

Exploring Technology



To Address Student
Multiple Intelligences
& Learning Styles

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Multiple Intelligences Theory

“Students possess different kinds of minds and therefore learn, remember, perform, and understand in different ways.” In 1983, Howard Gardner, Harvard University psychologist and professor of neuroscience, greatly impacted the educational world with this bold statement in his groundbreaking book, *Frames of Mind*. With his theory of multiple intelligences (MI), Gardner challenged traditional beliefs in the fields of cognitive science and education. Gardner proposed that every human being possesses seven different intelligences that reflect different ways of interacting with the world. The seven intelligences – Verbal-Linguistic, Logical-Mathematical, Intrapersonal, Visual-Spatial, Musical-Rhythmic, Bodily-Kinesthetic, and Interpersonal -- are all used by individuals in varying degrees, but one MI is always particularly dominant. Gardner believed that by understanding a student’s strengths and weaknesses in each intelligence, we could help to improve student success. Integrating multiple intelligences into the classroom involves changing our idea about teaching and learning so that we address individual differences, providing a range of activities and experiences to facilitate learning.

Although Gardner’s theory has been the subject of considerable controversy, it has truly been a catalyst, prompting educators to reconsider educational practice in the last century and resulting in a myriad of discussions concerning what many refer to as “learning styles.” Our traditional educational system in the past has addressed only the three intelligences – Verbal-Linguistic, Logical-Mathematical, and Intrapersonal. However, today most educators have become aware that students do indeed learn in different ways and have recognized that it is imperative to take this into account as a primary consideration in instructional design. Obviously, as teachers interested in the use of computers in the educational system, we should seriously take time to consider the ways in which technology can assist student learning.

How can these concepts of MI integrate with the use of technology in education? Some technologists might lead you to believe that technology itself is the answer to motivating students and actively engage them in learning; they rave on and on about how technology can result in better student problem solving and

increased critical thinking skills. The truth is, technology alone cannot accomplish this goal – only the *proper application* of technology can truly accomplish it! Another truth that technologist may not openly share is that, in some cases, a technology-based lesson may not be the most appropriate teaching method. In our excitement to incorporate technology, we must be cognizant of the strong temptation to apply technology, whether or not it meets our learning objectives, and refrain from it when it does not serve to meet our goals.

Student MI and learning styles can be addressed through technology when conscious effort is made to create lessons structured for a particular MI. By integrating an understanding of MI with technology tools, we can use technology to create content for students in a variety of formats and provide a variety of options for student interaction. One of the best ways to facilitate this type of student interaction is by allowing students to *create* projects that reflect their own learning style. There are many intuitive software packages (e.g., Apple’s iLife software, Inspiration, Kidspiration, PowerPoint, etc.) that can be used to accomplish this goal with a minimal learning curve so that more concentration can be placed upon the learning itself.

Due to the fact that since 1983 our understanding of the brain and human behavior has increased, most educators have accepted that there are two additional intelligences that should be appended to Gardner’s original seven – Naturalist and Existential – for a total of nine. Let’s take a look at the nine different intelligences and discuss ways in which technology can actively address different student learning styles.

1. The Verbal-Linguistic Learner

The Verbal-Linguistic learner relies upon reading, writing, and speaking as their dominant intelligence. This type of learner understands the order and meaning of words and has the ability to effectively use language to express their thoughts. Traditionally, this type of learner prefers literature, poetry, discussions, debates, word games, puns, creative writing, stories, and public speaking. In school, she especially excels at written assignments and reading comprehension.

Suggested Technology Tools:

- Use an online discussion forum, such as those provided in a Learning Management System such as *Blackboard* or *WebCT*, to allow for class debate. If a particular student's skills are especially strong in this area, consider asking them to facilitate the discussion. As an instructor, student facilitation can save you literally hours of time that would have been spent on keeping up with students' posts in the discussion forum.
- Create assignments for Verbal-Linguistic Learners to formulate math or problem solving story problems for other students to solve within a discussion forum.
- Consider using *Microsoft PowerPoint* to create *Jeopardy* or *Who Wants to Be a Millionaire* games for students to play. The following URL provides many examples of Jeopardy-type games and includes a PowerPoint template, which you can download to get started:

<http://www.mtn.ncahec.org/stumpers/index.asp>

- Provide crossword and word search puzzles for your students in order to address vocabulary or to introduce new topics in your learning modules. This is a great tool for "livening up" rote-type memorization drills, for facilitating foreign language skills, or for assisting English Learners. An excellent starting point for puzzle making can be found at:

<http://puzzlemaker.school.discovery.com/>

Discovery provides free tools to create online puzzles formatted in HTML or PDF format, which can then be saved and uploaded later onto your own web site or into a Learning Management System like *Blackboard*. If you find that this is something you wish to use in your lesson plans often, you may also want to purchase the CD-ROM to create the puzzles directly on your hard drive.

- K-12 teachers will find more appropriate lesson plans and puzzles to incorporate in the classroom for their age-level at the following web site:

<http://education.puzzles.com/>

- Would you like to tap into your students' inner muse? Assign your students a project to create some online magnetic word poetry (similar to the poetry that was made popular as refrigerator art) at:

<http://www.magneticpoetry.com/magnet/> or go to:

<http://www.shadowpoetry.com/magnet.html>

where the word tiles are automatically changed twice per week. At the Shadow Poetry site, students can email their completed word poetry to the instructor's email address or submit their masterpieces to Shadow Poetry Quill Magazine. There are literally hundreds of free poetry magnet web sites that have been created with java applets. Many of these web sites offer the visitor the opportunity to change the words of the magnet tiles, which facilitates the writing of poetry on practically any topic. To find more web sites like these, type the keywords "poetry magnet" within a Google search.

2. The Logical-Mathematical Learner

The Logical-Mathematical Learner is especially adept at using numbers, math, and logic to find and understand various patterns, which others may miss. These types of learners are very systematic and extremely organized and almost always have a logical rationale or argument for what they are doing or thinking.

Suggested Technology Tools:

- Logical demonstrations are very appealing to the Logical-Mathematical Learner. Appeal to their inner child with the following website, which utilizes an online Spirograph java applet to explain circle radius, circle offset, and revolutions in radians:

<http://www.wordsmith.org/~anu/java/spirograph.html>

- *Qarbon's Viewlet* software can be used to create visual demonstrations of difficult mathematical concepts and has proven to be an excellent tool for any type of problem solving. The ability to add text as well as sound in this format is also an extremely powerful way to provide web accessibility to disabled persons. An example of Viewlets, which cover the mathematical topics of probability, numerical methods, quadratic functions, differentiation, and complex numbers, can be accessed at:

<http://sug.hkcampus.net/~sug-wkc/viewlet/view.html>

- Music, by its very nature, has always overlapped with mathematical concepts. The famous 20th-century Viennese composers, Schoenberg, Webern, and Berg, experimented with the concept of composing music according to a strict twelve-tone matrix. In the first row of the matrix, twelve pitches were selected in a specific order creating the prime row upon which subsequent manipulations of rows were generated based upon transposition, retrograde, inversion, and retrograde inversion of the rows. Mathematical students are especially drawn to this method of music composition and are much more aware of the generated patterns than other students. *Finale's Notepad* software offers a freeware music notation/sequencer program, which will allow your students to enter the notes of their matrix-generated composition upon a musical staff, view and print the notation, and best of all, hear MIDI playback of their musical masterpiece:

<http://www.finalemusic.com/notepad/>

F	A	B	C	D	E ^b	E	G	B ^b	A ^b	D ^b	F [#]
D ^b	F	G	A ^b	B ^b	B	C	E ^b	F [#]	E	A	D
B	E ^b	F	F [#]	A ^b	A	B ^b	D ^b	E	D	G	C
B ^b	D	E	F	G	A ^b	A	C	E ^b	D ^b	F [#]	B
A ^b	C	D	E ^b	F	F [#]	G	B ^b	D ^b	B	E	A
G	B	D ^b	D	E	F	F [#]	A	C	B ^b	E ^b	A ^b
F [#]	B ^b	C	D ^b	E ^b	E	F	A ^b	B	A	D	G
E ^b	G	A	B ^b	C	D ^b	D	F	A ^b	F [#]	B	E
C	E	F [#]	G	A	B ^b	B	D	F	E ^b	A ^b	D ^b
D	F [#]	A ^b	A	B	C	D ^b	E	G	F	B ^b	E ^b
A	D ^b	E ^b	E	F [#]	G	A ^b	B	D	C	F	B ^b
E	A ^b	B ^b	B	D ^b	D	E ^b	F [#]	A	G	C	F

Twelve-Tone Musical Matrix

Obviously, this software tool can also be used for the student with a dominant Musical/Rhythmic intelligence as well.

- Consider using free downloadable fractal software to explain patterns and aspects of chaos theory. Check out the following fractal web sites:

<http://www.ultrafractal.com/download.html>

<http://www.cygnus-software.com/>

<http://sprott.physics.wisc.edu/fractals.htm>

Note: The last web site listed above also includes MIDI fractal-generated music, providing both a visual and aural illustration of fractal and chaos theory.

3. The Intrapersonal Learner

The Intrapersonal Learner possesses the type of intelligence that appreciates self-reflection. Often referred to as "Introspection Smart," this type of learner desires knowledge about the meaning, purpose, and significance of things. External rewards are not necessary with this type of person; rather he is inwardly motivated and has a strong sense of his beliefs, values, and spirituality.

Suggested Technology Tools:

- Since this type of person generally enjoys keeping a journal, consider creating individual forums for each student in the discussion board of *Blackboard* or *WebCT*. This will allow each student to keep a journal for reflection to share with others in the class.
- Blogging has recently become a popular way of keeping online journals and posting multimedia content. Based upon the constructivist idea that learning is social and that people learn better through interaction with others, blogging can help students develop a sense of themselves as creators of knowledge and connect them to a network of their peers. Assist your students with blogging by setting up free blog accounts for them at Blogger.com:

<http://www.blogger.com/start>

In addition, both Mac and Windows platforms have a variety of shareware software that can be used for blogging. The following blog was created with *Blog Wave Studio* shareware software for the Macintosh platform:

<http://homepage.mac.com/aussiedoglover/blogwavestudio/>

For more blogging freeware, type the keywords "free blogging" in a Google search.

4. The Visual-Spatial Learner

The Visual-Spatial Learner is primarily influenced by shapes, images, patterns, designs, and textures that can be seen with the eye. These learners also possess the innate ability to perform tasks that require “seeing with the mind’s eye” (i.e., visualizing, pretending, imagining, and forming complex mental images).

How do you learn new concepts? Some people read the manual; others jump in and try to figure it out on their own. Visual-spatial learners prefer watching a demonstration that shows them what to do and how to do it; they want to look, learn, and then do it for themselves. They respond best and learn more from something on a screen—especially if it moves—than they do from printed words on a page.

Suggested Technology Tools:

- Use a software tool such as *Macromedia Flash* or *SnapzPro* to create visually rich media that illustrates a difficult concept. The following example uses *Macromedia Flash* software as a visualization aid for explaining the early music history concept of the Guidonian Hand:
<http://www.patriciagrays.net/musichtmls/Flash/guido.html>
- Here are some other examples that were created with Macromedia Flash software:
3D Views of Architecture Timber Design:
http://tlscourseware.calpoly.edu/flash_examples/timber.swf
Concrete Pressures and Loads on Formwork:
http://tlscourseware.calpoly.edu/flash_examples/cement.swf
Italian Fairytales:
http://tlscourseware.calpoly.edu/flash_examples/La_principessa_incantata.swf
- Similar in scope to *Qarbon’s Viewlet* software, the following demonstration uses *SnapZPro* Macintosh software to illustrate data manipulation within a complicated Excel spreadsheet:

http://www.mediaserver.calpoly.edu/Architecture_and_Environmental_Design/Construction_Management/Johnston/ezwall_stream680.mov

- Since Visual-Spatial Learners usually enjoy reading maps, consider implementing mindmapping software to aid the organization of ideas and information within a graphical framework. One of the more popular educational software tools for mindmapping is *Inspiration*. *Inspiration* allows you to create mindmaps graphically from scratch or convert textual outlines into graphic content to assist Visual-Spatial Learners. *Inspiration* files can be printed or saved as HTML or as JPEGs/ GIFS for use on the web or in Blackboard. To learn more about how mindmapping can improve teaching/ learning skills and address the Visual-Spatial Learner, go to:

<http://www.inspiration.com/freetrial/index.cfm/>

Download the free 30-day trial software. *Inspiration* also sells a version called *Kidspiration*, which is quite intuitive for younger children to use.

Another company that offers mindmapping software is *Semantic Research*. Check out their free evaluation download available at:

<http://www.semanticresearch.com/downloads/>

- The Visual-Spatial Learner might also be attracted to CAD software in order to create 3-D visual designs or GIS software to facilitate the process of mapping out a particular area. For information on free CAD and GIS software, see:
<http://software.geocomm.com/>
- Due to the Visual-Spatial Learners attraction to color, you might consider a discussion of color psychology theory with the aid of a software tool such as Adobe Photoshop CS:
<http://www.adobe.com/products/photoshop/main.html>
- Assign student photography and video projects implementing the intuitive Apple software products of iPhoto, iMovie, and QuickTime VR:
<http://www.apple.com/ilife/iphoto/>
<http://www.apple.com/ilife/imovie/>
<http://www.apple.com/quicktime/products/qt/overview/qtvr.html>

<http://www.apple.com/quicktime/gallery/cubicvr/>

The following link demonstrates examples of video projects created by Landscape Architecture students at Cal Poly, San Luis Obispo:

<http://landarch.calpoly.edu/larc/video02.html>

- Consider video streaming short portions of foreign movies to improve foreign language comprehension.

Italian Newscast Example:

http://www.mediaserver.calpoly.edu/Liberal_Arts/Modern_Languages/ccremasc/Cremasco-003.mov

Italian Film Example:

http://www.mediaserver.calpoly.edu/Liberal_Arts/Modern_Languages/ccremasc/Cremasco-004.mov

Following the viewing of these videos, provide assessments in *Blackboard* or *WebCT* to evaluate student comprehension or discuss them within the discussion forum.

5. The Musical/Rhythmic Learner

In its most basic form, musical intelligence comes from a strong recognition of sound, tones, beats, and vibrational patterns, which in their totality are manifested through music. These types of learners are acutely sensitive to sounds in their environment (e.g., crickets, rain, traffic, clock chimes). Various sounds, tones, and rhythms may even have a visible effect upon them that others can witness in their facial expressions, body movements, or emotional responses.

Suggested Technology Tools:

- Teach mathematical operations, grammar, or facts through songs, jingles, or rhythmic beats. Do you remember “School House Rock?” School House Rock was one of the most popular educational programs on television for children in the early 70’s but adults loved it too! Take a nostalgic trip back in time and listen to *Conjunction Junction* for a short reminder of this method of teaching through song and rhyme:

<http://www.geocities.com/Athens/Academy/7304/conj.wav>

- Borrow a drum machine from the music department and have students learn key dates in the history of your discipline by creating musical raps OR teach mathematical operator concepts such as addition and subtraction using drum beats as an aural representation of their effect.
 - Make-up sounds for different math operations and processes or for grammar /phonetic punctuation and read them out loud ala Victor Borge style:
- <http://www.kor.dk/borge/puncsyst.ram>
- Teach Morse code to your students by demonstrating its relationship to musical rhythmic patterns.
 - Encourage your students to make their own songs (vocals & instrumentals) using Apple’s iLife GarageBand application. GarageBand is easy to use due to its use of sampling looping patterns and allows anyone to have success with musical composition, even if they haven’t had any formal musical training. For more information, view Apple’s GarageBand web site at:

<http://www.apple.com/ilife/garageband/>

- Assist your students in learning dry, sometimes boring data by creating Karaoke files with QuickTime Pro that they can sing:

<http://www.apple.com/quicktime/upgrade/>

Foreign language or English learner students can learn vocabulary more quickly through songs made with QuickTime Karaoke. For more information about creating Karaoke files, see:

<http://www.mediafestival.org/KaraokeST.pdf>

<http://www.freekaraoke.com>

- Share musical clips online (.MP3’s) with your students from different historical periods to coincide with your course content and discuss their relationship to the historical events of your own discipline.
- Since the Musical/Rhythmic Learner may be more aurally astute, consider assigning a digital storytelling project using PowerPoint

with the implementation of PowerPoint's narration feature. This will allow students to combine both visual and aural impressions in order to create a more effective presentation that addresses multiple learning styles.

6. The Bodily/Kinesthetic Learner

The Bodily/Kinesthetic Learner learns best by doing. A person with this affinity performs tasks much better after viewing a demonstration and prefers to mimic the actions of the teacher. This type of learner finds it quite difficult to sit still for long periods of time and becomes easily bored or distracted if not actively involved in a hands-on type of lesson.

Suggested Technology Tools:

- Assign a project where your students build some sort of 3-D object and use a digital still camera or camcorder to document its progress as it is being created. The final documentary can be facilitated with the implementation of Apple's iPhoto or iMovie software.
- Since this type of person usually enjoys role playing, consider creating a WebQuest or have them create one themselves. What is a WebQuest? Developed in 1995 by Professors Bernie Dodge and Thomas March at San Diego State University, a WebQuest is an inquiry-oriented activity in which most or all of the information used by the learners is drawn from the Web. WebQuests involve role-playing, teamwork, and the utilization of higher-level thinking skills such as synthesis and problem solving. Here are some excellent web sites that will provide you with more information about creating your own WebQuests:

<http://webquest.sdsu.edu/>

<http://www.rohan.sdsu.edu/~sshelton/CATS2002/quest.html>

http://www.techlearning.com/db_area/archives/WCE/archives/adampary.htm

Examples of WebQuests:

<http://www.spa3.k12.sc.us/WebQuests/Impressio nism/index.htm>

<http://www.ncsu.edu/coast/shell/index.html>

<http://www.stanford.edu/group/arts/nicaragua/student/contract/teacherguide.html>

<http://asterix.ednet.lsu.edu/~edtech/webquest/titanic.html>

<http://www.spa3.k12.sc.us/WebQuests.html>

- Teach your students various web search techniques by incorporating "Scavenger Hunts" on the web while simultaneously focusing on a specific class topic. These types of exercises can be especially helpful to English Learners. For more information on how to create a Internet Scavenger Hunt, see:

<http://www.esc20.k12.tx.us/etprojects/training/scavenger.html>

Scavenger Hunt Examples:

<http://homepage.mac.com/cohora/ext/internet/unts.html>

http://www.education-world.com/a_curr/curr113.shtml

Would you like to find even more? Use the keywords "Internet Scavenger Hunt" in a Google search. You will find literally hundreds of these lessons already created for your use.

7. The Interpersonal Learner

The student with Interpersonal Intelligence relies upon personal interaction with others as a learning tool. This type of person is very social and enjoys team activities of all kinds; however, unlike some leaders who tend to monopolize a team situation, this learner is usually sensitive to other's feelings and is quite skilled at "drawing others out" in discussion groups. Interpersonal learners are also quite adept at conflict resolution and mediation; they are naturally skilled in bringing about compromise between individuals of radically opposing opinions.

Suggested Technology Tools:

- Since this type of person is good at mediation and moderating, ask them to moderate a debate in your online discussion board within *Blackboard* or *WebCT*.

- Cater to this type of student's enjoyment of group activities by assigning them to a leader/facilitator-type role within a *Blackboard* online group for the completion of a class team project.

8. The Naturalist Learner

The Naturalist Learner acquires knowledge through personal encounters with the natural world. This type of learner especially appreciates the natural environment and is concerned with its preservation. An animal-lover at heart, this type of person may have several animals, has the distinct ability to recognize various species and classifications, and is an avid collector of insects, rocks, seashells, dried flowers, etc. Particular enjoyment is derived from collecting scientific "field data" and then cataloging it for later reference.

Suggested Technology Tools:

- Have students use *Microsoft Excel* software to create spreadsheets that catalogue collections and classifications.
- Provide your students with a sampling synthesizer to compose a musical composition from sounds recorded from the environment and share as an online digital .MP3 file that their classmates can download to their computers or iPods.
- Have students check out a camcorder from the school's media center and record their experiences in nature; then, teach them to edit their video with iMovie and share it with others online as a "virtual field trip."
- Establish a web site for a future class field trip and have student teams research assigned topics prior to the trip. Student-created PowerPoint files can be uploaded to the web site so that students can view the files and learn about various topics related to the trip. A trip calendar can also be created to keep students and parents informed of day-to-day events and meeting locations. Tools such as Apple's *iCal* and a .Mac account can make this process quite simple and easy to manage. In order to protect student privacy and ensure their safety, it is best to keep such a trip calendar within a password-protected site.

- Provide your students with personal digital assistants (PDA's such as Palms and Visors) for collecting field data. Collected data can later be downloaded onto other platforms and digital formats for further use.

- Ask your students to do a virtual science project online. Check out this virtual frog dissection by going to the following URL and clicking on the "demos" section of the site:

http://www.froguts.com/flash_content/index.html

9. The Existential Learner

The Existential Learner often ponders questions about life, death, and ultimate realities. This type of person usually enjoys philosophical exchanges and is interested in the writings of Plato, Socrates, Aristotle, and Einstein.

Suggested Technology Tools:

- Engage these learners in Socratic-type questioning through a real-time chat tool (e.g., Blackboard's Virtual Classroom, iChat, AOL Instant Messaging, etc.) or in guided discussions online.

For more information about improving your Socratic questioning skills and creating Socratic lesson plans, please review the following web sites:

http://www.greatbooksacademy.org/html/what_is_the_socratic_method.html

http://www.goodcharacter.com/Socratic_method.html

Online Multiple Intelligence Test

Did you know that your own preference for certain intelligences influences the manner in which you teach? For example, Verbal-Linguistic Learners tend to prefer lecturing and possess a heavy slant toward reading assignments; Visual-Spatial Learners will incorporate more visually appealing material in their lessons; and Bodily-Kinesthetic Learners will provide more hands-on projects for their students.

An 80-question online multiple intelligence inventory has been developed that provides a thorough evaluation of what your strengths and weaknesses are as a learner. Taking this inventory can be quite helpful to you as a teacher in assessing your learning preferences, which, in turn, will affect the teaching methods you employ:

<http://www.ldrc.ca/projects/miinventory/miinventory.php>

Another excellent resource is the online VARK questionnaire (which stands for Visual, Auditory, Read/Write and Kinesthetic Learners), available at:

<http://www.vark-learn.com/english/page.asp?p=questionnaire>

Once you submit the VARK questionnaire, the web site will provide you with an immediate evaluation of your learning styles. Assign this questionnaire to your students as a homework assignment and have them write down their scores for each category and then ask them to email the results to you. Also, have them click on the excellent links that have been provided on the final assessment page in order to read the help sheets of study strategies that may apply to their learning preferences.

Consciously Addressing Your Students' Learning Styles

As mentioned earlier, student learning styles can be addressed through technology when *conscious effort* is made to create lessons structured for a particular MI. In order to help your students reach their full potential, you must be fully aware of your students' learning styles and the multiple intelligences that they tend to favor; then, you must also be cognizant of your own learning styles and your own tendencies to teach within a multiple intelligence that fits your comfort level.

Force yourself to break out of your personal comfort level and strive to address other intelligences in your day-to-day teaching. If you attempt to implement some of the suggestions given here and provide your students with opportunities to be assessed in a variety of ways, you will find that they will be more motivated to learn. Remember, each one of your students possesses every single

intelligence but the degree to which they use them is as individualized as their fingerprint. Who knows, you may have the next Maya Angelou, Steve Jobs, or Jane Goodall in your classroom. One of the best things that you, as their instructor, can do to help your students reach their potential is to take the time at the beginning of each quarter to reflect on the students in your class. Visualize them as unique individuals, who have fully realized and developed their intelligences, and then plan your lesson plans accordingly!

ENDNOTES:

Books:

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