Scaffolding: An Important Teacher Competency in Online Learning

By Nada Dabbagh

Scaffolding is originally a Vygotskyan (Lev Vygotsky, 1896-1934) concept based on the idea of providing supportive assistance to the learner within the parameters of a learner's zone of proximal development (Zo-ped or ZPD) (Wood, Bruner, & Ross, 1976). ZPD is a measure of a learner's current ability and knowledge–what he/she is able to perform with no assistance–and the learner's expected or anticipated ability and knowledge–what the learner can be challenged to accomplish with supportive assistance (Vygotsky, 1978). "Learners progress through the ZPD by attempting successive approximations of the learning task, assisted by peers, more able others or with a tutor" (McLoughlin, Oliver, Collis, Winnips, 1999, p.1).

Scaffolding involves supporting novice learners by limiting the complexities of the learning context and gradually removing those limits (a concept known as fading) as learners gain the knowledge, skills, and confidence to cope with the full complexity of the context (Young, 1993). Assistance to learners is provided on an as-needed basis and as their task competence increases, fading of assistance is gradually administered to allow learners to complete the task independently (Pressley, Hogan, Wharton-McDonald, Mistretta, & Ettenberger, 1996; Jarvela, 1995). Fading of support during scaffolding should eventually result in self-regulated learning and lead to more self-reliant students (Winnips, 2001; Clark & Kazinou, 2001).

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The process of providing just-in-time, just-enough assistance and the gradual fading of assistance as learners become more competent in the use of task strategies calls for designing a layered learning experience in which novice learners get enough basic support and information to successfully engage in learning without slowing down advanced or more experienced learners who may need a different layer (or level) of support to maintain their learning momentum and interest. Skillful teachers in traditional face-to-face learning environments, are generally able to support students through a range of scaffolding approaches that can lead learners to deeper engagement in order to solve a problem or complete a learning task by themselves. However, online learning environments are now limiting face-to-face teacher-student interaction and opening new possibilities for the application of the principles of scaffolding (McLoughlin, Winnips, & Oliver, 2000). This paper proposes a distributed and shared approach to scaffolding where teacher-student, student-student, and student-content interactions are supported through the use of online learning tools, and where responsibility of scaffolding is shared amongst learners, teachers, and resources. This approach will enable students who engage in online learning to become more self-directed, self-regulated, and self-reliant by providing multiple levels and types of support.

Scaffolding in Online Learning Environments

Scaffolding in online learning environments just like in traditional, face-to-face learning environments should

eventually result in self-regulated learning (Clark & Kazinou, 2001). Self-regulation refers to the degree to which students are able to become metacognitively, motivationally, and behaviorally active participants of their own learning process (Zimmerman, 1989). Among the key self-regulatory processes affecting student achievement and motivational beliefs are goal setting, self-monitoring, self-evaluating, use of task strategies (e.g. rehearsing and memorizing and organizing and transforming), help seeking, and time planning and management (Dabbagh & Kitsantas, 2002). Scaffolding approaches that support self-regulatory processes include modeling thinking processes through the "think aloud" technique, providing resources and activities that present questions for critical thinking, providing scenarios or cases that emphasize multiple perspectives and require analytical thinking, and providing procedural guidance on how to complete complex tasks (McLoughlin & Oliver, 1999). Additional approaches include coaching students in problem-solving activities and prompting students to brainstorm different solutions to help them become aware of generative or metacognitive thinking processes (Clark & Kazinou, 2001). These approaches can best be mediated in an online learning environment through the use of Web-based course management tools that integrate a variety of online learning technologies making it possible to implement the full spectrum of scaffolding techniques.

In the distributed scaffolding model approach, particular emphasis is placed on telecommunications technologies that support asynchronous and synchronous forms of communication. Teachers can use telecommunications technologies to model thinking processes through the "think aloud" technique, provide timely individual feedback to sustain student engagement and motivation, and promote interaction and collaborative learning. Alternatively, students can use these same technologies to set goals, develop task strategies, and seek help from peers. In order to promote interaction and collaborative learning and to encourage learners to use these technologies to scaffold their learning, the instructor has to design meaningful learning experiences and assume the supportive role of assisting students to engage in these experiences as a community of learners. Additionally, the instructor needs to establish an atmosphere of trust and foster a "give and take" (social negotiation) approach to learning by being a participant, a co-respondent, and a facilitator. The goal is to create a learning culture where collaboration, learning with self-awareness, multiple perspectives, and self-management are promoted, and where the role of the teacher is reciprocal, supportive, and communicative as it is responsive to learner needs (McLoughlin & Oliver, 1999). Table 1 provides examples of how the scaffolding techniques discussed above can be supported using telecommunications technologies and other online learning tools embedded in Web-based course management systems. To provide more specificity to these examples, WebCt will be used as an example of a Web-based course management system in this table.

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Finding the Right Balance

Scaffolding is all about providing the right amount of structure in a learning environment, keeping in mind that some learners may require little or no structure and others may require a lot of structure. Too much scaffolding could result in dampening students' efforts to actively pursue their learning goals, causing them to lose their momentum or drive towards meaning making and self-directed learning efforts, and too little scaffolding could result in students' inability to successfully complete or perform certain tasks and instructional activities, leading to anxiety, frustration, and finally loss of motivation and attrition. Scaffolding is therefore a delicate balancing act, which can be very difficult to achieve without adequate support, training, and time. Students can help instructors find the right balance by fully participating and taking responsibility in identifying and asking for the level and type of scaffolding they need, and supporting teachers in this role by scaffolding others when possible. "With encouragement, students become skilled at seeking the type of scaffolding they require, and will also engage in peer scaffolding" (McLoughlin & Oliver, 1999, p. 44).

Another process that could help teachers in finding the right balance when applying scaffolding techniques is conducting a learner analysis. A learner analysis is a systematic effort to identify learner characteristics and individual differences that may impact learning such as prior knowledge, personality variables, aptitude variables, and cognitive styles. By conducting a learner analysis, teachers can determine the degree of scaffolding required based on their learners' cognitive characteristics, type of learning task, and learning context. For example, low scaffolding is recommended when learners have high prior knowledge, possess a wide range of cognitive strategies, are flexible and highly motivated, have low anxiety, and attribute success and failure on tasks to internal factors (internal locus of control). Alternatively, high scaffolding is recommended when learners have low prior knowledge, possess few cognitive strategies, have high anxiety, low motivation, and an external locus of control (Smith & Ragan, 1999).

Table 1. Using online learning tools to implement scaffolding techniques

Scaffolding Strategy	Web-Based Course Management Tool
Establishing an atmosphere of trust and an open and friendly community of learners	• At the beginning of an online learning experience ask students to post a short bio to the Main discussion forum area in WebCT • Ask students to introduce themselves to one another through the Student HomePages feature of WebCT
Fostering a give and take approach to learning	• Ask students to discuss any concerns about course requirements in the Main discussion forum area, and respond to their concerns
Coaching students in problem-solving activities and learning tasks	• Provide one-on-one mentoring and guidance through WebCT's E-mail tool • Provide feedback on student progress through the My Progress tool • Provide group coaching and facilitation of group tasks and activities through the Discussion forum or Chat areas • Encourage students to upload rough drafts and work-in-progress to the Presentation area, or to attach documents using the E-mail or Discussion tools, and provide timely feedback • Ask peers to provide feedback on drafts and work-in-progress uploaded to the Presentation area
Modeling think aloud processes	• Use the Whiteboard feature to model thinking processes in the synchronous mode and/or the Discussion forum feature to model thinking processes in the asynchronous mode
Providing scenarios or cases that emphasize multiple perspectives and require analytical thinking	• Using the Content Module tool, provide scenarios or cases that are linked conceptually through themes to help students gain a deeper understanding of the content
Providing procedural guidance on how to complete tasks	• Provide students with tips and cues through the Student Tips tool
Providing resources and activities that present questions for critical thinking	• Post resources using WebCT's Add Page or URL features and References feature to refer learners to Web-based resources that support critical thinking • Require students to use the Search tool to find supporting information • Provide an Index and/or a Glossary to important terms and concepts
Promoting interaction and collaboration	• Students can interact on a one-to-one or one-to-many basis with peers or instructor using theChat, E-mail, and Discussion tools • The instructor or students can share knowledge, and ideas using the Whiteboard and Presentation tools
Prompting students to brainstorm different solutions	• Through Chat, Discussions, Whiteboard, Search, Resources, and Presentation features of WebCt, instructors can encourage students to discuss and share their ideas and solutions to problem-solving tasks, apply knowledge to problem-solving, and collaborate with peers on problem-solving activities

Table 2. Instructional variables that affect the level of scaffolding

Factors that impact scaffolding	**Low level scaffolding, More generative strategies**	**High level scaffolding, More supplantive strategies**
Learner characteristics	• High prior knowledge • Wide range of cognitive skills • Highly motivated • Self-directed • Low anxiety • Internal locus of control • Discursive • Reflective • Possesses good interpersonal and social learning skills	• Low prior knowledge • Limited range of cognitive skills • Low motivation • High anxiety • External locus of control
Type of learning task	• Complex • Ill-structured • Low emphasis on performance • High emphasis on analytical, critical thinking and problem-solving skills • Requires collaboration and social negotiation • Tacit knowledge of task is often implicit and not measurable by conventional assessment methods • Process driven	• Simple • Well-defined • High emphasis on performance or performance level critical • Requires mastery through drill and practice • Overt, explicit and measurable performance • Product driven
Context	• Ample time for learners to practice reflective and comprehension monitoring skills • Emphasis on learning how to learn • Collaborative • Room for personalized learning goals • Learner-centered • Subscribes to constructivist pedagogy	• Limited time for learning • High accountability • Emphasis on performance skills • Learning goals are universal or dictated by others • Instructor-led or program centered • Subscribes to objectivist pedagogy

Table 2 has been adapted from figure 7.2 in Smith & Ragan, 1999, p. 125.

Scaffolding and Instructional Strategies

Low and high scaffolding are also highly correlated with the type of instructional strategies implemented in a learning environment. For example, in a learning environment where low scaffolding is required, generative strategies can be employed or encouraged. Those are strategies that align with the constructivist approach to learning which encourages learners to construct their own understanding of the learning content by being responsible for generating their own learning goals, and organizing, elaborating, and sequencing content based on where they see the emphasis and find meaning, and by monitoring and evaluating their own learning processes and discovering how new learning can transfer to other contexts. Alternatively, in a learning environment where high scaffolding is required, supplantive strategies are generally more suitable. Those are strategies that align with the objectivist approach to learning where the teacher is supplying all or part of the learning goals, organization, elaboration, sequencing, and emphasis of content, as well as monitoring and

Table 3. Teacher/student roles in objectivist versus constructivist learning environments

Type of role	Teacher role	Student role	Learning environment
Traditional role in F2F class	Manager, expert, disciplinarian, controller, dispenser of information, goal setter, time-keeper	Listener, receiver, novice, passive learner	Objectivist, directed or teacher centered, high teacher scaffolding, use of supplantive strategies, structured
Supportive role in online learning	Resource, co-participant, scaffolder, co-learner, moderator, facilitator, coach, monitor, advisor	Problem-solver, explorer, researcher, collaborator, goal setter, moderator, facilitator, scaffolder, participant	Constructivist, learner-centered, emphasizes collaborative learning, use of generative learning strategies, lower or adaptive teacher scaffolding, peer scaffolding

Table 3 has been adapted from the table in McLoughlin and Oliver (1999, p. 39) on contrasting roles and discourse in traditional versus information and communications technology classrooms, to include additional skills and characteristics of online teachers and learners discussed in this article.

evaluating students' learning and providing suggestions for transfer of knowledge to other contexts (Smith & Ragan, 1999). Table 2 lists the variables that affect low or high level scaffolding and their relationship to generative and supplantive strategies.

Table 2 suggests that teacher and student roles can be reciprocated, meaning that teaching and learning can become reciprocal processes to support interaction, collaboration, and knowledge construction. For example in a learning environment where low scaffolding is required and generative strategies are encouraged, the learner and the teacher are both supporting teaching and learning processes by being reflective, encouraging, motivating, responding, questioning, sharing resources, engaging in social negotiation practices, and creating a shared context for learning where control is balanced or distributed amongst learners, facilitators, and the learning outcomes. This type of "shared control" can best be implemented using online learning technologies that facilitate communication, collaboration, articulation, and reflection. The interaction between learning outcomes, technology, and instructor pedagogy becomes critical when trying to achieve a balanced or distributed control as it stands in sharp contrast with teacher-centered, one-way approaches to learning (McLoughlin & Oliver, 1999). Table 3 contrasts teacher and student roles in traditional (face-to-face) learning environments that are objectivist or teacher-centered, and online learning environments that are constructivist or learner centered. As the learning environment moves towards a collaborative and student-centered approach that uses interactive and collaborative technologies, teacher and student roles can be seen as increasingly reciprocal.

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To summarize, online learning environments are opening new possibilities for the implementation of scaffolding techniques. In the absence of (or limited) face-to-face teacher-student and student-student interactions, scaffolding as a pedagogical construct must be reconceptualized as a shared and distributed process enabled through online learning technologies that facilitate communication, collaboration, articulation, and reflection. Specifically, the teacher's role needs to be transformed from that of an expert, main deliverer of knowledge, and organizer of learning events, to that of a resource, facilitator, coach, co-learner, and co-participant in learning activities. These supportive and facilitative roles ensure that learners are receiving a range of scaffolding techniques leading to self-regulated learning. In an online learning environment that is based on learning as a social process and seeing an increasingly diverse and dynamic online learner population, the transformation of a teacher's role from didactic to supportive and facilitative requires knowledge and comfort in the use of learning technologies and pedagogical models that enable such transformations. Web-based course management tools are now making it easier for teachers to assume supportive and facilitative roles due to their comprehensive and integrative nature, user-friendliness, and embedded user support systems.

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