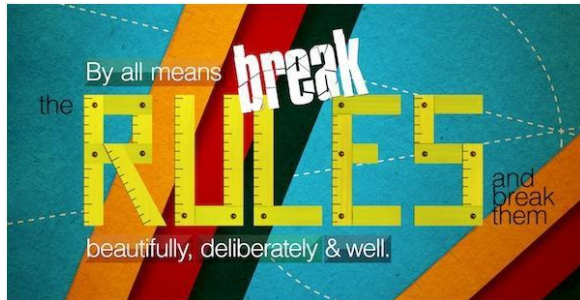**3. Often, IT employers bemoan the lack of innovation and critical thinking in an IT graduate. Why do you think that is? What can a student do to "grow" their own capacity to innovate think critically?**

 "Programming and related systems are very rule-centric.  Spending time only with these leads to limited thinking.  Also, people interested in rules-based systems are often not looking to break new boundaries, but instead feel more comfortable with the established order.

Exercises in "breaking the rules" to get people comfortable with the rules, but then finding ways to break them leads to innovations."

There are a number of resources out there that interconnect "creative thinking" and "rule breaking." Think about how an IT student can break rules and ways for them to discover what happens when they do.  Many business and entrepreneurial experts link "rule breaking" to innovation.
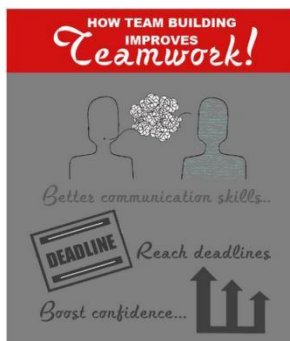
 "It is crucial to get IT workers in teams as soon as possible, and keep them there.  No programmer will ever get paid to build something on their own without feedback and reviewing requirements from others.

Consider referring IT students to:

- the best open source and coding forums **(Try Code.org or review this list of programming forums. The number of forums out there are varied and can be found for any type of concentration for IT students.)**

- provide them with examples of how/why it's essential they understand the fundamentals o f team work, and,
- guide them on how to work successfully as part of a team."
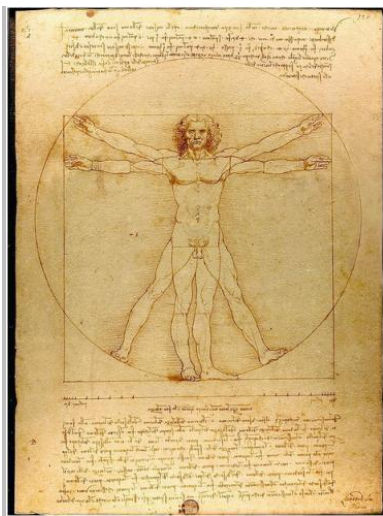


**"Instead of learning how to force data and processes into existing languages and systems, students should learn how to use existing systems as tools for crafting truly appropriate solutions for the people who need to use them."**  This is essentially the "don't fit the square peg into the round hole" meme.  IT students shouldn't use prefabricated, *easy solution* technology tools if the specifications require a different outcome, or a unique approach. This relates to the aforementioned IT industry professionals' recommendation on "learning to break rules." Sometimes, what's easy isn't always the best IT solution.  While IT has a wide variety of prepackaged, solution-based products that are commonly used in the CTC system to teach IT concepts, asking students to stretch boundaries and attempt to create solutions outside the confines of a vendor's safety net might be worth the risk.



The following are a series of ways for students to think about how they listen, ask questions, consider linguistics, and the actual meaning of both the spoken and written word in the context of academics and the workplace.

o   Listening exercises that lead to proper dictation of what the speaker is really saying should be incorporated into the classroom. The Udemy Academy lists a number of listening exercises that will introduce  students on how to become more effective listeners.

**Example:**  "Participants should stand in a line, or a circle. One person begins the game by whispering a sentence to the person after them. This sentence should be prepared beforehand, by someone moderating the game, but it should only be known to the person starting the game. The person who received the messages should then whisper it to the person after them, and so on.

By the time it gets to the final person in the group, they should say the message aloud. The first person will read the sentence they were given, and participants can note how much the two have changed. It's very unlikely, especially in large groups, that the message has not been altered at least a little bit…" (**Source:** Udemy.com)

While Udemy offers tuition-based courses, the exercises can be used in any classroom.  You can also view another Ted Talk (7:47 minutes) with Julian Treasure, a sound consultant, who outlines *5 Ways to Listen Better*.  Treasure's most recent Ted Talk presentation, How to Speak So People Want to Listen runs 9:58 minutes.

o   How can the IT student learn how to craft questions to get the best answer?  What are good follow-up questions?  The Conversation Café offers resources as well as meet-ups for students (in Washington State) who want to learn how to ask questions in the course of a general conversation.

**Dan Pink's *To Sell is Human* offers two worthwhile exercises:**
1.  Take Five: Start a conversation with a partner (classmate, friend, casual acquaintance, family-member, etc.), and take five seconds before responding.  Pink asks a few questions for the participants to ask themselves.  "Is your conversation partner actually finishing their sentences?  Is your partner getting their perspective fully on the table without you interrupting?  Do they have the time to take a breath before you start yapping?" (**Source: *To Sell is Human***, Dan H. Pink, 2012, pages 199-200)\
2.  Start a conversation with a partner and decide to essentially debate an issue with two distinct and different points-of-view.  One person starts, and the other person can only respond by asking questions.  "These questions must also abide be three rules: 1) You cannot ask yes-no questions. 2) Your questions cannot be veiled opinions.  3) Your partner must answer each question." (**Source: *To Sell is Human***, Dan H. Pink, 2012, page 200)

The general **5 W's** are also a good way to think about asking questions:  **Who, What, Where, When, Why** (**How** is sometimes included).  The **5 W's** can also be used to analyze a general business problem.  For example, here it's used to provide data on who makes game purchases.

- o Present IT students with potential interview questions, and also ask them to think about not only how they would answer these questions, but how and why they would ask them of someone they were interviewing.
- o IT graduates sometimes struggle to adapt to a world where they are not given very prescriptive direction on a frequent basis.  There is not always a "right" answer; instead, there is just a "best" answer.

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**Innovation:**  IT employers often talk about the need for innovation in their employees and the trouble they have in finding employees who can actually innovate.

One of the IT professionals responded to this section's question with this, "Mainly because 'innovation' is a buzzword: to innovate, you need creativity, divergent thinking, and the ability to sell ideas."

Again, Ted Talks (**Ideas Worth Spreading**) provide a variety of presentations on innovation. Ted Talks is a valuable resource as it provides snapshots and bite-sized, easily digestible, pieces information that get to the point and provide an overview of somewhat complex issues

*Building an IT Career-Ready Washington: 2015 and Beyond*
*The Ideal IT Student, Maureen A. Majury, M.Ed.*
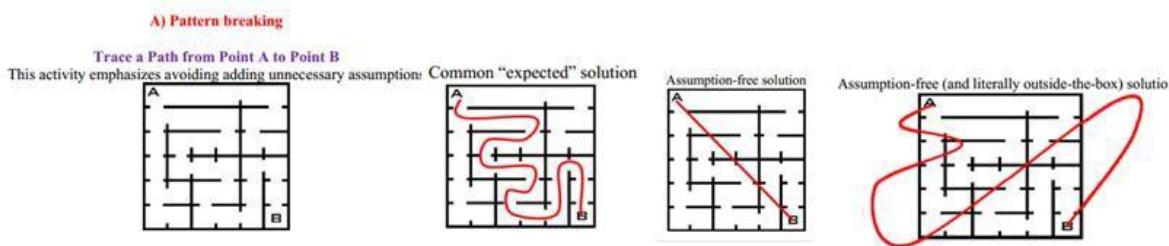© Center of Excellence for Information and Computing Technology, 2014

or questions. Nizah Shaer of High Start Group curated the top ten Ted Talks here. Take a look at Stephen B. Johnson's 17 minute presentation.

Both IT educators and students can review the third part of a series from **Scott Anthony, author of *The Little Black Book of Innovation*.**

> o Questioning: Asking probing questions that impose or remove constraints. Example: What if we were legally prohibited from selling to our current customer?
> o Networking: Interacting with people from different backgrounds who provide access to new ways of thinking.
> o Observing: Watching the world around them for surprising stimuli.
> o Experimenting: Consciously complicating their lives by trying new things or going to new places.

"To grow, explore and engage in exercises that expand **divergent thinking** – public speaking, persuasion, take on puzzles, and (examine critiquing skills and experimentation)."

Inspect the following from Dr. Daniel Raviv, Florida Atlantic University, ENCOURAGING DIVERGENT THINKING, for a series of exercises created to encourage divergent thinking or, as Dr. Raviv names it, "ideation." (**Source:** ASEE)



 **Our IT Professionals Offer the Following Ways IT Students Can Demonstrate IT Competencies:**
> o Online Portfolios:   There are a variety of free online project portfolios out there. However, the majority are geared towards graphic artists, photographers, designers,

etc.  That doesn't mean that they can't be used to host an IT student's project work. Alternatively, there are online portfolios that charge a user fee of $8 to $15 per month.  Another option is to use LinkedIn, as they have recently added a portfolio option for your profile where links can be added and project files can be uploaded.

- o IT Students should seek out IT competitions.  Big companies and organizations like Intel, Android, and IEEE Computer Society are worth checking in on as they host annual IT competitions.  Below are examples of IT competitions (**Note:** While some of these competitions are over, they are typically held annually, so either check back or sign up to receive information on the next competition):
    - o [Code Chef](#)
    - o [Coding ](#)(Listing a number of competitions)
    - o [Data ](#)(General)
    - o [Data Mining](#)
    - o [Imagine Cup ](#)(Sponsored by Microsoft)
    - o [Software Development ](#)(Listing a number of competitions)
- o Encourage IT students to develop a business plan and/or start their own business, even if it's just during summer break when a student might not be attending class. The Small Business Administration (USA government) has a number of resources to help students figure out what a [business plan ](#)entails.
- o Logic puzzles
- o Think about ways IT students can "Understand how to be a 'renaissance' person of IT  (you need to know more than just one thing in IT).  You need to know and do a lot of 'things' and know them well."