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ABSTRACT

When in the "zone of proximal development" for a particular skill or piece of information, a learner is ready to learn but lacks certain prerequisites. Scaffolding is an interactive process in which a teacher or facilitator assists such a learner to build a "structure" to contain and frame the new information. Scaffolding can be provided by teachers, peers, or computers, and may include the use of tutoring, performance systems, and reciprocal teaching. Online scaffolding practices include scaffolding embedded in the information, such as visual cuing, separate web pages of directions on what to notice or what process to employ, tutorials that are interactive or downloadable, help pages, additional explanatory links, or communication forms to contact the instructor or peers. In computer-mediated learning, scaffolding is more important than in traditional education because learning is typically collaborative, and all participants will provide scaffolding to other participants at different times during the learning process. Therefore, participants must be exposed to the idea of scaffolding and know when it is appropriate in the dialogic process. Pointers on appropriate use of scaffolding are given. The teacher may have to provide prerequisite skills to some students. A computer environment makes the provision of these easier because there is much prepackaged material on the Internet, including visuals, illustrations, and simulations. Students can create materials to help less sophisticated students, and post these on the class web page, thus creating a learning archive. The four stages of facilitated learning, from a constructivist view, are described, as is coaching in collaborative computer-mediated learning. The measure of a well functioning group is the decreasing need for external scaffolding from the teacher, as the members scaffold each other. Contains web sites for online resources. (TD)

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PROCESSES FOR DEVELOPING SCAFFOLDING IN A COMPUTER MEDIATED LEARNING ENVIRONMENT

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An Overview of Scaffolding: Vygotsky (1936) has provided an explanation of how learning can be facilitated with his explication of the" zone of proximal development". See http://www.uqac.uquebec.ca/dse/3psy206/auteurs/vygotsk.html. This idea in teaching developed into scaffolding. His concept is similar to that of Feuerstein (1979) in his development of "instrumental enrichment". See http://www.business1.com/IRI_Sky/onfie.htm. The zone of proximal development which a learner has for a particular piece of information is that time in the learner's life when he/she is ready to learn a particular piece of information but does not have all of the prerequisites or other information that is needed to acquire the information without assistance. Vygotsky asserts that the teacher or facilitator can provide this information by helping the learner build a structure into which to put the new information. This building process is called scaffolding. What the facilitator does is to probe the student and find out what is not known and then through hints or provision of structures, e.g., advance organizers, shows the learner how the new information can be related to the old. As learning is a socially constructed process, the learner and the teacher literally think together. This is a way for the learner to do what he/she cannot do alone. The teacher provides coaching and also provides feedback when the learner tries to use the new information in authentic ways. Scaffolding in this sense is temporary and task oriented support, which is provided to allow a learner to extend his/her reach in the social development of knowledge. This is why many constructivists talk of learning as apprenticeship. The learner takes in the new information and the structure that is provided, transforms it, and constructs his/her own knowledge, which, if the structure is appropriate, will be similar to that of the teacher/facilitator. Scaffolding allows the learner to model and to observe the model for discrepancies. See http://spider.cit.act.edu.au/metale/03news/mhe0345.htm.

Scaffolding Defined: Scaffolding in CML is an interactive process by which a learner is assisted by others (teachers or peers) to acquire knowledge or skill which cannot be acquired without assistance at that point in time and skill. It is like having training wheels on a bicycle. Scaffolding can be provided by teachers, peers, or computers, e.g., help screens. See CML tutors at http://www.umanitoba.ca/faculties/medicine/units/biochem/tutorials/Introduction.html or http://dbhs.wvusd.k12.ca.us/ChemTeamIndex.html. Understanding is determined by the previous experiences of the learner, past knowledge and the ways in which previous information has been stored (memory structures determine how new information will be assimilated or accommodated). Learners seldom come to a learning setting with the same background knowledge and discourse history. Without adjustment common learning is not possible. Differences can be scaffolded in CML hypertext. Even if learners have the same background knowledge they are likely, because of other factors such as, interest, intelligence, etc., to move through the material at different rates of speed. CML tracking can accommodate this. Tracking can be seen as a form of pedagogical scaffolding. Through the collaborative process of scaffolding the true intersubjectivity of learning is developed where all parties share understanding of the task and work together to co-construct meaning and understanding. For a discussion of tracking see http://www.scholastic.com/instructor/classroom/organizing/hot.htm.

Teaching in the Zone of Proximal Development: Learning capability ranges from things that the student can do without assistance to thing that are only possible with much assistance. This defines

the zone of proximal development. When a learner cannot demonstrate a desired performance the teacher will usually model the process and then allow the student to try an approximation. In this way after several iterations the student can perform the task. Now the learning process enters a new phase where the student is questioned and asks questions about the process trying to integrate it into what is already known. Eventually the learner progresses from guidance by another to self-reliance and self-guidance. Advance organizers are proposed as the link between what is known and the new knowledge, skill or process. The teaching process therefore becomes on of providing an advance organizer, modeling the appropriate behavior, exploring the use of the new skills and finally being generative with the new information, e.g., being able to teach others.

Scaffolding in the Zone of Proximal Development: To be able to learn from particular information, a learner must have sufficient background knowledge to be able, with help, to start to process the new information into personal knowledge (see http://edweb.sdsu.edu/people/bdodge/scaffolding.html). For example it would be almost impossible to teach algebra to a student who could not do basic arithmetic operations, e.g., addition. For those" in the zone", teachers and collaborative partners, in the business of learning, help those who are not at the desired level through a process called scaffolding. Ultimately we believe that all learners should think for themselves. Until they are capable of doing this we must provide support, or scaffolding, which will allow them to think about or solve problems in the topic in question with our assistance. Scaffolding can be provided at a variety of levels, depending on how close the learner is to being able to function independently. If the learner knows only a little, the scaffolder may need to model the complete act including describing personal thinking as the process unfolds. At a somewhat higher level of learner understanding, the scaffolder can have the learner model the process with assistance. Here the learner tries to perform and receives prompts or hints from the coach as the process unfolds. At a third level the scaffolder only has to identify the components which the learner should work with to start the process which the learner can then accomplish with little external assistance. At the final level the scaffolder only has to name the technique which should be use for the task to be accomplished. This last step is analogous to problem finding, or conditional knowledge, in the sense that the learner knows how to apply the knowledge but is unsure of when to use it or its appropriateness to a particular problem. Later we will call this update interactivity because it is conditional upon what has been learned before.

Ways Scaffolding Facilitates Learning: Scaffolding facilitates learning in the following ways: It helps learners make connections between what they already know and the new information, which is being presented. In this way new concepts are developed from and attached to earlier knowledge. It helps in developing mental schema, into which new information is transformed, as it becomes personal knowledge. That is, it helps in the organization of new information in ways that are meaningful to the learner. This assists in the development of evolving knowledge bases containing restructured information. Scaffolding reduces learning ambiguity. This facilitates the development of personal knowledge which is meaningful and which can be used by the learner. The transformation process allows the learner to internalize the information. Eventually the learner is in control of the task and the scaffolding is no longer needed.

Develop Scaffolding: When scaffolding is necessary, the teacher should try to minimize the cognitive load by setting the environmental conditions so that the student can both recall and use information that he/she already knows to perform most of the task (tie the new material to the old). Therefore the student has only to learn a limited amount of new information to be successful. The teacher starts by having the student identify the goal structure in the beginning of the problem phase. When the problem is correctly identified, the teacher helps the learner recall the appropriate information, which has already been learned. The teacher should try to approximate the appropriate step size that will

keep the cognitive load low for the student and adjust the step size so that the student is learning easily. Some techniques that will facilitate this are modeling the performance, thinking out loud while you model the task, and pairing an advanced learner with a novice. Providing prompts, links, guides, and structures so that the learner can readily identify what is to be learned and how it relates to what is already known are also facilitated. This can be done in some disciplines by providing worked examples that the students can follow. Prompts and guides should be faded as soon as the student can perform without them. If the concepts or tasks are complex or the learner exhibits difficulty in learning them, the teacher should use successive approximation (a behavioral technique where you reinforce any movement which moves the learner closer to the desired behavior). Finally, the teacher should provide immediate feedback on errors. Scaffolding is an interactive process which requires that the scaffolder understand where the learner is having problems and then is able to provide what is needed to help the learner function semindependently through the process. This requires that the both the learner and the scaffolder participate in a community of discourse in the sense of Vygotsky (1978). The teacher must think together with the learner. This is a reciprocal process and both learn through it.

Kinds of Scaffolding: There are many kinds of scaffolding, as many as there are techniques of teaching. Some of these include offering explanations when learners do not understand new information, resolving questions which come up during a learning process, inviting participation from those who seem to be on the periphery who may not be interacting with the new information, sharing ideas to stimulate thinking about topics related to the information to be learned (may also be used to help the learner recall prerequisite information needed to use the new information), to verify and clarify understanding. Other techniques include the use of extensive examples and contributed ideas to the process which help learners see what the concepts and processes are which are important to this particular process. Scaffolders model the desired behavior so that learners can see complete performances, scaffolders also model question and comment generation so that the learner learns how to dialogue in the interactive process. The model may do think alouds where he/she describes the thinking process, which is occurring at the same time that the model performance is taking place. This is done to make the thinking process visible to the learner. The scaffolder may share information, which the learner does not have or does not access readily which is needed for transformation, if the learning process is to be completed. The scaffolder may also provide evidence either to support the process that the learner is developing or to refute statements, which are incorrect.

Tutoring as Scaffolding: Tutors provide temporary support for students which allow them to perform at a level which is just beyond their present level of competence or development. To learn the student must think about the learning and plan and monitor what is happening in the learning process. The tutor should not do this because this is what the learner must do to be able to progress. A CML tutor usually functions at a level above the most basic where the tutor models the desired performance. A CML tutor (help screen, job aid, etc.) allows the learner to begin the process and then to ask questions or to prompt the student when the process fails to proceed or upon learner request. Performance support systems try to do what training in the classroom usually does change performance on the job. This type of a system is quite different from those proposed in traditional instructional design.

Performance Systems as Scaffolding: Performance systems assume learner competence, if the learner is provided step-by-step directions in the accomplishment of a process. See statistics example at http://trochim.human.cornell.edu/selstat/ssstart.htm. There are a variety of tools used as performance systems, which can be used to scaffold behavior. These include a variety of automated tools such as spreadsheets, templates, loan calculators, and computer programs like Quicken. Performance systems can provide granular training by providing cues (as with cue cards for study) and through the provision of explanations. Searchable references and databases with search algorithms can scaffold as

performance systems. Coaching and advice can also serve a scaffolding function which encourages both knowledge and skill integration.

Online Scaffolding Practices: The following is drawn from Winn (1997). Online strategies designed to scaffold students in the learning process include: Scaffolding embedded in the information which is presented to the student such as visual cuing. Scaffolding provided on separate pages which consist of directions on what to notice or what process to employ. Scaffolding in the form of tutorials which are interactive or downloadable. Online help systems in the form help pages, additional explanatory links or communication forms to contact the instructor or peers. This may be done through email, chat room of bulletin board. Virtual communities such as chat rooms, discussion data bases, virtual cafes, and the like can also provide online scaffolding. The teacher should also support varied ways for the student to organize new knowledge. This can include advanced organizers, outlines, cognitive maps, and flow charts. These kinds of scaffolds can also be used when students transfer knowledge across contexts. This kind of transfer is almost always teacher driven and even advanced students may not have an understanding of how information learned in one area can be used in another area. Therefore, the teacher should point this out and should show how the content of the new area relates to the content of the old one.

Reciprocal Teaching as Cognitive Scaffolding: Reciprocal teaching was designed as a form of cognitive scaffolding. In reciprocal teaching the teacher initially takes the most active role and models the behavior which the students are to attempt. Because the most important behaviors, what is happening in the head, are not observable they are operationalized and expressed in observable terms. This may be done through a think aloud process where the teacher describe the thinking which is going on as the observable behaviors are being performed. Gradually the learners try to perform the observable behaviors. When they can perform the external behaviors they are asked to go through the internal or thinking behaviors several times and describe them to the teacher. When the internal behaviors are clearly articulated the learners can then teach others the same process. This starts by having the learners teach the teacher , then each other, and finally those who do not yet possess the skill.

Importance of Scaffolding in CML: In computer mediated learning scaffolding is more important than it is in traditional education because learning is typically collaborative. In this many-to-many learning, all participants will provide scaffolding to other participants at different times during the learning process. Because of this participants must be exposed to the idea of scaffolding and know when it is appropriate in the dialogic process. Those who need scaffolding may or may not know that it is needed. If they know it is needed, that is they cannot do what ever it is that they are supposed to do with out assistance, then they should ask for scaffolding. Most learners are hesitant to phrase a message like this until they are sure that they are in a psychologically safe environment so the teacher may be the first resource used for scaffolding until learners see that they can use anyone who has expertise to provide needed help. When a learner does not know he/she needs scaffolding it is up to the others in the collaborative to suggest that assistance is needed, and to provide it. This usually happens when during dialogue it becomes clear that one or more players has failed to understand a point or that everyone does not have the same information base which is needed to work on the problem. When a colleague does not understand he/she should be told that scaffolding may be beneficial and be asked if it should be supplied.

The Teacher's Role in Scaffolding

Teacher Processes in Scaffolding: Teachers may want to draw attention to inconsistencies in information presented by others if the inconsistencies may lead to misunderstandings later. Minor inconsistencies should not be addressed to reduce the sensitivity of participants to criticism. Scaffolding is usually provided privately if it is not requested. This is done through the use of email rather than

posting the information to a bulletin board or for broadcast on a listserv. When providing scaffolding the scaffolder will enter into a dialogue of providing cues as to what to do. This can relate to processes, strategies, problem solving or merely the sharing of information. In some cases it may only be necessary to direct focus toward the important aspects/features of the process for the learner to be able to take over and complete the process. Whatever is needed the scaffolder should provide only enough support so that the learner is just able to do it on his/her own. Scaffolders can provide motivational support and highlight the production of good comments. Teachers and others can point out differences of opinion, which need to be resolved and privately point out dispositional roadblocks, such as not listening to the comments of others.

Adaptive Materials as Scaffolding: Material can be used out of level for learners who are either more or less advanced when the material is at an appropriate scholastic level of difficulty and at an appropriate psychological level in terms of learner interest. Regular materials can be adapted or used in an adaptive fashion to provide appropriate education for a particular learner. As with any adapted material, teachers should insure that the material is educationally appropriate and is also appropriate for their students' given age, gender, and psychological capacities.

Scaffolding Adaptations Using Web Material: There are a variety of adaptations, which can be found or developed using material found on the Internet. See http://www.anachem.umu.se/eks/pointers.htm. Adaptations include out of level use where no change is made to the material before it is used. Another version of this technique is to find material on the same content by another author with a different approach or writing style and substitute it for the regular classroom material. Substitute material may also present the same topic using a different stylistic or instruction approach, which may be conceptually or motivationally different for the learner. It is possible to find material on the same content, which is written, at a different level of reading difficulty, which may be more appropriate for a particular student. Material available at a lower reading level is usually marked for usage at a lower grade. However, some in-grade material may be used if a readability program (Provided in Microsoft Office, Windows 95 and higher) is run on the content to determine that the reading level of that material is appropriate. Some contents can be accessed in smaller step size so that the material is easier to comprehend for less advanced learners. Step size is a function of presentation density, conceptual density, and sheer quantity of information used in any given presentation. It may also be equated to the speed at which a learning game needs to be responded to or the complexity of the instructions in a CML task. The material can be an adaptation when it is less complex than that typically used. Complexity refers to the information density and organizational structure of the content. The same knowledge can be approach differently through the provision of alternative problem sets, explanations, examples, and the like, all of, which may be available on the Internet.

Adaptive Presentations of Content: The adaptive presentation of content implies that different learners will be presented with different materials which will be adapted to meet their learning needs. Consider the novice and the expert, both of whom need to be taught the same information. Should both receive the same educational diet? Probably not. Novices typically need more information than experts to make sense out of new information. Their background knowledge is lower and details must be filled in that the expert will already have in place. Some technological systems will allow different learners to be programmed in different ways. Qualified users may receive more in depth material or material that is interesting but not directly related to the objectives to be learned. Some programs will allow adaptive ordering of the visible links on a page which allows hints as to which links to explore next. Some programs will conceal those links, which the student is not ready for based on exposure or pretest

performance. Annotations can be provided to indicate which links have been visited and which should be visited. Help systems can be provided which will provide help at a variety of levels depending on the educational sophistication of the learner on the particular topic. Some systems can develop content-on-the-fly. The content is created separately for each learner based on a learner profile. The learner's profile would typically include learning experiences, learning preferences, knowledge sets, learning styles, and background information. This information would be fed into a neural network, which would swim the content stream and develop the adapted content for the individual. The learner provides feedback to the system as the learning progresses so the system can revise its sequences based on experiential feedback. Usually the learner is asked how useful the information is and how understandable. Given this kind of feedback the content for the next frames can be revised. For bridging betrween expert and novice see http://www.mentors.net/LibraryFiles/Expert.Novice.html.

Find Alternative Experience as Scaffolding: There are many things, which we may want CML students to experience in the many disciplines. In some cases there will be alternative experiences available on the Internet which students could access if they knew that they were available. The CML instructor who wants to provide choices should search these out or provide inducements to students to perform the searches. In some disciplines there may be multiple simulations, tutorials, virtual realities, tours, exhibits, etc which could provide similar experiences from different points of view for students with different preferences.

Cognitive maps: Cognitive maps consist of nodes or ovals with text in them and lines with relationships (see http://cotf.edu/ETE/concept.html) (see example at http://www.ioe.ac.uk/tescwwr/CAL.html) or write them on 3 X 5 cards if the map is being created manually. Sort the concepts into group. Ones which are understood, ones not understood, and those not relevant to the task at hand.Group the related terms. Arrange the cards so that those which are the most related are closest together. Leave room to draw lines. Draw lines between those which are related. On the line write the relationship between the two terms. Take the cards which had concepts which were previously deemed unrelated or unknown and see if any of them can be understood and added to the diagram. If they do add their lines and relationships. This drawing is the completed concept map. Maps can be very complex but they provide a organization which is hard to develop in any other way.

Concept Maps: Concept maps are diagrams which are designed to provide a visual language expression of the relationships between ideas and concepts. Concept maps have been used in education, philosophy, policy studies, etc., to show relationships between forms of arguments. In management they are used to represent the conceptual structure which underlie decision-making. Similar formal visual representation systems are used in many disciplines, e.g., semantic networks, bond graphs, CMP, PERT, Petri nets and the like. In CML concept maps can be used for the indexing and retrieval of hypermedia materials where the nodes are hot and can be used as a hypermedia interface. Other similar structure, albeit more complex ones, are Cone Trees and Perspective Walls (Robertson, Card, and Mackinlay, 1993) which use visual abstraction to increase the speed of pattern detection. Three dimensional representations can also be developed using specific software, see http://www.conceptsystems.com/papers/epp1/epp1.htm. The use of these techniques engage the user's perceptual abilities more effectively and therefore increase the level and speed of understanding. There is also the possibility of having users edit concepts maps which can be shared in real-time see Smart Ideas at http://aace.virginia.edu/aace/conf/webnet/html/164/164.htm.

How the Teacher can set Environmental Conditions

Scaffolding in CML for Unprepared Students: Unprepared students need training in skills, which are considered basic for those who enter a class with them. This may mean basic English and

math skills (see http://itrc.uwaterloo.ca/~engl210e/) or it may be third semester calculus, depending on the student. Many unprepared learners need assistance in developing study skills both for regular study and for study in CML. To provide these prerequisite skills the teacher may need to provide developmental education, remediation, and tutoring, or specialized instruction depending on the problems that the learners exhibit. A CML setting makes provision of these specialized instructional forms easier and more likely, if the requisite materials are already available. If the needed material is not available it is unlikely that the teacher will have sufficient time to develop it at least in the first few years that the CML course exists. There are many prepackaged materials, which can be used for individual students with prerequisite deficiencies. There are many tutorials (see http://www.nr.usu.edu/Geography-Department/rsgis/tutor.html), simulations (see http://www.fullman.com/semiconductors/, Internet drills (see http://www.lamc.utexas.edu/fr/home.html) and virtual field trips (see http://www.tsoft.com/~cmi/ or http://www.mip.berkeley.edu/) which can be accessed on the Internet to which individual students can be directed. There are writing labs online (see http://www.gallaudet.edu/~ghritter/CompLink.html#owl) as well as reference materials such as dictionaries (see http://work.ucsd.edu: 5141/cgi-bin/http_webster, thesauruses (see http://www.encyclopedia.com/ or http://explorer.scrtec.org/ , spelling and grammar checkers which will help students develop writing competency. There are statistics see http://trochim.human.cornell.edu/kb/kbhome.htm,statistical expert systems (see http://trochim.human.cornell.edu/selstat/ssstart.htm) and a host of mathematical practice, and teaching tutorials (see http://www.quasar.ualberta.ca/) to which students can be directed. The same is true in many science areas. Scaffolding for the unprepared student is limited only by the amount of time the teacher wants to invest, in most cases.

Student Created Materials: More experienced students can create material which are designed to help less learning sophisticated students. Student-created material can be posted to their own or the class Web page, which provides an authentic audience for the older student and provides level-appropriate materials for educationally younger learners (James, 1997). See http://www.soc.hawaii.edu/~leonj/leonj/leonpsy/gc/intro.html. Students could contribute to this teaching and learning archive, which could be accessed by other students.

Visuals, Illustrations and Simulations: Resources on the Internet can be used to help students see information in ways that are not available in the traditional classroom. A search of the Internet will provide many illustrations of things, such as, art objects, tools, experiments, etc., which students might need to see to facilitate their learning and their motivation to learn. These illustrations can be linked in an explanatory way to existing classroom content, and may be simplified for easier visual understanding. Pictures of realia (real things/objects), in a variety of settings can be accessed and shown, sometimes with motion. There are a variety of simulations, which are available, which may help special learners. The Virtual Frog Dissection (see http://george.lbl.gov/ITG.hm.pg.docs/dissect/info.html) shows a full dissection conduced on screen. There are simulations in simplified breeding experiments. e.g., the Virtual Fly Lab (see http://cdl-flylab.sonoma.edu/) which may be useful in agricultural areas. There are simulations on classical Pavlovian conditioning to illustrate how people learn see http://www.users.csbsju.edu/~tcreed/wcb/pavdemo.html . There are many educational animations for students that teach them about economies, towns, human groups and the like. Learners can experiment with and control of inputs of these animations to see different outcomes. There are a variety of morphed simulations in which, for example, a person ages on the screen or changes in some other way. Simulations are useful to illustrate processes, which take place over long periods of time. For many learners, these kinds of processes need to be illustrated iconically before they are presented symbolically (in text) if they are to be understood. Finally, text can be presented in a variety of ways, which are not available in a traditional print-only environment. The teacher, for example, can highlight electronic

material which has been downloaded or scanned to point out key terms, major concepts, answers to questions at the end of the chapter, specific important content, etc. Some of these techniques have been done in earlier, non-electronic settings with highlighters of different colors, for learning disabled students. However, when this is done electronically different lessons and projects can be used with the same text without expending books.

Stages of Learning with Facilitation: Those who study learning, from a constructivist view, describe four stages of facilitated learning (or teaching). First, there must be orientation where the learner is exposed to the new information and the new information is related to the learner's prior knowledge. See this through the development of the Visible Human Project at http://www.nlm.nih.gov/research/visible/visible_human.html. Then, if the learner is unable to assimilate and accommodate the new information, there is a period of coaching or apprenticeship where the facilitator and the learner think conjointly, and the facilitator provides scaffolding as is necessary for the learner to absorb the new information and transform it. Then there is tuning, where the learner refines the information and insures that he/she knows it in a way that allows it to be usable in authentic situations. Finally, there is a period of practice with supervision being faded in a behavioristic sense, which leads to autonomy of behavior. The behavior is routinized. The learner knows how and when to use the information and can do it effectively without external prompting.

Coaching in Collaborative CML: Coaching in CML is a process of providing hints, cues, and feedback. See directions for coaching at http://www.topten.org/content/tt.BL17.htm. Peers or teachers can accomplish it. The coach observes the learner and provides scaffolding when it is needed. Not too much coaching should be given. If a coach is providing most of the activity the learner may not be at the appropriate development level in terms of this particular content. The coach can use coaching to provide, or remind about the use of a strategy or technique, as well as the direct teaching of the technique. When coaching is done the learner should retain control of the activity as it is assumed that the student will maintain responsibility for the learning. This can be clearly seen in CML tutorials, http://vearthquake.calstatela.edu/edesktop/VirtApps/VirtualEarthQuake/VQuakeIntro.html.

Scaffolding in Groups: Teachers can provide scaffolding, but after collaborative groups have been working together for a while there will be little need for external scaffolding. Groups should not seek out the teacher for scaffolding unless they cannot scaffold each other. This is the measure of a well functioning group. Groups should only ask for scaffolding when their own internal resources have been exhausted. If teachers do to much scaffolding much of the value of the collaborative experience designed to help them work together solving authentic problems, will be lost. For issues related to setting up group discussions, which can be used to provide scaffolding, see http://builder.cnet.com/Servers/Threads/index.html.

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