

Teaching and Researching Complex Cognitive Thinking Skills and Social Skills: A Constructivist Lens

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Abstract Research into constructivist approaches to learning from a qualitative perspective can be difficult because of the tendency to try to measure learning or economic outcomes. Qualitative studies use more individualized approaches to research that are sensitive to nuance and perspectives. However, qualitative researchers need to think carefully about what they are considering when they examine situations through a constructivist lens. Opinions and perspectives may not represent the rich possibilities that more focused studies can provide. This paper outlines a readily adaptable, flexible way to examine a broad range of topics in public school educational contexts to ensure deep learning is examined using *topic elaboration* in the context of emerging *social skills deconstructed* to get rich data in a variety of learning and research contexts. The paper outlines how constructivist approaches can be used to ensure greater trustworthiness when exploring the ways that complex skills and social interaction are taught within school contexts.

Keywords: Constructivist research methodologies, complex thinking skills, social skills, work habits

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1. Introduction

The evening after I had read the call for chapters for a book, I was reading for pleasure and came across a part in the book, *The Web* by Jonathan Kellerman, that jarred me to think of constructivism in a slightly different light. The passage was a conversation among investigators about strange characteristics of the murder clues they were examining. The passage was:

From my reading it's a virtual constant. Even the most recent documented cases (the discussion was about cannibalism) seem to incorporate Christian and pre-Christian ideas. Are you familiar with the term 'cargo cult'?

Vaguely. A sect that equates material goods with spiritual salvation.

A spontaneous sect spurred by a self-styled prophet. Cargo cults develop when native people have been converted to a Western religion but have held on to some of their old beliefs. The link between acquiring goods and receiving salvation occurs because basic missionary technique combines gifts with doctrine. The islanders believe the missionary holds the key to eternal afterlife and that everything associated with him is sacred: White skin, Caucasian features, Western dress. The wonderful kahgo (In Japanese this is spelled kago and means cargo). The cults are rarer and rarer, but as late as the sixties

there was a cult that worshipped Lyndon Johnson because someone got the notion he was the source of the cargo.

Correlation confused with causation, I said. The same way all superstitions are learned. A tribe goes fishing the night of a full moon and brings in a record catch: the moon acquires magical properties. An actor wears a red shirt the night he gets rave reviews: the shirt becomes sacred. [1]

The part of this exchange that struck me was the phrase "correlation confused with causation". It seems that this same confusion across skill boundaries infects many aspects of our social interactions these days [2]. For example, recent reports of unprecedented levels of oppositional behaviours in classrooms are well known in education and efforts to address such issues using both skills development [3] and proactive mental health practices (School Mental Health Ontario, n.d.) are emerging. Political narrative also comes to mind. I would deem both of these skills (correlation and causation) to be complex learning with specific strategies that need to be learned. However, it appears that knowing the difference between them or among other complex learning skills is elusive for many educators [4,5] and this can cause challenges for qualitative classroom researchers. The teacher may be unsure of what is being taught, the students may be unsure about what is being learned, and the qualitative researcher may therefore be unsure about what is being studied.

But, in a constructivist context, such complex learning is enriched by the range of ideas that evolve in social contexts [6]; this seems true even though direct qualitative research about the impact of such social interactions can be difficult to capture using some qualitative methodologies, especially with younger participants. However, current research is showing a clear connection between the quality of students' social skills and their ability to learn, retain, and use complex cognitive skills [7,8].

Qualitative Constructivist Methodologies in a Thinking Classroom

The contention of this paper is that having a very clear view of the complex cognitive skills that are taught and used by participants in a study, and a strategy for deconstructing the social skills that are required for the tasks that are being studied [9], will allow the researcher to gain more confidence in the trustworthiness of their data. That is, if students are engaging in interactive learning, we need clarity about the skills they are using to be successful in that context, including both cognitive and social skills. To that end, this paper will outline a framework for identifying complex cognitive (thinking) skills, such as those needed to differentiate between correlation and causation. It will also provide a strategy for contextualizing the social skills that can overlay use of these cognitive skills, in a constructivist learning environment. These may also be employable by researchers using a constructivist approach in their methods.

A major assumption is that complex thinking skills are being explicitly taught systematically in our schools and institutions of higher learning. It makes intuitive sense that if we expect students to construct their new learning, we are giving them the skills to do so. Similarly, it makes intuitive sense that if we expect students to interact in the process of constructing their new learning, we are teaching the social skills to allow them to be successful in achieving productive interactions. However, we question whether either of these intuitions is correct across the profession of teaching. This is not a criticism of teachers, or the profession itself; rather, it is a call for clarity in pedagogical practice that needs to be conceptualized in the academy and provided as a framework for teachers as they acquire certification and upgrade basic qualifications.

Understanding Complex Cognitive Skills

We attribute many of the following insights about creating a productive, constructive context for learning and constructivist research to the late Dr. Floyd Robinson, previously a professor of education at OISE, University of Toronto. He was a big vision educator who understood curriculum concepts at a level we aspire to achieve.

Dr. Robinson taught a scheme for thinking about complex thinking skills that he called *topic elaboration*. While most educators will be at least peripherally familiar with Bloom's Cognitive Taxonomy and more recent variations, that taxonomy is not based on sustained procedural pursuit of any topic. Topic elaboration does that. This approach engages students in sustained inquiry that starts with the realization that any topic can be studied to a deep level (i.e., moving beyond facts to analysis, problem solving and societal improvement), by systematically applying a sequence of questions to the topic. To demonstrate this to my teacher candidates, we

typically used inconsequential topics (e.g., toothpicks) and consequential ones (e.g., conflict) to demonstrate the universality of this question sequence. The sequence is shown in Figure 1.

Figure 1. Topic Elaboration

- What is it?
- How does it work?
- What are its' interesting characteristics?
- How do/does/did those characteristics change (over time, space, place, etc.)?
- What are/were those changes related to?
- What could/would/should/might/will happen if...?
- What could/should /might/will/was be done about it?

When we print each of these questions on separate sheets of chart paper and mix them up, teacher candidates invariably put them in the same order (as in Figure 1) on the first try. This is, we believe, solid testimony to the logical progression of a topic involving complex ideas and responsible decisions as the outcome of studies. We have also used this sequence of ideas to plan units of study to progress from factual information to opinions, insights and decisions.

Using this sequence, the topic (e.g., toothpicks) would then be engaged by students as they work through each question about it (e.g., What is a toothpick? How does a toothpick work? What are the interesting characteristics of a toothpick? etc.). In a constructivist context [33,34] students would collaboratively massage the generic questions to address their topic and may even pursue diverse ideas related to the topic, depending on what they each identify as an "interesting characteristic". Here is the power of this scheme. Each question is connected to one or more complex thinking skills, as shown in Table 1.

Table 1. Matching Topic Elaboration Questions to Complex Thinking Skills

Topic Elaboration Questions	Related Complex Skill(s)
What is it?	concept clarification
How does it work?	model building (including word models, mind maps, etc.)
What are its' interesting characteristics?	narration, description, map making (including visual mapping or organizers)
How do/does/did those characteristics change (over time, space, place, etc.)?	comparison
What are those changes related to?	correlation
What could/would/should/might/will happen if....?	causation (or causal reasoning)
What could/should/might/will/was done about it?	decision making

If the discussants who were engaged in the novel as described earlier in this chapter could imagine this sequence of questions, their comments about the differences between correlation and causation may have been different. As an aside, this lack of differentiation, especially between correlation and causation seems to be a root of many of the partial truths we often see in political contexts these days.

Using this table, teachers and researchers will quickly see that they can target nine skills to be taught or examined for effectiveness in a research scenario. The cognitive literature is very clear about the value of certain strategies when these complex skills are taught as well,

with significant growth in students' ability to be self-directive via such skill application [10,11,12,13]. The research tells us to name the strategy so students can be metacognitive about its' use; tie the strategy to a generic question(s) so students can apply it broadly; teach the complex skill initially in a low content context (e.g., with content students already know) so that they do not need to focus attention on new content and new skill acquisition at the same time [5]; build the cognitive skill on a graphic organizer; help students transition from one step of the skill to the next so that they are building up a procedure for each skill as they use it [13]; extract the procedures from the students immediately after they are introduced to

each skill; and post skill procedures so that they can be used as classroom exemplars in the future [11]. Each one of these complex skills, taught with dedicated focus on students' skill development, also subsumes every level of Bloom's Taxonomy. That is, every time students clarify a concept (or any of the other complex skills), they will use knowledge, understanding, application, analysis, synthesis/creativity, and evaluation skills as well. These approaches are consistent with transformative learning principles as identified by several researchers and educational theorists [14,15,16]. An example of the emergence of the complex thinking skill of concept clarification is shown in the multi-part aspects of Table 2.

Table 2. Teaching an Example Complex Thinking Skill: Concept Clarification

Note: Start by telling students that a **concept** is a word that we use to explain a mental image we hold for something (e.g., If I say the word "table" we all have a mental image of a specific table in mind and that table will have some characteristics in common with all other tables, such as a flat horizontal surface and a supporting structure.)

Task: Ask Grade 5 students to define the concept 'government'.

The procedure you guide students to follow	The products that result from the procedure.
1. Name the concept. 2. Brainstorm a list of all of the words you think of when you say the word government and form a mind map with those words (drawing lines from the concept word is useful). Stop the brainstorming when the flow of words slows down significantly. 3. Start writing a definition of the word by writing on the board (chart paper, white board, etc.) "Government is" and pause. 4. Give students a number of non-examples of the next possible word until they land on a suitable word through the elimination (critical analysis) of the suggestions. (e.g., Is it a special day? Is it a type of food? etc.). Eventually students will suggest words or phrases like "a group of people" or "a legal body". Write that to continue the definition. (e.g., "Government is a group of people who..." and pause. 5. Ask students to extend the sentence by connecting any two or more of the words on the brainstormed list to extend the sentence. Write that extension by adding to the emerging definition and cross off the words on the brainstormed list that were used. 6. Cross off the four words that students have now used from the brainstormed list. Ask them to continue to use any two or more words from the list to expand the present definition into a new sentence. Write that sentence. Example: "Government is a group of people who make laws at the municipal, provincial, or federal levels. The titular head of Canada's government is the Governor General, but the elected head is the Prime Minister." (You can use this a teaching moment to explain that we have elected heads and appointed heads/titular heads of the federal government in Canada and that the appointed head is called the Governor-General). Add new words such as "titular" to a word wall or other source that students can use as a reference. Cross off the words that were used from the brainstormed chart/mind map. 7. Continue building the definition in this way until all the words on the brainstorming chart have been used. 8. Once all the words from the brainstorming chart have been used, ask students to review their definition to see if they feel they should or want to add anything else at this time. Post the resulting definition in the classroom for later reference in the unit.	federal reeve Governor General municipal provincial legislation vote Government elections prime minister mayors cabinet senate House of Commons representative laws Government is Government is a group of people who Example: "Government is a group of people who make laws at the municipal, provincial, or federal levels. The titular head of Canada's government is the Governor General, but the elected head is the Prime Minister." Example: "Government is a group of people who make laws at the municipal, provincial, or federal levels. The titular head of Canada's government is the Governor General, but the elected head is the prime minister. Provincial governments are led by premiers but municipal governments are led by mayors or reeves if they are smaller communities. Canada's federal government is run by elected members who are voted in or appointed by Canadians and sit in either the Senate (appointed) or the House of Commons (elected). The elected representatives make legislation to help Canadians.

The productivity and sophistication of applying complex thinking skills in this concept clarification exercise will likely be evident to teachers, as will the value of using this approach over copying a definition from another source. In classrooms where such complex skills are taught and applied regularly to challenge students' thinking and teach both complexity and self-regulation of thought and action [10,11,13], qualitative constructivist researchers have some challenges. First, qualitative researchers need to have a keen sense of how they might interpret and transform massive amounts of data or text by reducing the volume of raw information,

sifting notions that are trivial from those with significance, identifying significant and recurrent themes and being able to construct a conceptual framework to support interpretation of findings. This approach will offer what Hecker and Kalpokas (2024) call *coherent perspective* (see ATLAS*i*, n. d.) so that both the researcher and the audience have a greater understanding of the phenomenon under study. Another difficulty might include being able to isolate and describe the strategy they are researching in the chatter and clutter of learning contexts that are constructivist in nature. Such classrooms are busy, and often present students at broadly varying stages of the

same intended process. Even with adult learners, the interactions may not be linear, which challenges a researcher's tendency to try to 'capture' the reality they hope to study and to discern pieces of their data that are important. Additionally, moments of intended and productive interaction may be embedded in substantial periods of testing ideas, restating, self-questioning, and messy interaction. This 'mucking around' stage of complex thinking skill learning approaches requires patience from teachers and observers who will need to suspend their focus on the product to allow the learning process to emerge in a structured, skill-based environment that is being examined through a constructivist lens.

Complex Thinking Skills Enriched by Strong Social Skill Development

Teachers are directed to teach a wide variety of social skills in the various educational jurisdictions across the country, from early learning environments to adult learning contexts. For example, in Ontario, teachers are directed to teach and required to report on six social skills that are presented as pillars of their learning [17]. These learning skills include responsibility, organization, independent work, collaboration, initiative, and self-regulation. Recent research has shown that teachers tend to see this group of learning skills as highly regulated and dependent of a student's ability to collaborate, which is frequently interpreted as cooperation within the classroom [18,19,20,21] [22,23,24,25,26]. A recent MEd graduate at Nipissing University [27] studied how teachers assess the intended social skills in their classrooms and in online contexts and found that the assessment of the six skills (i.e., responsibility, organization, independent work, collaboration, initiative, and self-regulation) were consistently aligned with how the teacher perceived the student's skill of responsibility in their classroom (among other important outcomes). Indeed, it can be argued that if students are strongly responsible, other skills such as organization, independence, collaboration, initiative and self-regulation may follow. These may in fact not be completely autonomous skills but may be interconnected to the point of being indistinguishable for many professionals. This is problematic for the constructivist researcher who must develop ways to define and differentiate among these skills. We can do better and assess these skills more authentically if we have and sustain a strategy for teaching such skills effectively.

The pedagogical skill of deconstruction, applied to social skill development among students supports development of social skills. Depending on the age of the students, learning or work habit skills may be an area of goal identification and ongoing assessment that students can be very active in monitoring. Knowing what is meant (by the teacher) when a skill is taught, monitored and assessed, can support increasingly strong student engagement [28]. For example, if the teacher is teaching the skill of responsibility, she/he can deconstruct that skill to identify the aspects of it that could be taught during specific lessons and make informed decisions about how each sub-skill can be taught and acquired. Sub-skills of responsibility can then be taught by the teacher and monitored as work is completed and new learning is co-constructed in the classroom. For example, the skill of responsibility might be deconstructed to include the skills

of leadership, independence, self-advocacy, initiative, and organization. The teacher could then use mini-lessons to teach students how to develop each sub-skill.

Deconstructing sub-skills of the identified set of desired learning skills and work habits should be recognized to have both visual (what observers see) elements and verbal (what observers hear) elements in a constructivist context. By engaging students in what these elements might entail, students come to adopt the language and behaviours that are desired and reinforced/rewarded in the learning. This approach, of course, has early foundations in operant conditioning (Pavlov as explained in John E. R. Staddon and Yael Niv [29], *Scholarpedia*, 3(9):2318). This approach, which could be interactive with students, is shown in Table 3.

Table 3. Deconstructing Social Skills and Work Habit Behaviours

Note: The sub-skill of leadership (responsibility) is used as an example.

Leadership Looks Like	Leadership Sounds Like
• I take turns.	• We still need to...
• I stay on topic.	• Is this a good example?
• I monitor the time we have to do this work.	• Can we add more to this?
• I recognize the contributions of my teammates.	• Have we made this clear?
• I check with teammates to develop consensus.	• How else can we show this idea?
• I look for ways to help everyone in the group understand.	• How much time do we have left?
• I recognize the things I tend to do that help or hinder group efforts.	• Let's organize this into...
• I always have my share of the resources ready and available.	• Do we all agree....?
• I can prioritize to meet timelines.	• How can I help?

For constructivist researchers, the ability to deconstruct social skills and work habits into observable chunks with the assurance that they can then be taught (rather than assumed) will recognize the value of the drilling down practice to look at behaviours and words/thinking that signal certain understandings among study participants. Although these lists are not exhaustive of the possibilities, they do provide a good starting point for how students can think specifically about their social skills and work habit skill development. Such constructivist development of understanding also helps students to recognize success criteria (see *Growing Success*, 2010, <https://www.edu.gov.on.ca/eng/policyfunding/growsuccess.pdf>), monitor their own progress, and think about how they get to be successful in easily manageable terms. Teachers can post these brainstormed charts in the classroom for future reference and gradually build up students' understanding of how teachers arrive at an assessment of these skills for reporting purposes. This approach has the added benefit of putting some guardrails on behaviours so that less acceptable behaviours are sanctioned in a social context. Again, we can thank Pavlov and other operant conditioning pioneers for recognizing the efficacy of rewards in social situations!

Concluding Statement

For the constructivist researcher, this paper highlighted

some of the challenges that are present when trying to identify nuances and trends in complex cognitive (thinking) skill and social skill development of learners.

If students are taught the types and strategies for complex thinking skills and taught the ways they can think about their own social skill development, the classroom has been set up to be successful with challenging learning tasks. Enriched approaches like project-based learning, problem-based learning, web quests, flipped classroom tasks, inquiry units, and social projects can be successful with these skills in place as a learning basis. For the constructivist researcher, this chapter should show the value of pulling apart common terms that may often be used in some contexts (e.g., thinking skills, social skills, etc.) so that they see the value of breaking down common terminology to uncover complex meaning and intent early in the process of identifying the scope of their research.

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