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Constructivism in Theory and in Practice

For a number of years, we have included elements of constructivism in our EFL courses at Tel Aviv University. We came to realize, however, that although we were applying the approach in our classrooms, we were using traditional instructivist methodology in our workshops for teachers. We found that our workshops were controlled by the trainers and were not sufficiently based on the needs of our teachers as learners. Our awareness of this inconsistency led us to transform our approach to teacher training. This article describes this transformation and the benefits that accrued from our change in focus.

To provide a perspective for our changed direction in teacher workshops, we first discuss the concept of constructivism. We then describe two applications of a constructivist approach to learning, one in advanced university EFL courses and the other in an in-service workshop for university EFL teachers. The last section describes the process of discovery the authors and workshop participants experienced as a result of the changes made.

What is constructivism?

Constructivism is a theory of learning which posits that students learn by actively constructing their own knowledge (von Glasersfeld 1996; Fosnot 1996; Duffy and Cunningham 1996). According to von Glasersfeld (1995, 5), "Concepts cannot simply be transferred from teachers to students—they have to be conceived." Learning is a process that involves active construction and not passive acquisition (Duffy and Cunningham 1996). Thus, in constructivism, the familiar and inaccurate metaphor of the mind as a container waiting to be filled is replaced by the metaphor of the mind as an agent actively seeking to satisfy its curiosity and resolve troubling issues. Further, knowledge under constructivism is not seen as a commodity to be transferred from expert to learner, but rather as a construct to be pieced together through an active process of involvement and interaction with the environment. Under constructivist theory, learners would use available building blocks to construct knowledge that is viable

and meaningful for them in an ongoing process of construction, evaluation, and modification of constructs (von Glasersfeld 1983). Their developing knowledge is shaped by the activities in which they are engaged, the context of the activities, and the enveloping culture (Brown, Collins, and Duguid 1989).

Two approaches

Two main approaches to constructivism are cognitive constructivism and social constructivism. The former is associated with the work of Piaget and the latter with that of Vygotsky. The two approaches are not mutually exclusive, as underpinning both is the belief that students learn by constructing their own knowledge. However, the main emphasis in the two approaches is different. Cognitive constructivists concentrate on the importance of the mind in learning, whereas social constructivists focus on the key role played by the environment and the interaction between learners. Thus, although Piaget did not reject the role of social interaction, his main purpose was to shed light on the development of cognitive structures in learners. Vygotsky, on the other hand, focused on the effect of social interaction on learning, yet in no way did he deny the cognitive role (Fosnot 1996).

Piaget used the terms *accommodation* and *assimilation* to describe the interplay of mind and environment in the learning process (Gleitman 1987). According to Piaget, learners use their cognitive structures to interpret the environment. In doing so, they assimilate new information into their existing cognitive schemas, understanding the information only to the extent allowed by the existing schemas. At the same time, the cognitive structures of learners change as they interact with the environment. The new information assimilated into the cognitive structures leads to the modification of these structures. Piaget views the cognitive structures as accommodating to the environment. Thus learning is an ongoing process involving continual interaction between the mind and the environment, an interaction which is never completed. In Piaget's words (as quoted in Fosnot 1996, 18), cognitive structures are continuously "under construction."

Vygotsky, while not underestimating the role of individual cognitive structures in learning, argued that the social, interpersonal aspects of learning precede the individual, intrapersonal aspects (Confrey 1995). He emphasized the social origin of cognition and the effect of social interaction on learning (Duffy and Cunningham 1996; Fosnot 1996). This dialogic nature of learning became a central focus of study for Vygotsky.

The debate over the relative influence of cognitive structuring and social interaction on learning continues. Lewontin, Rose, and Kamin (as quoted in Fosnot 1996, 24) say: "Society does not think; only individuals think." Yet, we cannot possibly understand how individuals think without an appreciation of the cultural context in which their thoughts developed. Thus, cognition and cultural influences are inextricably entwined; both are involved in the process of learning and have implications for education.

Wood (1995) claims that constructivism offers a potentially powerful way to rethink education practice. We agree, and we offer some guiding principles and new directions that the theory suggests with respect to educational methodology and the construction of instructional materials. Following are some of these principles and suggestions:

- Since learning is an active process of knowledge construction, the learning environment should not impart knowledge but rather support the learners' construction of knowledge. It follows that learners should be exposed to materials, experiences, and situations from which they can inductively build their own knowledge.
- Since dialogue, discussion, and interchange affect learning, teachers should allow for activities requiring communication and exchange of ideas.
- Since meaning varies across learners, teachers should not expect consistency (Hannafin 1997). Rather, they should attempt to view students' work from the students' perspective, be aware of their own preconceptions, and understand the differences between the world of the learner and the world of the expert (Wood 1995). Moreover, student errors result from their non-expert, nascent conceptions and can be utilized as motivation for further exploration (Fosnot 1996).

- If, as Piaget claims, learning results from a need to return to equilibration after disturbance to a system, teachers need to create a learning environment that leads students to disturbance—perhaps by asking a question requiring thought or research—and then provides resources through which the students can resolve the disturbance and return to equilibration.
- Under constructivist theory, students need to reflect on what they are learning in order to integrate chunks of new knowledge into existing knowledge and thereby achieve synthesis. Such conceptual learning will not occur in a stimulus-response teaching environment but rather in an environment that encourages reflection and abstract thinking (von Glasersfleld 1995). To fine-tune their knowledge-building skills, students also need to reflect on the learning process itself so that they are aware not just of *what* they are learning, but also of *how* they are learning.
- Construction of knowledge leads to authentic learner authorship and ownership. The knowledge becomes part of the learner, and the learner emerges empowered. Courses should therefore support a learner-centered, task-based curriculum, which will encourage knowledge construction.
- Learning and classroom interaction cannot be totally scripted, since constructivist teaching requires teachers to respond spontaneously to student confusion and discovery (Schifter 1996). Thus, teachers should not attempt to plan lessons down to the finest detail; instead, they should leave time for the spontaneous interactions that can be instrumental in the learning process.

EFL issues

Language learning involves learning word meanings and internalizing the structure of the language. This information is not always connected in a logical or associative fashion that would enable students to easily derive associations from a set of principles. Other than knowledge of L1, no background information can help them construct knowledge of L2. But the constructivist approach can facilitate language learning by giving students choices and by providing language practice that is interesting and meaningful. Moreover, because student errors are viewed as part and parcel of interlanguage under the constructivist approach (Krashen 1982), students are encouraged to experiment freely with the language.

In content-area courses, students construct knowledge related to the specific content area studied. In language courses, the situation is different: students construct two kinds of knowledge simultaneously—content knowledge and knowledge of the language. This is particularly true in content-based EFL courses in which the teaching materials are organized by content topic. Conscious reflection on the language may help learners construct knowledge of the language.

Constructivism in the classroom

Making room for constructivism in our curriculum

Constructivism implies the construction of knowledge, and it is our claim that construction requires more time than instruction. To illustrate this point, let us consider a few examples of educational objectives in an advanced English for Academic Purposes (EAP) curriculum and compare how they might be implemented in constructivist classrooms (Brooks and Brooks 1999) as opposed to traditional or instructivist classrooms. The differences between the two approaches are sometimes blurred, particularly when the teacher adopts an eclectic approach (as many do). For example, a teacher may embrace instructivist methodologies for teaching but constructivist methodologies for assessment. At the risk of presenting an oversimplified dichotomy, in Table 1 we attempt to give concrete examples of how the two pedagogical approaches may materialize in an EAP course. The examples presented in the table are not inherent aspects of constructivist or instructivist classrooms but rather typical manifestations of each approach. For example, although there may be student choice of reading materials in an instructivist classroom, student choice, which is likely to result in increased student involvement with the content and higher motivation, is more common in a student-centered approach.

Table 1: Sample goal implementation in instructivist and constructivist classrooms

Sample Objectives	Instructivist classroom	Constructivist classroom
Dealing with factual information	The reading material is usually chosen by the teacher. Questions to accompany the text are prepared by the teacher. Main emphasis is on the correct answer (product orientation). Assessment is usually straightforward and quick, since it only requires comparison against an answer key.	Several reading sources or choices are given. Students choose what to read. Generic questions that can fit a variety of texts are provided for students to apply to their specific texts. Student-initiated questions are encouraged. Main emphasis is on the strategies employed to obtain the answer (process orientation). Assessment requires familiarization with multiple texts (chosen by the students) and assessment of a variety of responses, and is therefore time-consuming.
Comparing sources of information	Material to be compared is provided by the teacher. Criteria for text comparison are given. Answers are compared against a list of desirable responses. The whole instructional process is "fast," "painless," and "efficient."	One of the texts may be given; at least one other is chosen by the student. Some criteria for comparison are given, but additions are encouraged. There is a whole range of possible answers, and "correctness" criteria are flexible. The process takes longer and may appear "less efficient" than in the traditional classroom.
Identifying bias	Assessment of author bias is given or prompted by the teacher, expecting a specific "correct" response.	Assessment of author bias is elicited. Elicitation usually takes longer than instruction, and duration of activity is unpredictable.

As is evident from Table 1, the instructivist classroom can cover more ground, since no time needs to be factored in for students to access and select resources or to initiate questions and critically evaluate the sources. Similarly, no time needs to be factored in for the teacher or the class to evaluate a variety of responses relating to a variety of sources.

However, we believe, like Koschmann, Myers, Feltovich, and Barrows (1994, as cited in Greening 1998) and Greening (1998) that a fast pace may come at the expense of reflection and experimentation and that efficiency is a double-edged sword. Effective learning entails the internalization of knowledge and the ability to apply it in a variety of situations. Effective learning is not necessarily efficient, and the process of construction requires time. In other words, transmission is probably less time-consuming than discovery and absorption and therefore may appear to be more "efficient"; but if we are interested in effective learning, we need to allot time for that purpose.

Making room for constructivism requires flexibility and the willingness to preplan only a generic curriculum. A generic curriculum includes the main points that need to be covered in the course but is not rigidly predetermined. Instead of listing all of the content to which the learner will be exposed, a generic curriculum typically lists the strategic knowledge that needs to be learned and leaves room for a variety of sources to which this strategic knowledge could be applied. It is a challenge for the teacher to leave these "empty" spots in the curriculum, but in an approach in which the students are responsible for their learning, the spots can be filled by the students with the assistance or guidance of the teacher.

In contrast to the flexible and open curriculum that leaves room for constructivism, a rigid course outline forces the teacher to follow it, and the teacher may be afraid to

let go of certain curricular items for the sake of others. The transmission model goes well with the fixed curriculum, which is teacher-centered. In the instructivist curriculum, the instructor may use expressions such as "I have covered…," or "I taught…" instead of expressions such as "The students did…" or "The task included.…" The emphasis is on delivery of instruction rather than on task performance and knowledge application. In the constructivist model, on the other hand, there is less emphasis on the detailed listing of content areas to cover and more emphasis on the design of tasks that will allow students to develop their own knowledge.

Flexibility and the Internet

Flexibility seems to be the key concept in a constructivist approach. This includes cognitive flexibility (Spiro, Feltovich, Jacobson, and Coulson 1991), task flexibility, and curricular flexibility. We believe that the Internet can contribute to the first two types of flexibility. According to Spiro et al. (1991), cognitive flexibility consists of the ability to look at reality from a variety of viewpoints and then construct knowledge from all these different representations. This kind of flexibility can be facilitated by the use of hypertext, due to its multidimensional and non-linear nature. Task flexibility implies multiplicity, that is, multiple tasks, multiple options within a task, and multiple modes of representation, including, for example, visuals and sound. When there is task flexibility, students have the opportunity for individual choice, autonomy, multiple pathways, expansion of topic, access to background information, etc. The task is the interface between the Internet and the curriculum. Tasks can also be made flexible by allowing students to go beyond the resources originally provided and to choose a path of their own. In addition, the medium allows teacher-learner and learner-learner interactions before, during, and after performing a task. These interactions can serve a variety of purposes: cooperation in performing the task, exchange of ideas or findings, feedback, clarification, and evaluation.

The third type of flexibility, curricular flexibility, is supported by the immediacy of access to Internet resources, providing a rich library at the learners' fingertips, which helps build a pool of shared knowledge. In the past, even if teachers wished for curricular flexibility, they were bound by access constraints. The possibility of retrieving a variety of materials immediately allows the instructor to be responsive to the needs of the class as they arise and to make room for experimentation with student choice and preference.

Constructivism in the in-service workshop

The language learning center of the Division of Foreign Languages at Tel Aviv University was established in the late 1980s. The academic staff of the center is in charge of the pedagogical orientation of the center, educational software evaluation, research, development of online learning materials, and in-service teacher training to promote the use of computers in the classroom. The computer training exposes teachers to new electronic resources and tools and provides them with guidelines for integrating electronic resources with course syllabi as well as with implementation schemes. As center staff and EFL teachers, we continually seek ways to integrate information technology (IT) into our own courses.

For many years the attitudes of our EFL colleagues concerning the use of computers in language classes were varied. Some were intrigued by the possibilities offered by the new technologies, while others were not convinced of their benefits. Some found the use of computers difficult and frustrating. Typical comments were "I'm just no good at this!" or "It's easier or quicker for me to write it out by hand." Others resisted what they saw as the intrusion of additional material into a curriculum that they had worked hard to develop and viewed as already full and "complete." Still others feared a loss of face: "My students are much better at computers than I am. I'll look ridiculous or incompetent."

Integration of the technology requires the development of a philosophy and clear objectives, tasks to meet the objectives, and the seamless fit of the tasks into the curriculum. Very quickly we (the team) became aware that without effective training, IT would never be more than a marginal component of our courses. Assimilation of new ideas and methods takes time and, above all, training.

Over the years, we planned, organized, and implemented many teacher-training sessions, from workshops on DOS-based programs to sessions on the use of the Internet in our classes. With few exceptions these sessions were voluntary, and the attendees consisted of a small core group of motivated teachers.

Most of our teacher-training sessions were designed according to the instructivist paradigm of knowledge transfer, followed by hands-on practice. This methodology satisfied the cognitive aspects of the training, and also involved the teachers in the development of tasks. Thus, the second part of each session implemented learning by doing.

After years of instructivist sessions, however, we realized that some teachers felt our workshops were not helping them enough, and we decided to address this issue. Our underlying assumption, that clear explanation and well-designed practice would transform our teachers into instant competent consumers of technology in teaching proved to be unfounded. It may be that we overlooked the varied learning needs and styles of our fellow teachers. Even teachers who were reaching out to us often experienced frustrations and occasionally became discouraged. Fortunately, they voiced their concerns, which helped us modify and adapt our training to better fit their needs.

A change to a constructivist workshop

After an eye-opening workshop in which our colleagues freely expressed their doubts and questions, we realized we had to change the methodology of our training workshops. But to what? A fleeting moment of insight and the direction was there: We would conduct the next workshop the way we would conduct a constructivist classroom session.

In constructivist learning environments, group discussion is considered critical for understanding. In fact, it has been argued (Duffy and Cunningham 1996, as cited in Lefoe 1998) that learning is a "social, communicative and discursive process, inexorably grounded in talk," echoing the importance of dialogue voiced by Freire (2000) and Vygotsky (1986). Accordingly, we prepared a list of questions that teachers had asked. (See Figure 1.) At the workshop we suggested that the teachers discuss and then write their answers to the questions in small, self-selected groups and then share their answers with all the participants.

The teachers sat in groups of four or five, allowing for active participation on the part of all members of a group. We also participated in the groups, not as leaders or mentors, but in the same capacity as every other teacher. The group discussions lasted 45 minutes and were lively, as all the teachers were stimulated by the interaction. After these discussions a spokesperson for each group presented their doubts, reservations, insights, and conclusions concerning web-enhanced courses and the integration of Internet-based tasks into the curriculum. The whole-group discussion that followed was constructive, and the exchange of

Figure 1. Workshop handout with questions posed by teachers

Creating Internet-based tasks and integrating them into our courses

Developing the tasks

1. Why should we do the task at the computer rather than using hard copies of the material from the Internet? What can the Internet offer as a resource?
2. What are the unique characteristics of an Internet-based task? What kinds of tasks are suitable and worthwhile?
3. How is developing an Internet-based task different in planning, focus, and methodology from developing a classroom-oriented task?
4. How do we connect the task to what we usually do in class? How does the task relate to the classroom text/topic?

Using the tasks

5. How do students carry out the task? How do they manage with multiple "displays" and media?
6. How do they carry out cooperative tasks in pairs or small groups outside of class?
7. How do we motivate students who are anti-computers?

ideas led to the commitment to try to incorporate web-based elements into our courses.

At the end of the session, no one was in a hurry to leave, and many remained to continue the discussion. Subsequently we received phone calls and emails in which the participants thanked us for the workshop, expressed deep satisfaction with the results, and told us that they had successfully implemented some of the ideas that emerged from the workshop.

The workshop was exciting, provocative, and productive. Figure 2 reveals the insightful and rich nature of the participants' suggestions made during the workshop. These were subsequently collated and posted in the virtual teachers' room for further reference.

Figure 2. Summary of teachers' answers

1. Reasons for doing a task at the computer rather than using hard copies of material printed from the Internet

- We can save money and trees.
- Revising and updating are accomplished more easily, efficiently, and economically.
- We can save a great deal of effort and time because there is no need to print, photocopy, carry, and distribute handouts.
- The Internet can be a valuable resource for such things as online dictionaries, thesauri, search engines, animations, audio and video, and it can provide updated information related to the texts in the course booklet.
- Accessibility: The material is available anytime and anywhere. This is especially important for students who missed class or lost some pages.
- The links are live. (On the printed page they aren't!)
- Constructivism: Students have the opportunity for individual choice, autonomy, multiple pathways, expansion of topic, background information, etc.
- Authenticity: Students have access to authentic materials, and by using the Internet they perform a more "authentic" task.
- The Internet task gives students a sense of achievement.
- The task provides variety.

2. Unique characteristics of Internet-based tasks

- Through search engines and the use of multiple sources, students can do comparison and synthesis easily.
- Students can investigate a wide variety of sources for reliability and bias. This is particularly beneficial for critical reading.
- An extremely wide range of materials is available. There are no limits to where the students can go and what they can find.
- The tasks are likely to encourage spontaneous reactions and subsequent student interactions.
- The Internet allows synchronous, real time chats, for example, as well as asynchronous, delayed teacher-learner and learner-learner communication, such as email or forums, even when the participants are not physically together. Such forms of communication can further cooperation in performing a task, enable greater exchange of ideas or findings, and improve peer and teacher feedback, clarification, and evaluation.
- The tasks allow for flexibility; students can go beyond the resources originally provided by following hyperlinks.
- The focus is on process. Tasks can include a fairly complex progression of steps, moving from one to the next, and from one source to another to reach the final goal of the task.
- Tasks can include visuals and graphics.
- Tasks can incorporate the use of current information, such as news.

3. Differences in planning, focus, and methodology (from classroom-oriented tasks)

- Internet-based tasks allow students to construct their own meaning rather than being spoon-fed.
- The teacher has less control, and this has to be taken into account in the lesson planning.
- Planning and methodology need to provide for student autonomy.
- Internet tasks should be planned so that they have well-defined products.
- Modeling or "how-to" demonstration should precede student work on Internet tasks.
- It is possible to develop generic questions or a template, which can be applied to a variety of Internet sources.
- Teacher should provide at least some initial links to quality Internet sites and check in advance to make sure they work.

4. Relating Internet tasks to classroom texts, topics, and activities

- The Internet can supply concrete examples and illustrations for the texts or teaching points used in class.
- The Internet can be used to expand topics, update materials, and introduce a variety of media to classroom tasks.

5. How students manage with multiple displays and media

- Students in groups can do an oral presentation (perhaps using PowerPoint) or they can produce a written report.
- The task can be on paper, online or both. Students should be taught how to toggle between pages and applications.

6. How students can do cooperative tasks in pairs or small groups outside of class

- Email
- In a lab on campus
- At someone's house

7. Motivating students who are anti-computers

- Offer extra credit or incentives.
- Have them work with someone who is computer savvy.
- Allot class time for learning and practice.

Reflections

In what ways did the workshop reflect a constructivist approach and thereby facilitate teacher learning? It did so primarily, we believe, by replacing the traditional role of "instructor" with that of "gentle guide." Instead of imparting information, we saw our role as teacher-mentors and our job as setting a task and implementing it. As illustrated by our workshop for the teacher-learners, those of us guiding the session and applying a constructivist approach needed expertise beyond content knowledge. For example, in working with small groups and in customizing tasks to fit learners, we needed to be able to accommodate different learning styles and backgrounds, ensure that participants less comfortable with technology could contribute to the workshop and learn from it, and lead our teacher-learners to their own discoveries through reflection and dialogic activity with their peers.

Contributing to the success of the learning experience for the participants was the fact that they themselves suggested the questions on which the workshop would focus, thereby increasing the authenticity and relevance of the task. This is consistent with Freire's principle of "problem posing" (2000), wherein asking questions is one of the initial tasks a learner must engage in. Just as other learners, the teacher-learners in our workshop needed to be able to internalize what they learned and make that knowledge part of their personal store of knowledge before they could understand, justify, or implement the use of technology in their courses. Our teachers seemed to have achieved ownership of the concepts discussed in a way never achieved in previous instructivist workshops.

The different points of view of the participants as reflected in the workshop discussions were in line with the lack of consistency mentioned by Hannafin (1997). There was obviously no one correct answer for any question, but the different points of view all contributed to the collective answers produced. The disturbance produced by the teachers' uneasiness in trying to use the new technology was reduced during the workshop discussions, as can be seen in the answers shown in Figure 2.

Our in-service session focused on the use of technology in the classroom. We believe that for any new technology to impact education, the teacher needs to function as a user-friendly interface between the student and the technology—on one side receptive to student needs, on the other aware of the potential uses of the technology.

A learning environment based on constructivist principles and methodology can enhance learning, whether the class is composed of student learners or teacher learners. Teachers

training in a constructivist environment may well find that their own learning experience has a beneficial wash-back effect on their pedagogy and methodology.

References

Brooks, J. G., and M. G. Brooks. 1999. *In search of understanding: The case for constructivist classrooms* (revised ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Brown, J. S., A. Collins, and P. Duguid. 1989. Situated cognition and the culture of learning. *Educational Researcher* 18 (1): 32–42.

Confrey, J. 1995. How compatible are radical constructivism, sociocultural approaches, and social constructivism? In *Constructivism in Education*. ed. L. P. Steffe and J. Gale, 185–225. Hillsdale, NJ: Lawrence Erlbaum Associates.

Duffy, T. M., and D. J. Cunningham. 1996. Constructivism: Implications for the design and delivery of instruction. In *The handbook of research for education and technology.* Indiana University.

Fosnot, C. T. 1996. Constructivism: A psychological theory of learning. In *Constructivism: theory, perspectives and practice.* ed. C. T. Fosnot, 8–33. New York: Teachers' College Press.

Freire, P. 2000. *Pedagogy of the oppressed.* New York: Continuum.

Gleitman, H. 1987. *Basic psychology.* New York: W. W. Norton and Company.

Greening, T. 1998. Building the constructivist toolbox: An exploration of cognitive technologies. *Educational Technology* 38 (2): 23–35.

Hannafin, M. J. 1997. The case for grounded learning systems design: What the literature suggests about effective teaching, learning, and technology. Paper presented at the ASCILITE Conference, Perth, Australia.

Krashen, S. 1982. *Principles and practice in second language acquisition.* Oxford: Pergamon Press.

Lefoe, G. 1998. Creating constructivist learning environments on the web: The challenge in higher education. *ASCILITE 1998 Conference Proceedings*, 453–64.

Schifter, D. 1996. A constructivist perspective on teaching and learning mathematics. In *constructivism: Theory, perspectives and practice.* ed. C. T. Fosnot, 73–91. New York: Teachers' College Press.

Spiro, R. J., P. J. Feltovich, M. J. Jacobson, and R. L. Coulson. 1991. Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. *Educational Technology,* 31 (5): 24–33.

von Glasersfeld, E. 1983. Learning as constructive activity. *Proceedings of the 5th annual meeting of the North American Group of PME.* ed. J. C. Bergson and N. Herscovics. Montreal.

—— 1995. A constructivist approach to teaching. In *Constructivism in education.* ed. L. P. Steffe and J. Gale, 3–15. Hillsdale, NJ: Lawrence Erlbaum Associates.

—— 1996. Introduction: Aspects of constructivism. In *Constructivism: Theory, perspectives and practice.* ed. C. T. Fosnot, 3–7. New York: Teachers' College Press.

Vygotsky, L. S. 1986. *Thought and language.* Cambridge, MA: M.I.T. Press.

Wood, T. 1995. From alternative epistemologies to practice in education: Rethinking what it means to teach and learn. In *Constructivism in education.* ed. L. P. Steffe and J. Gale, 331–39. Hillsdale, NJ: Lawrence Erlbaum Associates.

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