Constructivism: Is it All or Nothing?

Prepared for

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by

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After nearly three decades of teaching in a mathematics classroom, I have experienced a tremendous amount of change. Pedagogy, technology, and educational trends form the thrust of professional change, which in turn become the catalyst for personal change and growth. Even in a society of mass production, it would be reasonable to suggest that my beliefs, actions, and knowledge base are unique to me as an individual, as are those of any other person. If the main tenet of constructivist learning is that people construct their own understanding of the world, and in turn their own learning, (Ishii, 2003) then I, like everyone else am a constructivist. While that title may not be problematic, one would have to consider if the definition is too wide or too narrow.

Early proponents of constructivism, such as Piaget and Vygotsky, seem to suggest a narrow definition. Piaget’s work focused on young learners in which his formal operational period began at around age 11, when adolescents began to be able to think in an abstract manner. Vygotsky, with an increased emphasis on social factors and language, still required direct intervention in learning by a knowledgeable other, a teacher, in his zone of proximal development. Neither of these notions seems capable of encompassing a construction of personal knowledge on their own. A more radical view of constructivism proposed by von Glaserfeld suggests that knowing is not matching reality, but rather finding a fit with observations. This seems overarching, and hardly seems to match the reality of trying to have 30 teenagers understand some of the basic math concepts that are part of the narrow concept of their experiences and the larger needs of society. Clearly, a more substantial understanding of constructivism is needed.

Clements and Battista (1990) offer four key components of constructivism: knowledge is actively created, ideas are constructed through integration with existing knowledge structures, reality is a personal interpretation of the world, and learning is a social process. Matthews (19??) adds that language, especially mathematical language needs to be mastered, and at the end of the day, transmitted. Ernest (1996) promotes goal awareness, multiple representations, cognitive conflict
resolution, and metacognitive self regulation as pedagogical implications of constructivism. The National Council of Teachers of Mathematics (1989) has endorsed constructivism as the standard for the United States, suggesting that the traditional view of the learner as a passive recipient of information has given way to an emerging view of the learner as an active participant. This would suggest to me that constructivism is the active process of building new knowledge upon existing schema, in language and knowledge conflicts are resolved in a social situation. Since math is a cumulative, vertically structured discipline, and one learns math by building on the math that one has previously learned, I should conclude that mine is a constructivist math classroom.

Perhaps now is the time to reflect on past and current classroom practices before jumping to unfounded conclusions regarding constructivism? Reflection slows down activity, giving time for the reader to process (the) material of learning and links it with previous ideas (Moon, 2001). How many constructivist tenets occur on a daily, weekly, or monthly basis? Given that each student who enters my classroom demonstrates huge differences in mathematical skill level and knowledge at each grade level, each student is faced with a personal development of mathematical ideas. While not all classes involve group or cooperative learning, we do meet as a group; thus to some degree, learning takes place socially. Classroom discussions, where ideas are challenged, changed, and refined, both by me and fellow classmates, support constructivist ideals. Mathematics has always been accompanied by its own language and vocabulary, suggesting that all my students are bilingual, speaking at least two languages: math and English. Clements and Battista (1990) suggest that the role of a constructivist teacher is to support students’ invention of viable mathematical ideas rather than to transmit adult ways, but that has always proven to be problematic. While most students are encouraged and are able to present their own methods for solving problems, few have the scope or rigour necessary to solve a family of similar problems, thus leaving the solutions shallow and rigid. To a great extent, math involves many fundamental rules of procedure that must be followed, not unlike the set of rules used when driving a car. Without this structure, bedlam occurs on the streets and chaos in the classroom prevails.
Because I am new to constructivism, do my lessons follow constructivist principles? Pon (2001) reports that constructivism isn’t about a method of teaching, but rather a way of thinking about teaching and learning. Pirie and Kieren (1992) explain that a teacher must have the following basic underlying beliefs to successfully embrace constructivism:

- All students will not achieve the same goal.
- There are many paths to the same understanding.
- Everyone holds a different understanding.
- Learners construct their own knowledge.
- There are eight different levels of mathematical understanding for each topic.

While I may take issue with what the eight levels are, most of my lessons are built around those beliefs. With a mandate to adhere to the intended learning outcomes as prescribed by the British Columbia Ministry of Education, is it my duty to teach toward a constructivist methodology, or is it the policy makers’ responsibility to set curriculum to constructivist standards? New math curriculum, set to finally encompass grade 12 next year, has all grades following a standard set of general topics, measurement for example, and yet have taken all the spiralling of successive content out of the new math curriculum. It seems a contradiction of sorts, as the spiralling from grade to grade is the essence of building new knowledge upon existing knowledge with a clear understanding that each student is currently at his/her own unique point in that particular topic area. There is a belief that math educators almost universally accept that learning is a constructivist process (Cobb et al, 1992); however, pedagogical applications of constructivism in math classes are extremely rare in school (Boaler, 1998). This seems a fair assessment of my current classroom practices: I believe in constructivist learning principles, but have not yet adopted constructivist practices.

As I retrace my educational philosophy, two pillars are abundantly clear: pedagogy and relationships. In my experience, students learn the best when teachers have a strong and clear
understanding of the subject matter, and when they display a willingness to help, understand, and support their students, in both curricular and personal issues. Many researchers believe that teacher quality is by far the single most important determinant of student performance (Darling-Hammond & Falk, 1997). Like so many of my colleagues, I believe in constructivist learning principles, but am somewhat unsure how to employ them, or if they will actually work in the classroom.

One of the key roadblocks is time: time to study and research constructivist pedagogy, time to acquire open ended questions that foster knowledge building, time to develop necessary questioning techniques, and time to allow students to construct personal knowledge with all the curricular demands currently in place. When added to this, the considerable length of time it takes most teachers to truly be masters of subject area content, it is clear why implementation of constructivist activities lags behind constructivist support. There is a definitive need for teacher training institutes to include constructivist strategies in their mandate.

Technology, especially mobile technologies may be used to enhance the constructivist movement. Programs such as the Jasper Video series and WISE offer constructivist benefits to both learners and educators by not only providing a constructivist platform, but also by accommodating the learning styles and pacing of all students. As technology continues to race forward, mobile learning devices, especially smart phones, offer unique opportunities for just in time learning, as well as learning in context. These devices also offer learner motivation, synchronous and asynchronous communication opportunities, as well as a wide array of evaluation formats. Again, time to learn and implement the constructivist affordances these devices offer is an issue to be taken into consideration.

For me, constructivism is not an “all or nothing” prospect. I do believe that students need to actively build new knowledge upon existing knowledge, in context whenever possible. I am growing more and more toward the social nature of learning, the power of discussing, and testing new learning schema with peers and classmates. I also adhere to the notion that teachers are an
essential component of the constructivist paradigm, and I strongly support the hiring and retention of teachers with exceptional pedagogy. Technology, especially mobile technology, holds many possibilities for the constructivist movement as education and learning progress into the second decade of the twenty-first century. There is no single prescription for excellent teaching or learning. Quality educators have a wide array of tools in their educational toolboxes, using each based on the learning situation at hand. Constructivism is a teaching and learning tool that offers great potential. Most math teachers employ constructivist tenet, knowingly or not. I see constructivism as a tool that will surely see more use in the future, but will continue to remain as one of the many tools in my educational toolbox.

References


