

THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN SCAFFOLDING INSTRUCTION

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Abstract: *Scaffolding is a relevant construct in conceptualizing the student-teacher interaction and designing qualitative learning environments according to the socio-cultural theory of Vygotsky. However, in the area of scaffolding, research is not very smooth mainly because scaffolding is a dynamic process that takes place in the teacher-student interaction and is highly contextualized, thus it is hard to identify the unit of analysis and to differentiate between scaffolding and other interactions. In current education, there is a high tendency to use information and communication technology (ICT) in designing learning environments. The present article aims to answer the question if ICT is an effective tool in scaffolding by looking at studies investigating scaffolding and the role of ICT in learning.*

Keywords: *scaffolding, ICT, motivation*

1. The investigation of scaffolding interactions

The term is used to explain how support is gradually removed in the learning process according to socio-cultural theory of Vygotsky. There is not a common accepted definition of scaffolding. However, contingency, fading and transfer of responsibility are key characteristics. Contingency refers to adapting the educational intervention to the level of the student. The support will fade as the child becomes more competent and the responsibility will be transferred from the teacher to the student. Until now, the scaffolding focused more on the cognitive and metacognitive level and less on the students affect. The main finding across different studies is that scaffolding is an effective tool¹. However, because there is not yet consistent agreement regarding what the construct means, there are difficulties in measuring it².

Van de Pol, Volman and Beishuizen developed a framework to analyze scaffolding strategies such as feedback, hints, explanations, modeling, and questioning. All these strategies can be used only if the teacher knows the students and constantly pay attention to their reactions during the learning process. A strategy is considered relevant only if it is perceived as a strategy by students also. For instance, if the teacher addresses the right questions but the students do not perceive and understand teacher's intentions, therefore they do not respond, scaffolding does not take place.

¹ Janneke Van de Pol, Monique Volman, Jos Beishuizen, Scaffolding in Teacher-Student Interaction: A Decade of Research. *Educ Psychol Rev*, 22, 2010, 271-296. DOI 10.1007/s10648-010-9127-6

² *Ibidem*.

The strategies used in scaffolding address either the cognitive or metacognitive level or the affective level of learning activities. For instance, when the teacher helps the student to stay on target and to follow objectives, the metacognitive level is targeted. Students are easily distracted by contextual stimuli. Therefore, teacher has to make sure they are staying on task. The material that is taught must be presented in an organized way. Also, zone of proximal development should be considered to make sure children are in the comfort zone, the task in neither too easy not too hard. Students should be aware of what will be taught and why. Increase of freedom should come as a reaction to children's understanding and increased autonomy. Concerning learners affect, the authors propose that a distinction should be made between the development of interest and the control of frustration and other negative emotions.

Because scaffolding is highly contextualized, a must in research about scaffolding is that the investigated constructs must be operationalized at the student-teacher interaction level. In this context, grounded theory was a preferred approach to identify and categorize descriptions of scaffolding situations in the classroom. It generated many classifications depending on the key characteristics of scaffolding the researcher was focusing on. The authors of the review mentioned that this tendency of focusing on descriptive studies illustrated the stage of research in scaffolding. However, the diversity of descriptives regarding scaffolding set the stage for the next step which would be a top-down approach in exploring the effectiveness of scaffolding.

2. The role of motivation in the scaffolding process

Children differ in their motivational orientations. Unfortunately, the learning task is not the only aspect children are interesting in. Sometime, their focus is on being accepted by the peers and the teacher. In this case, children might excessively seek for help or ask for confirmation of their actions asking for more support than they actually need. Some children might be excessively ego defensive so they will be prone to see the school tasks as threats and will try to avoid them. Jiang, Vauras, Volet & Wang³ consider that these tendencies do not act like traits but rather like dynamic states that interact with each other. The authors analyzed these tendencies both at the micro-genetic level (situational) and long-term developmental level. They argue that these dispositions are learned in early years during interactions in daycare and family context.

The authors were interested to explore individual differences in low school performers and found that motivational orientations are related to academics. They explained that low performing students are trapped into a vicious circle. Maybe because they acknowledge their failure, they start using ego defense mechanisms or

³ Jingwen Jiang, Marja Vauras, Simone Volet, Yili Wang, Teachers' emotions and emotion regulation strategies: Self- and students' perceptions. *Teaching and Teacher Education*, 54, 2016, 22-31. DOI:10.1016/j.tate.2015.11.008

socially oriented motivational dispositions. In this context, scaffolding might be an effective tool in redirecting the attention towards the task. For this to be effective, the teacher has to identify and to use the students' instructional level in designing the learning tasks. In a longitudinal study, Marja Vauras (et al.)⁴ showed that 4th grade students can benefit from training at both cognitive-metacognitive and emotional- motivational level. Further, three case studies illustrate that scaffolding failed when the child had high levels of ego defensive behavior. The developmental mechanisms behind the children's tendency to rely excessively on social support or to avoid the tasks seem to be an unbalanced combination of cognitive, motivational, and socio-emotional domains. If scaffolding is not correctly used, especially low achieving students either start relaying on adults or start avoiding the tasks. Their maladaptive behavior is sometimes feed by adults if they are overprotective or use coercion to force the child to do the task.

3. ICT in the scaffolding process

Information and Communication Technology (ICT) can be an effective tool in supporting instructional scaffolding. Immediate feedback, individualized learning pace, accessibility and customization are some characteristics that enable educators to create responsive learning environments that support individualized instruction, making ICT a wonderful candidate in instructional scaffolding. However, there are some false beliefs that might overestimate the role if ICT in learning and might have implications in scaffolding instruction as well. In an article published in 2013 in Educational Psychologist journal, Kirschner and van Merriënboer⁵ brought scientific evidence to demolish three such legends: learners as digital natives, learners with specific learning styles and learners as self-educators.

The first myth consists on beliefs that because children use technology from very early in life, they naturally develop cognitive and metacognitive skills needed for effective regulation of own learning process and they become skilled in using technology. However, research data does not seem to support these assumptions. Concerning learning, students use ICT mostly to read information or write power point presentation. Moreover, it seems that in the process of information searching, students are driven by the links and not by a mental plan. This is called "butterfly defect" according to Salomon and Almog (1998)⁶ and it seems that it leads to artificial network of knowledge. Also, studies concerning teaching activity, more specifically using power point in university settings suggest that this is not related to

⁴ Marja Vauras; Pekka Salonen; Erno Lehtinen; & Riitta Kinnunen, Motivation in school from contextual and longitudinal perspectives. In M. Wosnitza, S. A. Karabenick, A. Efklides, & P. Nenniger (Eds.), *Contemporary motivation research: From global to local perspectives* (pp. 1–23). Hogrefe & Huber Publishers, 2009.

⁵ Paul Kirschner & Jeroen van Merrinboer, Do Learners Really Know Best? Urban Legends in Education. *Educational Psychologist*, 48:3, 2013, 169-183, DOI: 10.1080/00461520.2013.804395

⁶ *Apud* Paul Kirschner & Jeroen van Merrinboer, *Op. cit.* p. 171.

significantly better learning outcomes⁷. Professor Bent Meier Sorensen from Copenhagen Business School published an article called “Let’s ban PowerPoint in lectures - it makes students more stupid and professors more boring.”⁸ The main idea of the article is that critical thinking cannot be developed with previously prepared bullet points.

Another false belief is that learning styles can be diagnosed and teaching can be done accordingly. Students cannot be characterized by only a particular style, different combinations of styles being present within one person. Moreover, most research uses self-report data assuming that students are aware of their learning styles. In addition, the authors argue that what students prefer might not be the best choice in the learning process. The variable invoked is the context such as the characteristics of the profession that sometimes imposes some constraints on learning particular complex skills. Then, Kirschner and van Merriënboer mention the study conducted by Coffield et al. (2004) in regard to an impressive number of 71 different learning styles used in different research papers. This is rather unrealistic as a method to classify individuals when so many classes can be used. It probably reflects the complexity of the phenomenon. Research focusing on matching the teaching style with the students learning style seem to show inconclusive results. The authors suggest that a more effective teaching tool in addressing differences among students is to focus on the level of expertise each student has when choosing effective strategies. Indeed, novices and experts benefit from different learning tasks. Focusing on prior knowledge provides a more realistic source of information on what can be effective in teaching.

The last false belief presented in the above cited paper concerns the idea that learners can regulate their learning with the use of technology. The constructivist approach pointing that teacher should not provide information to students but rather develop skills that can guide them in searching the needed information found a very fertile soil in the rather new growth of access to any kind of information. The authors argue this is rather risky because students often do not have the skills or the motivation to critically read the information found on the internet. Besides not having the background knowledge that could guide the selection of keywords used in google search for instance, another risk is the availability of already formed opinions that can replace the own thinking process and “save” time for the very busy student. The authors demolish most of the myths by arguing that students maybe do not have the needed skills to distinguish between relevant and irrelevant or fake information. This might be a decision-making problem where not only cognitive skills are relevant but also emotional and social aspects play their role. In search for fast answers, students might not be motivated to question the source of some news

⁷ Russel Craig & Joel Amernic. Power Point Presentation Technology and the Dynamics of Teaching. *Innovative Higher Education*, 31(3), 2006, 147-160. DOI:10.1007/s10755-006-9017-5

⁸ Bent Meier Sørensen, Let’s Ban PowerPoint in Lectures: It Makes Students more Stupid and Professors more Boring. 2015, <https://theconversation.com/lets-ban-powerpoint-in-lectures-it-makes-students-more-stupid-and-professors-more-boring-36183>

they found or an opinion that might not be sustained by facts. Peer pressure and peer modeling can influence how students treat the web information. Decision making does not involve only cold cognition. Teachers' role is to design instructional tasks that help the students realizing how misleading sometime the information on the internet is. The authors suggest some strategies teachers could use, such as shared control and second-order scaffolding.

4. Implications in designing learning environments that foster scaffolding instruction

To support successful instructional scaffolding, ICT might need to get fundamentally involved in the infrastructure of learning so that the whole pedagogy should be rethinking. There is a lot of talking about ICT, plenty of training programs for the teachers who apparently embrace this reality of ICT in the class. However, when implementing it, teachers might prefer just a surface approach that would not be in conflict with old and well implemented teaching traditions and beliefs. For instance, they could use technology to illustrate the content they teach without really changing their teaching or they could develop assignments that involve students searching the internet for information without really teaching students how to search effectively. Thus, they are staying in their comfort zone, a rather understandable attitude when considering the complexity of the ICT phenomenon that might question core aspects of teaching and learning. Luckily, students are really open to implementing technology in their learning. In time, they might be the ones who will force the change in mentality around the concept of learning in the digital area. However, as mentioned by Kirschner & van Merrinboer⁹ students are tempted to choose the easier solutions not the ones they could benefit most. They need guidance and they need critical thinking skills to select the information they use and to stay away from negative or irrelevant media influences. Maybe, until more is known about how ICT should change or is changing the pedagogy, teachers could focus on students' metacognitive skills to instrument them to be well prepared to wisely interact with ICT. There is enough research on how to develop critical thinking skills¹⁰ and this is something teachers can do despite their potential resistance to ICT. Also, ICT should not give students too much freedom they might not know how to handle.

⁹ Paul Kirschner & Jeroen van Merrinboer, *Op. cit.*

¹⁰ R. T. Pithers & Rebecca Soden, Critical thinking in education: a review. *Educational Research*, 42 (3), 2010, 237-249, DOI:10.1080/001318800440579.

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