISA, Key Stage 3	Does NOT use effectively or is not a related activity	= ____
	Strong triangulation through multiple assessment measures	Some triangulation through multiple assessment measures	Poor triangulation through multiple assessment measures		
	Strong use of complex tasks in authentic contexts	Some use of complex tasks in authentic contexts	Poor use of complex tasks in authentic contexts		

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