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The Application of the Learning Sciences to the Design and Delivery of Student-Centered Learning Activities

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Handbook of Research on Student–Centered Strategies in Online Adult Learning Environments

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Chapter 21

The Application of the Learning Sciences to the Design and Delivery of Student-Centered Learning Activities

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ABSTRACT

The goal of this chapter is to provide a framework for creating student-centered learning activities that rest on a firm theoretical foundation and are based on a definition that highlights the actual learner abilities involved in successful student performance. To achieve this goal, it is important to establish a definition of student-centered learning that can be used to guide the selection of the important pedagogical elements that must be addressed in the design of student-centered learning activities. Having established these foundational elements, the chapter provides a framework for the design of case-based instruction that incorporates teaching and learning principles derived from theory and research in the learning sciences.

INTRODUCTION

Creating the conditions for and the skills of effective adult reasoning and the disposition for transformative learning - including critical reflection and dialectical discourse - is the essence of adult education and defines the role of adult educator. Jack Mezirow (2009 p. 22)

The great educator, E.L. Boyer (1997), in his *Scholarship Reconsidered*, provided a perspective on the goal of teaching that can serve as a description of the goals of student-centered learning. Boyer stated, "...create a common ground of intellectual commitment...[and] stimulate active, not passive, learning and encourage students to be critical, creative thinkers, with the capacity to go on learning after their college days are over" (p. 24).

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There are many perspectives on student-centered learning and it is possible to develop an extensive set of characteristics derived from the literature. A report by Attard, Di Ioio, Geven and Santa (2010) titled *Student-centered Learning: An Insight into Theory and Practice* produced for the European Student Union, states the need for a student-centered focus in European education and draws a contrast between what they call conventional (traditional) and student-centered learning practices. Table 1 contrasts some of the elements of conventional instruction and the delivery of student-centered learning.

In their overview of the need for a student-centered approach to education in Europe, Attard, et al. cite MacLellan and Soden (2004, p. 254) who describe conventional instruction as “lecturing, note-taking, and memorising information for later recognition or reproduction.” They cite MacHemer and Crawford (2007, p. 11) who show that in contrast to the passive learning in conventional instruction, the student-centered learning experience is active, as it is based on the premise that “student passivity does not support or enhance ... learning” and that it is precisely “active learning” which helps students to learn independently.

Attard’s et al. list suggest that student-centered learning activities should:

1. Produce student engagement
2. Explicitly target higher-level cognitive and metacognitive strategies
3. Require cooperation and opportunities for social learning
4. Assist students in becoming autonomous and self-regulated learners

Others such as Costa (2013) have focused on student empowerment as a critical goal of student-centered learning and lists five important characteristics of student-centered learning that might produce student empowerment.

The five key characteristics are:

1. The balance of power: faculty do not make all the choices;
2. The development of student metacognition, such as self-awareness as a component of course content;
3. The role of the teacher as facilitator of learning rather than a transmitter of knowledge;
4. Increased student participation and responsibility for learning, and
5. The purpose and processes of evaluation, to providing constructive feedback and to assisting with overcoming individual difficulties.

More recently, the focus of attempts to characterize student-centered learning has shifted to engagement. For instance, the Yerevan Communiqué (2015), that summarized the main points of educational planning at the Ministerial Summit of the European Higher Education Area, stated in part: “student-

Table 1. Comparison of conventional instruction and student-centered learning

Conventional Instruction	Student Center Learning
1. Students as passive recipients of information 2. Teaching what to think 3. Competition for grades 4. Lecture and note-taking 5. Teaching for memorizing, recognition or reproduction	1. Helping students become active processors of information 2. Showing students how to think 3. Cooperation in learning activities 4. Active learning with activities that allow for comparison of ideas questions and reinforce inquisitiveness 5. Support for self-regulated learning

centered learning and teaching plays an important role in stimulating students' motivation, self-reflection and engagement in the learning process.”

Student engagement has been the focus of large-scale assessment and instructional projects in the United States (Kuh, 2001) and the United Kingdom (Trowler & Trowler, 2011) for some time and has been defined as “the investment of time, effort and other relevant resources by both students and their institutions to optimize the student experience and enhance learning outcomes and development of students, and the performance and reputation of the institution” (Trowler & Trowler, 2011).

Klemenčič (2015), in a review of much of the work of the European Higher Education Area has suggested that the student-centered learning concept “remains poorly defined in policy documents and this ambiguity potentially jeopardizes its implementation.” In her critique, Klemenčič questions the suitability of many of the characterizations of student-centered learning because they focus more on student actions and outcomes.

Klemenčič's main argument is that these characterizations of student engagement focus more on student behavior and student actions but not the more fundamental concept of student capabilities that are important to inform those who wish to implement student-centered learning in their instructional endeavors. In Klemenčič's critique she states that student agency needs to be a central focal point of student-centered learning with a focus on student autonomy, self-regulation, and choice as critical student abilities.

Klemenčič's (2015, 2017) characterization of student agency is comprised of two general capabilities: student efficacy and student self-regulation. Self-efficacy is defined as a personal judgment of “how well one can execute courses of action required to deal with prospective situations” (Bandura, 1982). According to Bandura self-efficacy is gained through

- Performance accomplishments (Past experience)
- Vicarious Experience (Modeling by others)
- Social Persuasion (Coaching and evaluative feedback)
- Physiological and emotional states

High self-efficacy has been identified with a number of positive attributes (Schunk & Pajares, 2001) important for successful learning including:

- A high motivation to master difficult tasks which they see as achievable goals to be mastered
- An ability to overcome failures and difficulties on their way to achieving a learning goal. Unlike those with low-efficacy who will tend to give up when challenged, they will look for new information and increase their efforts to attain the goal
- Those with high self-efficacy will set higher goals and strive to meet those goals which actually enhances their self-efficacy
- High self-efficacy in learners has been associated with increased effort, persistence, goal setting and higher performance

Researchers in the learning sciences have defined self-regulated learning (Zimmerman, 2011; Azevedo, Johnson, Chaunce & Graesser, 2011) as metacognitive processes which are used in monitoring and controlling cognitive processes such as memory in efforts to learn. Metacognition is essentially, thinking about thinking. That is, when a student needs to solve a problem, they may think about the

problem before they start to analyze it in terms of problems they have solved before. While solving the problem they may monitor their work to evaluate whether or not they are on the right track, or if they need to consult more resources to gain information. After they finish, they may evaluate their results to determine if they are within an acceptable range or if they made logical sense.

Topics learners address as they elicit metacognitive process in self-regulated learning include:

- Conditions that affect learning (conditional knowledge),
- Setting goals and designing plans predicted to reach them,
- Tracking how plans unfold as a task is engaged and diagnosing faults, and
- Making adjustments as a task unfolds and for future engagements in similar learning tasks (Winne & Azevedo, 2014; Azevedo, Johnson, Chauncey, & Graesser, 2011)

Student identity has also been considered in the study of student agency. Identity development has been considered from the standpoint of education as a socialization process focused on the inculcation of student attitudes, values, and beliefs important in the various disciplines (Lave & Wenger, 1991; Collins & Kapur, 2015). Others (Benner & Sutphen, 2007; Biestra, 2008) have sought to augment the traditional definition of identity by evoking the concept of the developing habitus from the work of Bourdieu (1990). Habitus or habits of practice are said to guide practice on a less conscious level than beliefs, values, and attitudes. The developing habitus comes to define the student's habits of practice and although they do not operate at a conscious level they guide the learner's or practitioner's activities. The skills and actions guided by the unconscious habitus actually shapes and frames the perceptions and approaches to activities in the discipline. Taken together with attitudes, values, and beliefs, the skilled practice of habitus can actually enhance the perception of events in practice and provide a constantly improving frame of reference (Benner & Sutphen, 2007).

According to Klemenčič (2015), "The notions of agentic possibility and orientation are temporally embedded, implying that they are shaped through considerations of past habits of mind and action, present judgments of alternatives for action, and projections of the future. They are also intrinsically relational and social, and situated in structural, cultural and socio-economic-political contexts of action" (2015, p. 3).

If so, the focus of work with student-centered learning is the development of student agency, which means educators should provide instructional activities that assist students to become more independent, confident and reflective learners and at the same time help students develop an identity of a successful learner and the habitus of an effective and reflective professional.

The basic premise of this chapter is that student-centered learning activities designed to produce student agency must deliver instruction in a way that integrates knowledge, cognitive, and applied skills and professional comportment. This type of student-centered learning requires a unique pedagogical approach with a sound theoretical foundation.

It is the aim of this chapter to provide a conceptual framework that will guide the design of a student-centered teaching approach that focuses on enhancing student agency. This chapter will provide an overview of a relevant theoretical perspective; situated learning that is derived from the learning sciences and addresses the development of student agency. Within this framework situated learning and other relevant pedagogical methods such as cognitive apprenticeship, transformative learning theory, and case-based learning will be presented as pedagogies that can produce student agency.

BACKGROUND

The Situated Learning Perspective

In the last two decades, many learning scientists have shifted their studies from a focus on the individual's cognitive processes and learning to a broader conception of thinking and learning as social activities more in line with Vygotsky's (1978) ideas about the social nature of learning. Learning scientists with this sociocultural perspective focus on the social nature of learning and thinking and many make the claim that all learning and thinking is situated in and tied to social contexts. Rather than focusing on the learning processes of individuals, learning scientists with this sociocultural perspective focus on activity systems and communities of practice and investigate learners' interactions and patterns of participation in the activities of the system. According to this perspective, learning and cognition are thought to be the products of activity occurring in situations or communities of practice and knowledge, learning and thinking are distributed among the members and elements of these communities (Greeno & van de Sande, 2007).

The work in situated learning stresses two issues. First, teaching methods need to express explicitly expert's mental processes and strategies used in solving problems in a subject domain and domain knowledge is always taught in service of carrying out of actual tasks rather than as isolated, decontextualized knowledge. Second, the situated learning approach focuses on both cognitive and metacognitive skill development (Collins & Kapur, 2015; Collins, Brown, & Newman, 1987)

Situated learning theory, or what Greeno (1997) has called the situative perspective, views learning and cognition as distributed over activity systems and communities of practice rather than residing strictly in the mind of individuals. The situative perspective looks at learning, cognition, motivation, and achievement as social activities (Turner & Nolen, 2015) and applies the sociocultural view to research into classroom learning that examines:

- How learning is constituted in the classroom
- The role of student identity in learning
- The nature and consequences of discourse
- Materials used in the classroom

Greeno and van de Sonde (2007) have outlined the main issues in situated learning as it applies to education. Their main points include:

- Knowledge and cognition are distributed among individuals who interact within a social system
- Knowledge and cognition function as a capability for participating in activity systems
- Learning is a change in participation and positive learning is a change in the direction of more full, active participation

It is important to understand that learning in the situative perspective is considered to be a positive improvement in participation in the activities of the learning community, which in turn contributes to the development of the student's identity as a member of the learning community (Anderson, Greeno, Reder, & Simon, 2000). From the situative learning perspective then, teaching is a matter of guiding students to understand the nature of affordances in their specific learning communities and helping them develop

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the abilities to make use of them as well as the right intentions to motivate their use. Learning becomes a matter of developing abilities to both recognize and use affordances in the learning environment.

As students become more adept at recognizing and using relevant learning affordances they participate more in learning activities and begin to develop a professional identity which, from the situative perspective is defined as, “One’s participation in and across activities and the sense one makes of oneself in relation to these activities” (Hand & Gresalfi, 2015). In these descriptions of situated learning theory, we can see that it addresses student self-efficacy, the social aspects of learning, and the development of student identity, all elements of student agency.

To address these situated learning pedagogical elements in student-centered learning one needs to design learning activities that incorporate notions of the social nature of thinking and learning, important social aspects of discourse, and guidance for the development of an appropriate learning identity. The situative perspective can inform student-centered education by providing guidance on how to assist students to recognize relevant learning affordances and develop the abilities and intentions to find and use them. Pedagogical elements derived from research in situative learning (Greeno, 1992; Greeno & van de Sande, 2007; Gresalfi & Cobb, 2011) include: the social nature of cognition and learning; affordances and constraints in discourse; and an activity-based concept of identity development.

Herrington & Oliver (2000) conducted an extensive literature review to identify the elements crucial to a situated learning design that can provide more insight into the specific pedagogical elements of situated learning and enhance student agency:

1. Provide authentic contexts that reflect the way the knowledge will be used in real life
2. Provide authentic activities
3. Provide access to expert performances and the modeling of processes
4. Provide multiple roles and perspectives
5. Support collaborative construction of knowledge
6. Promote reflection to enable abstractions to be formed
7. Promote articulation to enable tacit knowledge to be made explicit
8. Provide coaching and scaffolding by the teacher at critical times
9. Provide for authentic assessment of learning within the tasks

More specific guidance about the nature of pedagogies that can help develop student agency have been provided by Benner and her colleagues (2007, 2010; Mclean & Pasupathi, 2012; Foster, Dahill, Goleman & Tolentino, 2006).

According to Benner and Sutphen (2007) teaching should address the knowledge and skills that students will need to be agentic professionals who are:

- Integrative when problem-solving which requires the ability to combine knowledge, skill, and moral judgment
- Reflective which requires the ability to examine and assess one’s own performance
- Context-dependent which is a relationship between ability, the task or problem, and the nature of the current environment
- Flexible problem solvers that use reasoning in transition as elements of the environment change during problem-solving

Benner and her colleagues (2007, 2010), for instance, have called for education for agency that focuses on the following:

- **Contextualization:** Teaching knowledge and skills separately or in a decontextualized manner produces fragmented educational experiences. Students should be taught in an environment where knowledge and thinking are situated and action applied in a particular context. Faculty members must provide linkages between the discipline knowledge and the use of that knowledge in the practice setting.
- **Authentic Learning Experiences:** Typical classroom teaching situations involve impoverished settings that do not approximate the dynamic real-world environment and many assessments focus in on fine-grained or elementary competencies. Students need instruction and assessment using instructional materials that approximate real-world settings encompassing a diverse set of discipline-related situations
- **Multiple Ways to Think:** A singular focus on teaching scientific and critical thinking skills often results in a cynicism and a habitual critique of methods being taught. Scientific and critical thinking need to be augmented with other ways of thinking such as the ability to reason through the trajectory of a developing business situation and that integrate situational needs and the student's own life experience
- **Formation of Professional Identity:** Educators should transition from a focus on socialization and role-taking to an emphasis on the formation of a professional identity which supports reflective practice

Pedagogies for Agency

Student-centered learning that aims to produce self-efficacious, self-reflective, and self-regulating students should be delivered by instructional methods that address the abilities that contribute to agentic action as outlined by Benner and her colleagues (2007, 2010).

Pedagogies of Interpretation

Producing self-efficacy in student agency calls for a contextualized interpretation informed by the ability to filter the practices and theory of a discipline through personal experiences and consider the unique nature of the elements that make up the current situation under examination (Benner & Sutphen, 2007). Students must develop a certain level of critical interpretation to be able to analyze situations and the methods they use and although this type of interpretation is not bad in itself, it can cause the student to become overly critical or analytical of what is being taught and may leave the practitioner with restricted forms of action. Instead students need to be prepared to reflect critically on their profession's best practices, theories, and techniques but still maintain a solid foundation that allows them to act and practice in a self-reflective way that is situated on the current situation.

Foster, et al. (2006) have characterized this contextualized interpretation as passionate engagement which refers to a type of performance that integrates the ability to situate learning and practices within one's own experience and world view, a contextual awareness of the critical elements of the situation, and the knowledge of best practices in the profession. The pedagogy of interpretation requires experiential

learning and integrative learning experiences that combine knowledge of theories and techniques so that students will have a repertoire of experiences to bring to bear on the professional situations they face.

Pedagogies of Contextualization

Much of what is taught in educational institutions is general and not necessarily linked to any specific situation. But research in the learning sciences (Nathan & Sawyer, 2015) points out that knowledge and cognition are situated and therefore practice must be adapted to the given context. Problem solving in practice is practical reasoning and requires that the practitioner select the elements of professional knowledge most relevant to the given context. Again, there is an interactive element to reasoning in context and it requires a more self-reflective, personal demeanor than if one were viewing the situation from a decontextualized, scientific perspective that tends to objectify situations and participants.

According to Brookfield and Hess (2008) the pedagogies of contextualization help students to:

- Develop a consciousness of the context,
- Participate constructively in their encounters with contexts, and
- Engage in social and systemic change

Pedagogies of Formation

An important aspect of student agency, habitus or habits of practice, are said to guide practice on a less conscious level than beliefs, values, and attitudes (Bourdieu, 1990). The developing habitus comes to define the learner's habits of practice and although they do not operate at a conscious level they guide the student's activities. The skills and actions guided by the unconscious habitus actually shapes and frames perceptions and approaches to practice.

Unlike the traditional methods of socialization, which might be communicated didactically, habitus develops through activity and as the skills of the discipline are learned they create a keener focus and enhance abilities to make finer and finer distinctions. Therefore, habitus or habits of practice are an interactive process whereby a new identity is formed so that students begin to act like contributing members of the discipline. Note that there is a social aspect to the development of habitus because this development requires activity and activity in most disciplines requires interaction with other practitioners and other people. Formation can be built into instruction by providing students with opportunities to reflect on practices during learning activities with the aim of producing practitioners who continually refine his or her abilities of discernment.

Pedagogies of Performance

A strictly scientific or analytic perspective may lead students to believe they can practice unconnected to others in the professional situation if they are just analytical enough. Professional action is situated but in the sense that the professional must interact with others in the course of the performance of his or her duties. Performance is where a professional integrates what has been gained from pedagogies of interpretation, formation and contextualization. Performance is embodied theory put in practice.

Thus far, this chapter has addressed how the situated learning perspective and pedagogies derived from that perspective can address the development of student agency, generally. In the next section more specific techniques for addressing self-efficacy, self-regulation, and student identity are presented.

The Social Nature of Cognition and Learning

Based on principles of situative learning, student-centered education can employ social learning techniques that make implicit the cognitive and metacognitive aspects of expert performance. Focusing on the social aspects of learning in activities such as discussion and development of a learner's identity can help to develop the self-efficacy and self-regulation components of student agency.

Aspects of Discourse

Faculty can help students develop the appropriate intentions and abilities to identify important learning affordances in discussions (Greeno & van de Sande, 2007) including:

- Informational affordances and constraints such as shared schemata and rules for concept development
- Affordances and constraints that guide discussion such as levels of evidence that are expected or required for mutual understanding and for considerations that are relevant in negotiating the contents of contributions
- Individual positioning and the effect of constraints and affordances that are available or withheld based on one's position in the community of learning.

IDENTITY

Hand and Gresalfi (2015) have defined identity from a situative perspective in terms of activities and the "sense one makes of oneself in relation to these activities" and derived a number of characteristics of identity derived from the situative perspective. These include beliefs that:

- Identities or relationships that students develop in relation to a particular activity are directly related to and mediated by the features and affordances of the activity
- Identities can be affected by expectations as to their entitlements and expectations about participation in interaction
- Positioning in the community of learning corresponds to regularities in the ways that students are expected and entitled to participate in interaction (Gresalfi & Cobb, 2011; Holland et al., 1998)

The Development of Contextualized, Integrative Thinking

The student-centered perspective on learning and cognition was informed by the earlier anthropological study of apprenticeship. Lave (1988) and later Lave and Wegner (1991) studied traditional apprenticeship learning and training in authentic settings and established a set of principles for learning in authentic

contexts that laid the theoretical groundwork for studying cognition in practice or what has been called situated cognition.

In Lave and Wenger's work it was found that apprentices start out working on small pieces of the final product with assistance from the experts and advance to more difficult tasks and products that successively approximate the final product. Because they learn in context, apprentices have access to experts who provide both modeling and coaching and offer examples of both finished products and work-in-progress. Through observation of the experts' successful techniques (and also the errors of other apprentices) apprentices can create internal models of the final product, which they can use to guide their developing skills. A basic tenet of Lave and Wenger's theory of situated cognition (1991) is that the interaction of observation, coaching, and scaffolding provided by the expert and the increasingly skilled performance of the apprentice allows the apprentice to shape a productive mental model that can guide their work.

Cognitive Apprenticeship: Developing Self-Regulated Learning

Alan Collins and his colleagues (Collins and Kapur, 2015; Collins, Brown and Newman, 1987), and others extended Lave and Wegner's (1991) characterizations of apprenticeship and situated cognition and applied them to attempts to improve teaching by focusing on cognitive skills in school subjects such as math, reading, and writing. The offshoot of Collins et al. (2006) work was the establishment of a set of principles for what they called "cognitive apprenticeship" or the application of apprentice learning to the teaching of cognitive skills in applied settings.

The term cognitive apprenticeship was used to stress two issues. First, as with traditional apprenticeships, teaching methods attempt to express explicitly expert's mental processes and strategies used in solving problems in a domain such as math or reading, and domain knowledge is always taught in service of carrying out of actual tasks rather than as isolated, decontextualized knowledge. Second, although cognitive apprenticeship teaching uses the same modeling, coaching, and scaffolding techniques as traditional apprenticeships, the focus is cognitive and metacognitive skill development (Collins and Kapur, 2015; Collins, Brown and Newman, 1987).

Collins, Brown, and Holum (1991), using the principles of apprenticeship derived from Lave and Wenger (1991) and their own previous work, outlined a cognitive apprenticeship instructional methodology comprised of:

1. Modeling,
2. Coaching,
3. Scaffolding,
4. Articulation,
5. Reflection, and
6. Exploration.

In their methodology, modeling, coaching, and scaffolding are social learning methods that are used to help students develop the cognitive and metacognitive skills that are the targets of cognitive apprenticeship. Modeling is the technique of learning from observing expert performance, coaching is where the expert provides feedback to guide the development of expert performance, and scaffolding is the technique of providing support for performance at first but then fading that support until which time the learner can successfully perform the task without support.

The next two methods are articulation, where the instructor aims to encourage the students to express their knowledge or strategies, and reflection, which is a comparison of the student's critical processes and those of the expert. Exploration, the last technique in cognitive apprentice instruction, is an attempt to move the student to independently execute expert problem solving and to seek out and define new problems that can be solved with the newly acquired skills and strategies.

Collin's research (1991) led to further work in situated cognition and the establishment of a set of characteristics for learning environments conducive to the teaching of cognitive skills. According to Collins et al (1991), "Situations might be said to co-produce knowledge through activity. Learning and cognition, it is now possible to argue, are fundamentally situated" (p 32). The idea that learning in context produces knowledge through activity points the way to a new pedagogy for producing student-centered learning environments where knowledge and skills are blended together in service of skilled practice.

Learning in Context

In the conception of learning environments adhering to cognitive apprenticeship principles (Collins, Brown and Newman, 1987; Mims, 2003; Lombardi, 2007; Ryman, Burrell, Hardham, Richardson & Ross, 2009) there is an emphasis on the need to address the direct instruction of cognitive and metacognitive skills using apprenticeship techniques as described by Lave and Wenger (1991), and also to incorporate a set of contextual elements. They called these types of learning environments cognitive apprenticeships and suggested that they include the following design elements:

- Situated learning
- A culture of expert practice
- Intrinsic motivation
- Exploitation of cooperation

Situated Learning

A learning environment in support of student-centered learning can be a situated learning environment just by dint of integrating learning activities where students practice and apply knowledge and skilled know-how within a domain or context related to the discipline they are studying. Activity-based learning such as case-based or problem-based learning coupled with discussions can provide affordances for learning in context or situated learning. To make a learning environment student-centered the learning activities should allow for social learning such as discussions and group activities and provide opportunities for learning of cognitive and metacognitive skills along with content knowledge.

Culture of Expert Practice

Student-centered learning environments for cognitive apprenticeship provide affordances for students to observe and hopefully mimic expert performance. To incorporate a culture of expert practice while at the same time allowing students to develop an identity as a member of the learning community, educators must be able to draw upon students' real-world experiences and classroom learning and allow for them to be integrated into online discussions and activities. The learning system must allow faculty to

integrate videos and learning materials that demonstrate effective practitioners at work and must structure discussions and other discourse activities to support both expert modeling and coaching.

A culture of expert practice allows students to observe not just experts, but other apprentices at work providing access to a range of skill levels and a diversity of expert performance leading to an understanding that there are different paths leading to the achievement of the final product. Providing students with access to expert performance and providing affordances for discussion and reflection allows faculty to make both the observable and tacit aspects of expert performance visible to students creating an environment that addresses the high-end cognitive apprenticeship of thinking like an expert. Related group work can also bring successful problem-solving strategies and skills out in the open for all students to observe and from which to learn.

Exploitation of Cooperation

Learning environments that are based on social constructivist learning principles are able to exploit benefits of cooperation (Collins & Kapur, 2006; Collins, Brown and Newman, 1989). Just as students can benefit from affordances of a situated learning environment that allows them to use the environment as a scaffold for problem-solving, groups provide similar scaffolding support because a range of skills and expertise can be found within the members of the group and can provide each student with access to expertise they might not yet possess. Group activities such as role playing or dividing up various pieces of a problem and putting them together can provide opportunities for each student to observe and play a variety of roles. Cooperative problem solving can provide a range of social learning opportunities such as modeling that help make those elements of expertise and effective problem-solving strategies transparent that were once opaque. In their initial work they also included exploitation of competition in their list but Collins (2006) later stated that competition should not be stressed in situated learning environments.

Adopting the Apprenticeship Approach for Student-Centered Learning

The Carnegie Foundation (2007) in their studies that identified the important components of professional education created a method for integrating cognitive and metacognitive skills along with domain knowledge by focusing on what they called cognitive apprenticeships. In student-centered learning it is important that learning activities provide affordances for learning both knowledge and skills in an integrated fashion. But another aspect of student-centered learning is the development of identity, which requires learning to think like a professional in a given discipline.

The Carnegie studies produced a series of reports that stressed the need to address three high-level sets of skills and knowledge they called apprenticeships. The Carnegie studies identified three dimensions, which they labeled high-end apprenticeships:

- A knowledge apprenticeship that includes teaching the academic knowledge base and habits of mind important in a given discipline of study
- A skill-based apprenticeship that relates to practice in the discipline, and includes professional judgment
- An ethical practice apprenticeship that addresses development of ethical standards, ethical comportment, social roles, and responsibilities of the professional in a given discipline.

The last apprenticeship for ethical practice relates to the need to help students develop reflective thinking in a way that integrates the knowledge, skilled-know-how, and the discipline's traditions and standards of practice (Benner & Sutphen, 2007). This, of course requires an integrated teaching approach rather than one that separates learning into separate teaching domains such as classroom lecture, lab and clinic.

Transformative Learning

Student interaction is a powerful component of a student-centered learning environment so it is important to insure that discussions and other interactive activities are presented in a way that allows for comparison of ideas, questions, cooperation, and support for self-regulated learning as outlined by Attard, et al. (2010). This requires a perspective on learning and a pedagogy that addresses the mechanisms involved in becoming a reflective learner and problem solver. An important perspective on learning that supports the use of cases, problems, and discussions to develop self-regulated learning is Jack Mezirow's transformative learning theory (2003, 1995, 1992), which has been developed over the last several decades.

Mezirow's theory (2003) focuses on learning mechanisms involved in creating perspective change or what has also been called a change in frames of reference. Transformative learning requires an ability to reflect on interactions with others in critical discourse as well as the ability to self-reflect. The goal of transformative learning is to produce more adaptive and efficient frames of reference that allow for engagement in reflective thinking. The unique focus on both mental and educational processes that enhance the ability to reflect and engage in productive discourse makes transformative learning theory particularly relevant to and a powerful pedagogy for student-centered learning.

Faulk and Morris (2012) have outlined the core transformative learning processes needed to produce changes in frames of reference or schemas:

- **Critical Reflection:** The process an individual uses to learn. Critical reflection involves pondering new concepts;
- **Critical Self-Reflection:** The process of questioning personal values, beliefs and assumptions;
- **Critical Dialogue:** The process whereby an individual considers new concepts, how these concepts fit within the personal point of view, and what revisions to personal assumptions, beliefs, or values may be indicated compared to other points of view.

Fetherston and Kelly (2007) provide some guidance on the use of transformative learning and outlined assumptions regarding transformative learning:

1. Transformative learning involves profound shifts in our understanding of knowledge, the world, and ourselves;
2. Reflection is key to the achievement of transformation;
3. Transformation is a process precipitated by experience(s) or information that disrupt current understanding;
4. Teaching for transformation involves creating spaces for critical engagement and dialogue.

Transformative Learning Types

According to Mezirow (2003) the mechanisms of reflection and dialectical discourse are critical elements of transformative learning and the educator's role is to create conditions that encourage students to carry out discourse and reflection. Transformative learning theory has also identified different learning types that Mezirow named instrumental learning and communicative learning.

Instrumental learning is akin to the psychomotor skills learning that are familiar from Bloom's taxonomy and involves some aspect of control over the environment or performance. There is an element of scientific reasoning in this type of learning and empirical testing is used to prove or disprove assertions.

A second type of learning is called communicative learning and is related to our attempts to validate our own beliefs and testing our underlying assumptions. We do this testing "through rational discourse; and striving for decisions through consensus building" (Mezirow & Associates, 2000, p. 3). Communicative learning then, relates to attempts to understand our own beliefs and values but also those of others, and is implicated in the type of reflective thinking that should be the goal for adult education (Illeris, 2017). It also requires a different type of analogical reasoning to evaluate truth as opposed to the scientific reasoning in instrumental learning. Communicative learning, the type that is required for successful personal interactions and especially with group discourse, is at the heart of the transformative learning process (Mezirow, 2009). From a student-centered learning standpoint then, communicative learning can be addressed by the social-learning pedagogy described in this chapter.

Discourse and Critical Reflection

Mezirow (2009) defined the essence of adult education as "the creation of the conditions that produce the skills of effective adult reasoning and the disposition for transformative learning, which includes reflection and dialectical discourse" (p. 22). As the authors have pointed out, critical discourse is the vehicle that educators use to guide students to develop and use critical reflection, a necessary component of transformative learning. Discourse as defined by Mezirow is congruent with the critical social learning issues identified by Collins and his colleagues (2006, 2015). Group activities then, should be incorporated into learning environments to allow students more opportunity to take advantage of social learning methods as well as opportunities for observing those with more and less expertise (Klemenčič, 2015). These student observations along with direct modeling by faculty members will allow for the comparisons and reflection on performance that lead students to create working mental models of various skills and practice situations.

With these reviews of situated, apprentice, and transformative learning theory the critical pieces for a conceptual framework that will guide the design of a student-centered learning environment are in place. The elements of such a design framework will be outlined for educators who wish to develop student-centered activities that can assist students in the development of the elements of self-efficacy, self-regulation, and a student identity that make for a more agentic student.

Producing Transformative, High-level Learning for Agency

Based on a review of work in the learning sciences it should be clear that learning environments must be developed in a way that addresses both domain knowledge and higher levels of learning if they are to be student-centered (Costa, 2013). To do this the design and delivery of student-centered learning

for agency must draw from research in the learning sciences that demonstrates how learning involves sets of overlapping domains of cognitive, metacognitive, and affective processes (Neumann, 2015). Student-centered education must reach beyond the traditional preoccupation with the cognitive domain in learning if educators want to produce students who are agentic. To benefit from recent developments in student-centered learning educators must adopt a more holistic pedagogical framework for developing (and assessing) the various domains of learning and thinking mentioned above. The next section of the chapter will provide guidance on how student-centered learning can be developed to deliver contextualized learning that is critical for the development of transformative, student-centered learning.

RECOMMENDATIONS

The desire to create learning environments with a student-centered approach has led to the need for new theoretical perspectives and new pedagogies. And recommendations that instruction should provide support for a number of high-level cognitive skills and knowledge elements (Harkrider, MacDougall, Bagdasarov, Johnson, Thiel, Mumford, Connelly & Devenport, 2013). By providing direct instruction of cognitive and metacognitive skills a student-centered approach addresses the higher-level skills used by the agentic student we have been discussing. Harkrider, et al advised that instruction should:

- Cover a wide spectrum of cognitive levels
- Incorporate tasks, knowledge, and problem-solving skills learners are likely to encounter and apply in future practice.
- Assess students' knowledge and skills
- Provide specific feedback to students
- Provide expert modeling of problem-solving approaches
- Provide explicit support for comparing and contrasting features, factors, and issues embedded in cases

The creation of student-centered environments then, must provide activities that support active learning through supporting cooperative learning and comparison of ideas. case-based learning that typically involves both individual learning and group discussion has been explored for its potential as a student-centered approach to learning (Avolio, B. (2014); Harkrider, MacDougall, Bagdasarov, Johnson, Thiel, Mumford, Connelly & Devenport, 2013; Shulman, 1992) and has been found to be useful for teaching principles and concepts as well as strategies, dispositions, and habits of mind which are all important components of student agency.

Shulman (1992) has suggested that cases can be said to help teach students to think like a professional in relation to the range of activities that make up professional practice. Basing instruction on this perspective would require a shift from teaching for traditional learning outcomes that focus on concepts and rule-based modes of thinking to one that integrates the elements of the three high-end apprenticeships defined in the Carnegie Report (2007),

- A knowledge apprenticeship that includes teaching the academic knowledge base and habits of mind important in a given discipline of study

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- A skill-based apprenticeship that relates to practice in the discipline, and includes professional judgment
- An ethical practice apprenticeship that addresses development of ethical standards, ethical comportment, social roles, and responsibilities of the professional in a given discipline and focuses on metacognitive strategies and habits of mind.

Applying this perspective to case-based education requires that cases be designed to present a simulated professional context and learning situations that guide students into thinking in an integrated fashion like a member of the profession.

Case-based education typically involves reading of the case material and perhaps notes or summaries as well as class discussions. Although the content and design of the case are important, many people believe that the accompanying discussion is vital to helping students develop critical thinking skills. In earlier work on the role of discussion in case-based learning Schwab (1964) suggested the need for two different levels of discussion that accompany a case analysis. The first level of discussion focuses on the case content where the group generates a number of different alternative perspectives on the case material. The second level of discussion requires the students to be more reflective, using the dialogue and analysis generated in layer one as a second body of material beyond the text itself. This multi-level discourse requires students to cycle between lower level and more sophisticated analysis and reflection on the material and their own thinking about the case and others' perspectives. According to Shulman (1992) the narrative nature of cases may help teachers accomplish transformative teaching that helps students translate abstract, propositional knowledge into more concrete skilled know-how that corresponds to practice.

Bruner's (1990) analysis of thinking also provides relevant perspective to the situated nature of case-based learning. Bruner divided thinking into two modes he labeled paradigmatic and narrative. Paradigmatic thinking about facts, concepts, and principles is general, abstract, and is the type typically addressed in school learning when students are asked to memorize or analyze general knowledge. Narrative thinking by contrast is more specific, contextualized, and more personal. According to Shulman, in memory and knowledge representation research paradigmatic thinking might relate to semantic memory while narrative is more akin to episodic memory. Shulman makes the case that the narrative nature of cases makes them instances of situated cognition as it is defined by Collins (2006) and his colleagues and also can be seen as a form of apprentice learning as defined by Lave and Wagner (1991) and her colleagues.

According to Shulman (1992) a case-based pedagogy may capitalize on the strength of situated cognition because:

- The character of the case's narrative form may be particularly well suited to a situated learning process.
- Learners may find it far easier to remember and use ideas that are located in the narrative form of cases.
- Cases may reduce the problems of transfer of learning because they simulate the way in which the most effective forms of learning are situated in specific settings and circumstances.

To Shulman then, cases are powerful teaching tools because their narrative format creates a contextual learning that matches the situated cognitive processes revealed by research in the learning sciences. As

well, the discussions that accompany cases can create opportunities to help students develop reflective thinking skills, another teaching method supported by learning sciences.

Cases as an Application of Situated Learning for Agency

Typical case-based teaching approaches include the case (and perhaps a study guide) for presenting the facts of the case and a discussion that attempts to involve students in an analysis and discussion of assumptions and outcomes for the case. Collins and his colleagues (2015) provided a set of important techniques for cognitive apprentice education that included: a. modeling; b. coaching; c. scaffolding; d. articulation; e. reflection, and f. exploration. Cases, study guides, and discussions can address a subset of these elements perhaps modeling, articulation, and reflection. It is possible to design cases that include modeling by having either characters demonstrate desired behaviors or faculty modeling in discussion sessions. Students may also derive modeling from other students in discussions. Coaching can also be done in discussion sessions if the faculty wishes to incorporate it, but most of the time discussions are intended to allow students to articulate their ideas.

Affordances that Support Situated, Student-Centered Learning

Adapting cases to address situated learning principles requires a design model that integrates the cognitive, skill, and comportment components of apprenticeship learning and specifies the discourse and identity development affordances that will be addressed in the situated learning environment. Creating a case-based lesson structure that addresses situated learning principles calls for specification of the following components:

- **Case Modules:** Generic components of the case including the case study and case notes, study groups, classroom and technology supported discussion. These are listed mainly to show where the other elements fit into the case structure.
- **Apprenticeships/Learning Outcomes Goals:** The three high-end apprenticeships:
 - A knowledge apprenticeship that includes teaching the academic knowledge base and habits of mind important in a given discipline of study
 - A skill-based apprenticeship that relates to practice in the discipline, and includes professional judgment
 - An ethical practice apprenticeship that addresses development of ethical standards, ethical comportment, social roles, and responsibilities of the professional in a given discipline that will guide the learning goal specification and the specific learning outcomes related to each of the three high-end apprenticeships.
- **Social Learning Methods:** Specific activities designed to provide support for cognitive instruction.
- **Transformative Learning Thinking Types Addressed:** Instrumental learning; Communicative learning

Noone (2009) has shown how a lesson or module can be designed to integrate the three high-end apprenticeships. Building on Noone's approach but revising it substantially, Table 2 shows a generic planning structure for a case-based situated learning environment.

Table 2. Generic design model for incorporating situated learning techniques

Apprenticeships	Outcomes/Goals	Situated Learning Methods	Learning Activities	Transformative Learning Theory Thinking Types
Cognitive Apprenticeship	Student will demonstrate knowledge of...	Modeling	Case study analysis	Instrumental
Skills-Apprenticeship	Student will demonstrate skill in...	Scaffolding Reflection	Discussion following reading of case	Instrumental
Ethical Compartment Apprenticeship	Student will reflect on some aspect of the discipline's practice	Coaching Reflection Articulation	Secondary discussion incorporating reflection	Communicative

The structure is a map of the learning outcomes and activities that will address the three high-level apprenticeships in an integrated fashion. The learning in the three apprenticeships still has to be operationalized with traditional learning outcomes but the goal of providing learning activities that integrate the three apprenticeships is more achievable if we define the learning outcomes for them.

Once the learning outcomes and activities are defined the designer also needs to specify which social learning methods (e.g., modeling, coaching, scaffolding) will be used in the various case modules to address the learning outcomes. Finally, specific learning activities and transformative learning theory thinking types related to discussions and identity development should be listed.

An Application of Teaching for Agency With Case Based Learning

To demonstrate the approach with a concrete example a case study in ethics and information stewardship will be used to show how a situated pedagogy can be applied to create a case-based situated learning environment.

Celltronics and the Company Blogger

The case involves a manager who works for a company called Celltronics that produces content and services for the global communications industry but is interested in moving into the mobile game arena. The manager is approached about taking on a new position as a project manager for a new game called GameGirlz. The game will move the company into a new mobile games niche for girls, 14-19. Security is tight and the potential new manager is warned repeatedly that the project has the highest security in place. As the case unfolds it is revealed that Celltronics will be embedding code into the software to gather data about user behavior and preferences. Although technically not illegal and Celltronics plans on aggregating individual data so no user's individual behavior will be examined, this revelation opens up ethical questions about violation of privacy.

Eventually a situation arises related to information leaks to outside sources from somewhere within the company. Company officials contact the new manager with urgent requests to track down the employee. It turns out that a Celltronics employee has been running a blog site for some time that is actually quite respected in the industry but now is revealing some inside company information related to the new project. This not only creates a competitive exposure but also may lead to potentially damaging publicity.

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The project manager is asked to locate and deal with the company blogger to stop any potential damage to the project and the company reputation.

Applying a situated learning perspective to this case we can create a learning environment that addresses the three high-end cognitive apprenticeships. This can be done by introducing modeling, coaching, and scaffolding techniques to the case through introduction of characters who serve as models of professional competence, or by structuring discussion or discourse activities in ways that guide students in contextual reasoning, reasoning in transition, or other aspects of professional comportment. In general, the case can address the high-end cognitive apprenticeships and address the need to structure case-based learning in a way that addresses the critical elements of student-centered learning.

Harkrider et al. (2013) recommended that case-based instruction provide support for a number of high-level cognitive skills and knowledge elements. By providing direct instruction of cognitive and metacognitive skills, the case addresses the higher-level skills needed for student-centered learning. Harkrider et al. advised that cases should:

- Cover a wide spectrum of cognitive levels
- Incorporate tasks, knowledge, and problem-solving skills learners are likely to encounter and apply in future practice
- Assess students' knowledge and skills
- Provide specific feedback to students
- Provide expert modeling of problem-solving approaches
- Provide explicit support for comparing and contrasting features, factors, and issues embedded in cases

In our demonstration case about information security and stewardship learning outcomes have been defined for each of the three high-end apprenticeships including:

- **Knowledge Apprenticeship:** Outcomes call for demonstrating knowledge of information and security and ethics and thinking like a professional in terms of career choices and thinking in transition.
- **Professional Skilled Know-How Apprenticeship:** Outcomes define student skill in evidence-based practices in data collection and analysis and ethical considerations in management decision-making.
- **Ethical Comportment Apprenticeship:** Outcomes can relate to student cultural or spiritual experiences students can draw on to make decisions that affect employee's careers

Learning activities need to be defined that will help address the situated learning elements and transformative learning processes related to critical discourse and critical reflection. These components will be addressed primarily in discussions or group activities. Knowledge and skill outcomes tend to be related to the case material but may be connected to class activities, study groups, or class discussions.

Table 3 shows an example of the situated learning design model for a student-centered learning approach in the ethical information stewardship case.

Table 3. Design model for ethical information stewardship case

Apprenticeships/Learning Outcomes	Case Modules	Social Learning Methods	Transformative Learning Theory Thinking Types
<p>Knowledge Apprenticeship Academic knowledge base and habits of mind important to the profession</p> <p>Learning Outcomes</p> <ul style="list-style-type: none"> • Student will demonstrate knowledge of privacy laws as they relate to companies and their employees • Student will demonstrate ability to think like a manager when faced with a dynamically changing situation involving employee rights versus company requirements <p>Skilled Know-How-Apprenticeship</p> <ul style="list-style-type: none"> • Skills that relates to practice, including professional practice judgment <p>Learning Outcomes</p> <ul style="list-style-type: none"> • Student will demonstrate skill in collecting and analyzing user data • Applying applicable legal principles related to security while balancing employee rights and satisfaction <p>Ethical Comportment Apprenticeship</p> <ul style="list-style-type: none"> • Ethical standards, ethical comportment, social roles, and responsibilities of the profession. <p>Learning Outcomes</p> <ul style="list-style-type: none"> • Student will reflect on cultural or spiritual influences in ethical decision making • Student will demonstrate an understanding of how ethical issues intersect with managing decisions 	<p>Case study and case notes</p> <p>Student study group</p> <p>Class activity-online discussion</p> <p>Second level, Reflective Class Discussion</p>	<p>Modeling of manager behavior in case study</p> <p>Student articulation of main issues related to information security</p> <p>Instructor Coaching in online discussion</p> <p>Student exploration of ethical issues</p>	<p>Instrumental</p> <p>Instrumental</p> <p>Communicative</p> <p>Communicative</p>

Providing Discussion Affordances in Situated Learning Environments

The situated learning environment should help students integrate the three apprenticeships into their developing professional identity. To support student-centered learning educators must create cases that help students connect basic knowledge with practice in action and discussions that guide students to ask questions that require reflection and critical self-reflection. Table 4 provides some examples of discussion or activity questions that address the three cognitive apprenticeships

NEW DEVELOPMENTS

The original apprentice environments were shops and studios where master craftsmen created their products. The places of production were also the places for learning, the skills needed to create the products or crafts and teaching and learning were informal; there was no need for record keeping. With the extension of apprenticeship methods to formal school learning there was a need to manage information related to tracking and assessment of the learning that was taking place. This limited the implementation of apprenticeship approaches in formal educational settings. Cognitive apprenticeship projects had to take place in physical classrooms and required direct delivery of instruction.

With the advent of learning management systems, tracking, recording, and management of learning data became manageable. With the addition of capabilities for designing and managing instructional

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Table 4. Suggested discussion or activity questions

High-End Cognitive Apprenticeship	Discussion or Activity Questions
<p>Professional Knowledge</p> <ul style="list-style-type: none"> • Ability to acquire and use knowledge that allows for thinking in ways typical of and important to the profession e.g., learning how to think like a manager, consultant or other professional practitioner 	<p>What are the information and security and ethics issues? How would you deal with them? When it comes to career choices, one must always consider the pluses and minuses of any decision. What are the issues related to this project that might influence your choice?</p>
<ul style="list-style-type: none"> • Professional knowledge creates habits of mind and allows for integration of skilled “know-how” and professional judgment 	<p>Given what you have heard so far, do you think you would be willing to take on the leadership of this project? Are there ethical issues with becoming involved in this project? If so, what are they?</p>
<ul style="list-style-type: none"> • Reasoning across time taking into account changes in the situation and changes in the practitioner’s understanding of the situation 	<p>You decided to accept the job offer. What did you accept? Can you foresee anything that might occur to cause you to change your mind and decline the offer?</p>
<ul style="list-style-type: none"> • Reflective, self-improving practice to keep current with changes in ideas, knowledge and practices 	<p>Are you happy with your decision about whether or not to manage the project or do you wish you could reconsider?</p>
Professional Practice Skills	
<ul style="list-style-type: none"> • General and discipline- specific skills of professional practice. 	<p>What data are you going to collect from these 14-19 year-old girls? How are you going to store and analyze the data? How much personal information would you include, and is anonymity an issue?</p>
Professional Conduct	
<ul style="list-style-type: none"> • Professional attitude and awareness of the social roles and responsibilities of the profession 	<p>Is it acceptable to fire an employee because of something he or she posted on a blog?</p>
<ul style="list-style-type: none"> • Moral and ethical thinking 	<p>How do ethical issues intersect with your role and purpose as manager?</p>
<ul style="list-style-type: none"> • Cultural competence 	<p>Can you expect similar reactions across cultures if it is discovered that Celltronics is gathering personal data?</p>
<ul style="list-style-type: none"> • Professional socialization and identity 	<p>What cultural or spiritual values did you draw upon in making these decisions?</p>
<ul style="list-style-type: none"> • Emotional intelligence and interpersonal competencies 	<p>How would you find out which employee is feeding information to the news and what would you do about that employee?</p>

activities into learning management systems such as Blackboard™ and Canvas™, instruction could be delivered over distances and student progress can be tracked. Extending learning from classrooms to outside settings and attempting to create a single learning environment composed of both classroom and outside learning along with online learning put faculty members closer to the goal of implementing a situated learning environment and capitalizing on the power of situated learning affordances.

Merging of situated learning methods with instructional technology systems creates what Rosenheck (2013) called Cognitive Apprenticeship 2.0. Unfortunately, learning management systems currently in use do not necessarily provide the opportunity to seriously link the material in the system with classroom and outside or online learning. Also, the technology for accessing the material is mainly in the form of stationary computers, cell phones with limited screen size, and tablets with limited availability for content input by the students. What is needed are new forms of technology that are portable but contain better functionality for viewing and responding to instructional materials. Although the form factors are not clear yet, it seems inevitable that new learning technologies will be coming that allow for the creation of powerful, mobile situated learning environments.

CONCLUSION

To provide a sound foundation for case-based learner-centered environments, educators should turn to research in the learning sciences. Situated learning methods identified in this chapter, can assist students in developing a more agentic identity that is more, self-efficacious, contextual, reflective, and integrative, and helps students see themselves as contributing members of a learning community. To help insure that cases are addressing the higher level thinking abilities, it is important to provide support for the learning of cognitive and metacognitive skills by providing activities that call for integrating knowledge, cognitive, and practical skills in situated learning activities.

An instructional design approach informed by a student-centered learning perspective allows faculty members to address the development of student agency through the design of learning environments and activities that provide options for assisting students to develop critical discourse and critical reflection. The direct incorporation of situated learning techniques can provide student-centered contexts needed to produce self-efficacious, self-regulated and life-long learning.

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KEY TERMS AND DEFINITIONS

Authentic Learning Activities: Activities that mimic real-world issues or situations. In the business education this could be simulations, problem-based learning exercises, or cases.

Cognitive Apprenticeship: Extension of apprenticeship training techniques to the teaching of cognitive and metacognitive skills.

Contextualization: Practical reasoning and requires that the practitioner select the elements of professional knowledge most relevant to the given context.

Situated Learning: What some have called the situative perspective views learning and cognition as distributed over activity systems and communities of practice rather than residing strictly in the head of individuals. The situative perspective looks at learning, cognition, motivation, and achievement as social activities and applies the sociocultural view to research in classroom learning.