

# Different Keystrokes for Different Folks: Addressing Learning Styles in Online Education

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## Abstract

Online learning has become increasingly popular in recent years. This interest in online education has brought about new learning opportunities for both educators and learners. Technology has enabled higher education institutions the ability to provide quality education reaching learners that might otherwise be impossible. When developing online classes it is important to keep in mind the different types of learning styles. In this paper the VAK Learning Styles (Visual, Auditory, and Kinesthetic) were addressed. The authors also provided practical guidance for implementing the VAK model by reviewing several free online tools that can assist with building online learning experiences that address each learning style.

**Keywords:** online education, online learning, learning styles, teaching, e-learning

## 1. INTRODUCTION

Online learning has become increasingly popular in higher education in recent years. In 2013, the number of students in the United States taking at least one online course grew to 6.7 million, making the proportion of all U.S. students taking at least one online course an all-time high of 32% (Allen & Seaman, 2013).

A learning style is the way a person prefers to learn (Grasha, 1996). There is a rich body of literature surrounding the study and implementation of learning styles in face-to-face instruction (Kolb, 1984; McCarthy, 1987; Fleming & Mills, 1992; Gardner, 1993; Lawrence, 1993; Felder & Brent, 2005), and the benefits provided to learners when given opportunities to use their preferred learning style. However, there is a gap in the literature

regarding practical methods for addressing learning styles in online instruction. Online learners do not have the face-to-face experience of the traditional classroom where they can often see and hear the interactions of the professor and other students, so in many cases, the online learning experience can seem very isolating. In this regard, it is arguably even more important in an online learning environment to address the learning styles of all types of students in order to help each student have the optimal chance to succeed in the course. Student learning styles should be taken into account during the instructional design of online courses (Zapalska & Brozik, 2006).

Zajac (2009) goes so far as to suggest that the future of online education may lie in the ability to choose not only the time and place of learning, but also the ability to personalize the

forms and methods through which the learning content is delivered. This would allow students to self-select methods of online instruction that appeal to their own particular learning styles.

A variety of learning style models have been proposed since the 1980s. The authors will give a brief background of some of the more prominent learning style models, and will then focus on the popular VAK (Visual, Auditory and Kinesthetic) Learning Styles. While learners may have overlapping learning styles, most people will have a dominant style falling into either the visual, auditory, or kinesthetic categories. Each of these categories will be described in detail and related to the online learning experience.

In addition, the authors will then provide practical guidance for implementing the VAK model by reviewing several free online tools that can be utilized to build online learning experiences that address each learning style.

## 2. LEARNING STYLES

### Background

Learning styles have been defined by educators in a variety of ways. Kolb (1984) defined a learning style as the process by which an individual retains new information or skills. Kolb (1984) developed an experiential learning style theory, comprised of four stages: getting involved in concrete experiences, reflective observation of the new experience, developing a new idea with an abstract conceptualization based on reflection, and active experimentation with the new idea.

McCarthy (1987) built upon Kolb's approach and developed the 4MAT model, identifying four different types of learners. The Type One learner performs imaginative learning with a focus on making connections. Type Two learners use analytic learning, focusing on formulating ideas. Type Three learners utilize common sense learning and focus on applying ideas. Finally, Type Four learners use dynamic learning, with a focus on creating original adaptations and learning by trial and error.

Until the 1980s, intelligence was primarily measured by I.Q. tests, and individuals who scored higher on these standard tests were considered to be more intelligent than others. Intelligence was, in fact, considered to be a

single factor that was inherited and thus, unchangeable. The work of psychologist Howard Gardner (1993) challenged this notion, as Gardner believed that traditional I.Q. tests only measured the analytical portion of human intelligence. Gardner initially proposed seven ways through which humans could show intelligence, and later added an eighth, together comprising his paradigm-shifting multiple intelligences theory (Smith, 2008).

The eight intelligence areas that Gardner (1993) defined included:

- 1) Linguistic intelligence – sensitivity to the sounds and rhythms of spoken words as well as the meaning of words, written language, and the ability to use language effectively.
- 2) Logical-mathematical intelligence – the ability to detect patterns, think and analyze problems logically, and perform deductive reasoning.
- 3) Musical intelligence – the ability to compose, perform, or appreciate musical patterns, recognizing rhythm, pitch, and tone.
- 4) Bodily-kinesthetic intelligence – the capacity to use mental ability to coordinate movement of the body and to handle objects skillfully.
- 5) Spatial intelligence – the ability to perceive the visual world accurately and recognize spatial patterns.
- 6) Interpersonal intelligence – the capacity to discern the motivations, temperaments, intentions, and desires of others.
- 7) Intrapersonal intelligence – the ability to understand one's own feelings, motivations, fears, strengths, weaknesses, and behaviors.
- 8) Naturalistic intelligence – the capacity to recognize and categorize features of the world around us, understanding and drawing upon nature.

The theory of multiple intelligences has been widely used in the field of education, especially in the United States (Smith, 2008).

### VAK/VARK Learning Styles

Over the years, Gardner's (1993) work on multiple intelligences has been filtered by the education community into a focus on three types of physiological learning styles. The VAK theory of learning styles derives its name from the

three types of learners that it describes – visual, auditory, and kinesthetic. In recent years, the VAK learning styles have become quite popular, perhaps due to their simplicity.

### *Visual*

Visual learners perceive information best when viewing (spatial) or reading (linguistic). Linguistic visual learners retain information better when reading the written word, while spatial visual learners tend to understand concepts more fully when they are presented as graphs, charts, pictures, or videos (Clark, 2000). Visual learners retain information from pictures, displays or how words appear on a page or chart.

### *Auditory*

Auditory learners respond best when presented with learning material that they can listen to or discuss, and often read aloud or move their lips when reading (Clark, 2000). They tend to learn more through verbal instructions, lectures, or group discussions and by talking aloud as much as possible. To help with retention, the auditory learner prefers studying in a group and putting hard to remember items into a song or rhyme. For instance, in 1492, Columbus sailed the ocean blue.

### *Kinesthetic*

Kinesthetic learners respond best when presented with situations where they can move, do, or experience something, and can lose concentration after long periods of no movement. They may use color highlighters to organize thoughts and take notes by drawing diagrams or pictures. Subsets of kinesthetic learners are actually tactile rather than kinesthetic, meaning that they learn best through handling or touching (Clark, 2000). These two categories, kinesthetic and tactile, are often grouped together. The authors will consider the kinesthetic learning style as inclusive of tactile learners, meaning that persons with this learning style will learn best by moving, doing, experiencing, handling or touching. Kinesthetic learners prefer hands-on activities in which they stay actively involved in the learning process.

Similar to the VAK Learning Styles, Fleming and Mills (1992) developed the VARK Learning

Styles, consisting of visual learners, auditory learners, reading/writing learners, and kinesthetic learners. The addition of the reading/writing category to the VAK model addressed a distinction that Fleming found in visually oriented students, where some students clearly preferred the written word while others had a distinct preference for charts, graphs, or other symbolic representations (Fleming & Baume, 2006).

The VAK/VARK Learning Styles are often considered together and some authors describe subcategories within the VAK Visual Learning Style category to address linguistic versus spatial learners (Clark, 2000), which is comparable to the reading/writing learning style in the VARK model. The authors will utilize the more popular VAK Learning Styles model for further analysis in this paper.

### **Determining Learning Style**

According to Pashler et al. (2008), learning styles refer to the view that different people learn information in different ways. Assessments of learning styles tend to ask people to evaluate information on the basis of preference. For example, does the person learn more from listening versus viewing pictures versus completing an activity? It is important for instructors and students alike to recognize their own learning styles. Instructors tend to structure lessons around their own learning preferences; awareness of this tendency could help instructors to plan lessons to purposefully appeal to a variety of learning styles.

Several learning style tests have been developed to help individuals recognize their learning styles. These tests are used to determine how learners process information so that they develop strategies to enhance their learning potential. Example questions from the learning style tests are:

- 1) I prefer classes in which the instructor:
  - a) lectures and answers questions
  - b) uses film and video.
- 2) To remember things best, I would prefer to:
  - a) create a mental picture
  - b) write it down.

If you would like to take a test to determine your learning style, please follow this link:

<http://www.personal.psu.edu/bxb11/LSI/LSI.htm>

### 3. RELATED RESEARCH

When developing classes for online education it can be very helpful to consider the different types of learners. Educators need to be aware of how students acquire and retain skills and information to help their progress. It can be expected that when different methods of learning are available, student acceptance of the information will be improved (Manochehr, 2007).

Bonk and Zhang (2006) introduced the R2D2 model for adapting online instruction to accommodate student learning styles. The model name, R2D2, stands for Read, Reflect, Display, and Do. The model was chosen specifically as a mnemonic device that would be easily memorable (due to its connection to the Star Wars movies), thus enhancing the probability of its use. The Read component of the model includes reading, listening, and knowledge acquisition and addresses students who are primarily verbal or auditory learners. The Reflect component asks students to reflect, typically in writing, on what they have learned or observed. It focuses on students who are observational learners. The third component, Display, focuses on visual learners and has students represent what they have learned through visual depictions or symbols. The final component of the R2D2 model, Do, focuses on kinesthetic learners who prefer hands-on experiences. It involves having students apply what they have learned through building or experimenting with what they have learned in a hands-on setting.

Manochehr (2007) conducted a study to investigate the impact of e-learning on student knowledge-based learning styles. In addition, the study also attempted to provide evidence that e-learning is more effective for those with a particular learning style. The study used Kolb's learning style model to measure the learning styles of students. Kolb's model (1984) consisted of four styles, the Assimilator (learns best through lecture, papers and analogies), the Converger (learns best through hands-on labs and field work), the Accommodator (learns best through simulations and case studies) and lastly the Diverger (learns best through brainstorming). The results of the study revealed that the Assimilator and Converger did better in e-learning methods, while the Assimilator and

Accommodator performed better in traditional learning environments. In other words, those who learn better through brainstorming, watching and doing perform better in e-learning classes.

Kolb's learning style theory was tested by Esichaikul and Bechter (2010) to determine if there are differences between the learning types; Accommodators, Divergers, Assimilators, and Convergers in regard to online learning. Findings revealed that differences between the four learning types exist when students post to discussion boards, use communication tools, and in regard to problem solving. Divergers, compared to Convergers, prefer to challenge a point of view in the discussions and tend to ask the teacher for help. In contrast, Convergers prefer to analyze data and put things into a model framework. In regard to using learning tools in the classroom, Accommodators exchange email as a communication tool and tend to relate things to their own experiences. Assimilators like to have offline discussions via phone or personal meetings and introduce new perspectives into the discussion boards.

Zapalska and Brozik (2006) identify several teaching strategies for online instruction that take the VARK learning styles into account. Their first suggestion is to provide content in a variety of formats such as including audio narration with a PowerPoint presentation, as well as a written transcription of the audio. Their second suggestion is to build the online course environment so that it provides a hierarchical structure, but also allows students to have control with the ability to move through topics in random order. Their final suggestion is to encourage active collaboration between students, with both individual and group activities required for the same course.

Zajac (2009) investigated the possibility of providing methods for personalizing course content delivery within a virtual learning environment. The author suggests that a learning styles questionnaire be integrated into the online classroom, so that students can self-assess their own personal learning style. Then, students would be able to choose from a variety of course delivery methods aligned with their determined learning style.

While this handful of studies has addressed learning styles in relation to online education, there is clearly a need for further research. In

particular, the technology tools that are available to assist with instructional design continue to evolve at a rapid pace. It may be helpful for instructors to incorporate new technologies into the classroom. The next sections will address some of the newer technology tools that are available to create learning experiences for each of the of the VAK learning styles. The tools mentioned in the next section are all freeware which can be accessed and used in the classroom at no charge to the educational institution.

#### 4. TOOLS FOR VISUAL LEARNERS

This section will review free online tools that can be used to enhance online teaching in ways that appeal to the visual learner.

##### Mind Mapping

A mind map is a type of diagram that is used to represent ideas and relationships between those ideas. Mind maps are often used to help formulate and organize ideas or concepts to help in solving problems, organizing writing, or making decisions. Mind maps are also becoming a popular way for students to take notes and organize ideas. The diagramming approach is very appealing to students who tend to be visual learners.

In online education, mind maps can be useful tools for both the instructor and the student. Instructors might consider developing mind maps of concepts in addition to traditional written descriptions or lists in order to provide another dimension for concepts and appeal to students with visual learning tendencies. These mind maps could be displayed alongside lecture notes or presentation slides within the online learning environment. Students in an online course could also be asked to reflect on reading and develop a mind map of the concepts that they've learned. This could be done individually or as a group activity.

There are a variety of commercial and free mind mapping software tools available for installation on your computer. However, WiseMapping.com is a free web site that allows for the creation of visually appealing mind maps directly through a web-based interface. Students can collaborate on mind maps as well by sharing them with others, which is ideal for the online learner. You can try WiseMapping without a login to see if it

may be useful for your purposes here: <http://app.wisemapping.com/c/maps/3/try>.

##### Screencasting

Screencasting is the process of recording your computer screen while you complete a task, often with audio narration or on-screen text-based narration, as a short video. In online education, screencasting can be an excellent tool for the visual learner, as well as the auditory learner if narration is provided. It is especially well suited to explaining "how-to" concepts in using computer software, performing tasks on the Internet, or other visually-oriented tasks that can be displayed on-screen. The ability to show and explain something in a video is often more effective for these types of tasks than attempting to explain what to do or where to click in written text. It is one of the situations where a picture is truly worth a thousand words.

In education, there are also other benefits to screencasting. If an instructor records a screencast video for a variety of tasks that students need to understand in the course, they have effectively provided not only a lecture, but a resource that can be reviewed by students over and over again until they understand the concept. For traditional lectures, some instructors might find that recording an entire lecture-length screencast is useful for their students. The authors have found through personal experience that screencasts of a technical how-to nature are most effective when they are recorded as short videos of five minutes or less. For example, programming or software tasks can be broken into small pieces and each recorded separately. These shorter videos seem to appeal very much to students, as they do not have to necessarily devote 30 or 60 minutes to watching a lecture but can get right to the content that they are looking for and quickly review it. In technical courses, even though these videos are quite short in length, students tend to view them a number of times until they are able to complete the tasks themselves.

Short, five minute screencasts can also be useful in online instruction as responses to questions posed by students in the online learning environment. When a student asks how to do something, the instructor could record a screencast with the response and post it into the

online classroom for that student as well as others to see and review. Over time, this library of short videos will become a useful resource for future online courses.

There are many commercial software packages available for developing online learning modules and complex, lengthy screencasts. Two of the most prominent are Adobe Captivate and TechSmith Camtasia Studio. However, one extremely useful, and free, tool for creating screencasts is TechSmith Jing ([www.techsmith.com/jing](http://www.techsmith.com/jing)). Jing is a simple, web-based tool that allows you to create screencast videos that are under five minutes in length. From simple movements of your mouse on the computer screen to specific regions of focus, Jing allows you to easily develop short screencasts, with or without audio narration. You can also choose to share your finished screencasts through the sharing mechanism provided by TechSmith, or you can embed your screencasts directly into your own online learning environment.

## 5. TOOLS FOR AUDITORY LEARNERS

This section will review free online tools that can be used to enhance online teaching in ways that appeal to the auditory learner.

### Voki

Voki is an excellent way to add audio to the classroom. Voki is a tool that allows users to create their own talking character which can then be imported into the classroom, blog, website, email or profile. It enables the instructor to add audio to an announcement, assignment or discussion. It is way to introduce technology in a fun way while engaging students with interactive lessons (Voki, 2013).

By using Voki the user is able to choose a character that can look like the user or choose an identity from a list of characters that include animals, people, monsters or vegetables to name a few. Once the character is chosen the user can customize the character by adding clothes, glasses, hats, backgrounds and adding a voice. Adding a voice to the animation is simple. The user can choose from one of the character voices available within Voki or they can add their own voice via phone, microphone, text to speech or by uploading a file. Once the user is happy with the animation it is ready to

publish in the classroom. This simple way to add sound to the classroom will help the auditory learner in understanding short instructions for assignments, announcements, and discussions.

Setting up an account with Voki is extremely easy. Simply log on to [www.voki.com](http://www.voki.com) and start customizing characters to implement into the classroom. An example of a Voki character can be seen below in Figure 1.

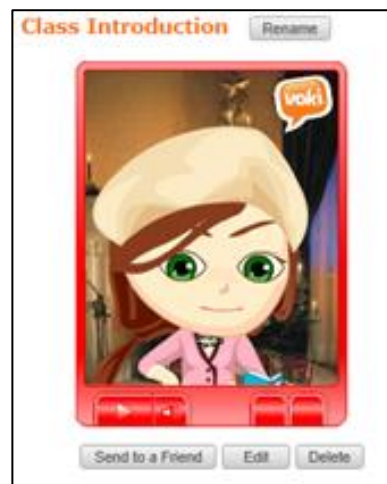


Figure 1: Sample Voki Character

### Audacity

Audacity is a multilingual audio editor and recorder which records live audio, converts tapes and records into digital recordings or CDs, edits Ogg Vorbis, MP3, WAV or AIFF sound files while allowing the user to mix sounds together (Audacity, 2013). Audacity has created versions to support Windows, Mac and GNU/Linux so that all users can access the software.

Audacity can easily record live audio through a microphone on a computer or mixer. This tool also allows the recorder to dub over existing tracks and has level meters which can monitor volume levels during or after the recording. The sound quality supports 16-bit, 24-bit and 32-bit samples which will records up to 192,000 Hz and up to 384,000 Hz for high resolution devices. Tracks and selections can be manipulated using the keyboard. The user can import sound files, edit the files and then combine them with existing files or new recordings. After the file is created the recordings can be exported into the classroom. Audacity is a great way to personalize the online classroom in discussions,

weekly lectures and lessons. Instructors can record lessons that the auditory learner can easily follow.

Audacity provides detailed training manuals which will explain each feature as depicted in Figure 2 below which shows a screenshot of sound being recorded using the software. Tutorials are available in multiple languages and support is provided.



**Figure 2: Audacity Sound Recording**

## 6. TOOLS FOR KINESTHETIC LEARNERS

This section will review free online tools that can be used to enhance online teaching in ways that appeal to the kinesthetic learner.

### Zooming Presentations

Prezi is a tool that brings a refreshing zooming animation style to screen-based presentations. The tool was launched in 2009 at Prezi.com, and is primarily web-based, meaning that you create content using an online editor rather than software that is installed on your computer. Prezi is truly innovative in terms of changing the way presenters display information. Rather than organizing content into slides as is the typical paradigm for presentations supported by Powerpoint, Keynote, and other office productivity tools, Prezi is much more visually oriented and organizes content into a large canvas. Concepts are placed into frames (areas) within the canvas that can then be animated in any sequence chosen by the creator. The presentation view then “zooms” around the canvas to present the concepts in the chosen order. The animation itself is quite smooth and modern, and the tool

allows you to turn content frames and re-orient the view with each zoom, making the presentation an extremely appealing visual experience. You can also adjust the size of frames on the canvas, making some of them quite small, in effect nesting frames inside of one another. During presentation mode, this allows you to literally “zoom in” to a concept in one frame, and see the details of that concept inside of it, which is very useful for showing hierarchy of concepts.

But, aside from the slick modern animation technique, how does Prezi differ significantly from the traditional PowerPoint slidedeck model? In some ways, it doesn't. The content within the presentation will likely be the same in many cases. But for visual learners, the idea of seeing the “big picture” first and then delving into different parts of it can be a mind opening experience. Prezi functions in a non-linear fashion, quite like a mind map, and appeals to many students for this reason (Conboy et al., 2012).

In addition, due to the prevalence of PowerPoint presentations in higher education, students have often reported “Powerpoint boredom.” In some cases where Powerpoint is used extensively during classroom lectures, students have been known to justify missing a lecture because they know that they can simply read the Powerpoint slides at a later time of their choosing. In contrast, Prezi presentations can sometimes follow a defined path setup by the instructor, but other times can veer off of the path, allowing the instructor to easily jump out of order or delve into different areas depending upon the classroom discussion. Prezi presentations can give students the sense that they have to attend a lecture in order to see the full explanation of the Prezi (Conboy et al., 2012). In online instruction, this could possibly be a negative rather than a positive. However, in an effort to address as many learning styles as possible in online instruction, an instructor could address this issue by recording audio narration of the Prezi, either as an audio media file inserted into the Prezi itself or by recording a screencast of the Prezi presentation.

So, if Prezi is such an exciting and appealing new visual presentation tool, why have the authors chosen to include it in the kinesthetic learning style category? Well, though the visual appeal of Prezi is quite striking and worth a full

explanation, another use of Prezi even more suited to online education is what struck the authors as most important to include here. Since Prezi is a web-based tool, it offers very simple collaboration options for co-building or co-editing a Prezi presentation. Students simply have to sign up for a Prezi account, and then once a Prezi presentation is created, the creator can invite others to collaborate, giving them full edit rights. The collaboration experience is truly real-time, and students will see avatars of others who are currently working on the presentation within the area where they are working. The experience of building a Prezi presentation can be somewhat time consuming, even when starting with one of the useful pre-built templates. It requires reflection about what the visual big picture should look like, and how the pieces of the concept should fit together before beginning. The tool itself is very intuitive and responsive to on-the-fly changes in the display path, providing an extremely hands-on experience of truly developing a concept.

Prezi could be useful in online instruction in many ways, as an appealing and exciting presentation viewing experience for visual and auditory learners, and as an individual or group collaboration project with a full hands-on experience that could apply to a variety of teaching disciplines. Prezi is available for use at Prezi.com. An account is required to use the tool, but a complimentary free education account is available to all students and instructors. An example introductory Prezi presentation can be viewed here: [http://prezi.com/5\\_auptg6wjic/prezi-example/](http://prezi.com/5_auptg6wjic/prezi-example/)

### Quizlet

Quizlet is an excellent tool for the kinesthetic learner. The learner defines what they need to learn and Quizlet provides the tools to accomplish that goal (Quizlet, 2013). Educators and students alike can create lessons based on the weekly material. Some learners create flashcards when it comes time to study for an exam or quiz. Quizlet allows the instructor or students to create flashcards along with tests and games to assist with learning the material. The flash cards are an electronic version of using index cards where the question is written on one side of the card and the answer on the other. After reading the question students will click to flip the card to show the answer. An option is

available in which students can see both sides of the card while learning the material.

Other features within Quizlet include Scatter which is a matching game in which terms and definitions are randomly scattered across the screen. Students are to match the correct answers to the appropriate definition in as little time as possible. Using the race of time students can play Space Race in which they can play with other students in the class to test their skills. Additionally, students can play the same game using Voice Space Race which uses the Spoken Language System (SLS) created by the MIT Computer Science and Artificial Intelligence Laboratory. Students can answer the questions aloud and the voice recognition system will determine if the answer is correct.

The software allows the student to match words to definitions with fellow classmates, take a practice exam that will be automatically graded and play games in which they are being timed to see how long it will take them to answer the questions. This tool allows students to work in and out of the classroom on their lessons on any device including smart phones and tablets. This tool will keep the kinesthetic learner involved and active in the learning process while serving as a memory aid.

## 7. CONCLUSION

For the purposes of this paper, the researchers used the VAK Learning Styles (Visual, Auditory, & Kinesthetic) as a framework for addressing the learning needs of online students. In doing so, attributes were discussed to differentiate the different types of learners. Online free tools that can create audio, video, sound, hands-on activities and more were featured to showcase the plethora of tools that are available to enhance the online classroom. These tools are freely available and can provide a wealth of opportunities for making the online learning experience more effective for students with each learning style. In order to provide quality online instruction, the learning styles of students should be addressed by online educators and curriculum developers.

Few studies were found addressing learning styles and online learners. With the increase in online classes, future research is needed in this growing area.



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