

**Analysis and Cognitive Advantages of
Diverse and VAK Learning Styles**

by S.H. Lad

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Professor: Dr. Shashank Varma

TA: Lu Meng

ANALYSIS AND COGNITIVE ADVANTAGES OF DIVERSE AND VAK LEARNING STYLES

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Abstract

This paper explores the learning styles theory known as VAK (Visual, Auditory, and Kinesthetic) and the impacts it has upon perception and understanding during teaching. The VAK theory asserts the existence of a specific learning style that will optimize each student's ability to learn material. This paper explores the benefits of student-specific teaching in both secondary and post-secondary education systems, and the impacts upon acquisition and retention. Additionally, qualitative and quantitative assessments have been included to understand performance from VAK on base subjects like mathematics as well as complex degree paths such as nursing and medicine. After developing the benefits of VAK learning, the paper explores studies on racial, ethnic, sexual, and socioeconomic parameters and their effects on VAK to help shed light on common trends. The underlying objective of this paper is to understand the effects of VAK on retention and retrieval and display the benefits that it provides.

Keywords: Cognitive Science, Development, Learning, Teaching Strategy, Education Policy, Information Retention and Acquisition

Introduction

This paper reviews a variety of cognitive science and developmental learning literature relevant to recent studies in VAK (Visual, Auditory, and Kinesthetic) Learning. The basis of the theory of VAK presents a notion that any student, regardless of factors such as age, sex, or ethnicity, has the potential for maximizing learning (primarily information acquisition and retention) using a specialized learning program. In this regard, the shortcomings of the traditional classroom setting (in primary, secondary, and post-secondary systems) is that it tends to encompass one specific style for a large group of students. With more information coming to light regarding diversity and affinity, it is becoming increasingly important to understand how the characteristics that make us unique may change the way we learn.

While there are a few methods of identifying a student's VAK preference (some of which will be highlighted in this paper), a few key characteristics differentiate one form from another. People who prefer Visual learning styles optimize their retention through the use of "symbolic devices such as diagrams, graphs, flow charts and models that represent printed information." Alternatively, Auditory inclined individuals use their ears as their primary sensory input, allowing them to capitalize on techniques such as group "discussions, lectures, tutorials, and talking through material". Lastly, Kinesthetic learners need to embody the material by having to "feel to live the experience in order to learn". Kinesthetic people enjoy group activities, traveling to field trips, hand-on seminars, and other active teaching methods (Ahmed 102). With such diverse needs for each learning group, it becomes imperative to understand that the common-large-group lessons of traditional education systems fall short for many.

The literature and studies discussed in this paper shed light on the benefits of catering a unique learning experience of each student. The approach begins by highlighting the current

thoughts on VAK that exist in the VAK world. We then take a step back to gain a brief overview on the history of VAK development. The next section directly builds on the benefits of VAK observed in various education systems and the need for its universal implementation. The paper then dives into various studies that display the existence of learning diversity in student groups and correlation with different subject fields. The last portion of the VAK overview presents the future possibilities of this phenomenon and provides deeper commentary on the critics of VAK learning.

Following the exploration of the VAK principle, this paper dives into a discussion focusing on the various implications of the principle in other fields of cognitive science, statistics, and computing. Some of the notable mentions include neuroscience and learning model developments. The final portion of the paper describes the potential for future research to build on the current resources on VAK and provides some closing remarks on the principle.

The literary sources and graphics contained within the papers have been chosen and tailored to display the depth and benefits of the VAK approach. The reputation of each source has been validated, and the majority of visuals and excerpts come directly from prominent researchers in the field of cognitive science, education development, public policy, computing, and probability/statistics.

The primary goal of this paper is to analyze and understand VAK learning styles and their benefits in the classroom. Although many portions provide specific examples, there is no intention to promote one specific learning style. Instead, the objective is to simply illustrate that the educational needs of each student are just as unique as they are and the adoption of VAK over traditional methods in the classroom has the potential to reap countless benefits.

Current Views on VAK Learning

The education system for secondary and post-secondary schools often fail to implement the VAK styles in their curriculum. The root cause of this problem often stems from the efficiency in group education and the educator's own teach style. The benefits of VAK often overshadow these principles, and the possibility of combining these learning styles with traditional education systems has been proven to be beneficial for many students.

Advocates of "common core" and "common lesson" education often dissuade the principles of VAK due to the ease of presenting the same material to large groups. While it is true that developing a custom experience for each student (whether that is all-encompassing or a portion of the larger lesson) can tend to be time, cost, or resource intensive, the benefits in new content acquisition and retention speak for themselves as we will explore in detail in this paper.

The most interesting of VAK is that it "changes the teachers focus as they begin to respond more sensitively to the different learning preferences of their students" and "reexamine their own learning and teaching styles" (Wehrwein 156). One of the primary issues in the adoption of VAK is that many educators feel comfortable conforming large class sizes to be taught in the one learning style that they relate too. A visually oriented teacher may find themselves teaching only visually focused material, without considering the diverse style needs of the entire class. Later in this paper we will dive deep into illustrating how wide the diversity in learning styles within even the most common groups can be while also highlighting the general benefits of custom-teaching plans.

Historic Development of VAK Learning

The first official developments in the VAK learning principle were recorded in the late 1970's when researchers found exciting evidence of longer retention in small-group education.

Although the success was first completely attributed to the smaller sized focus groups, subsequent research showed that the research group's teacher's ability to adapt to the students in the classroom provided benefits as well. This revelation spurred a decade of studies from the leading researchers in a variety of fields. The studies regarding VAK still continue to this day, with the implementation of VAK growing by the year. However, proponents of the principle are still working to replace and ameliorate the traditional classroom experience around the world. Although many critics still exist today, this paper will highlight many of the key benefits of VAK.

Impacts of VAK Upon Education

The benefits of VAK have been proven in a variety of studies, the most relevant of which highlight the impacts upon students under the age of 25. While there are studies that have shown the benefits of VAK in adults, most research in the field has been conducted with student in secondary and post-secondary education systems, who tend to be under 25 years of age. The benefits of VAK highlight the direct need for educators in these systems to adopt emerging practices of learning style diversification going forward in order to enrich the experience of all students.

A prominent VAK study was conducted by Maulidia Tifani Alfin Nur Hardiana and Professor Pujiati Suyata of the Yogyakarta State University in Indonesia. These researchers conducted a study with undergraduate writing students to analyze the “effectiveness of VAK model in learning of summary writing” (Hardiana 43) by conducting an analysis against an experimental and control group (one with and without VAK-diverse instruction). In order to quantify the benefits of VAK, Hardiana conducted a pre and posttest with both groups.

Figure 1 shows some results of the VAK study of students in the undergraduate writing program for the experimental and control groups. Looking at the results of the study, we can see

that the experimental group (who were exposed to the diverse VAK learning style principles) saw an increase of 6.5 on average versus a 5.3 increase in the control group. On a more qualitative side, a larger percentage of the experimental side expressed that they were more “interested to understand the contents” of their studies through a follow-up survey. Through this sample group, VAK has shown a higher score and higher satisfaction level amongst participants. The researchers also noted that the responses of the survey’s feedback portion indicated that the “results in the VAK model can train self-esteem and cultivate a critical attitude of the student” (Hardiana 48).

Additional studies have also been conducted in a variety of secondary and post-secondary institutions have shown a higher emphasis on student satisfaction in the classroom. A big driver of this is the student’s ability to experience freedom in their educational journey. Research studies have shown that these are key components of information retention. Students who can relate to coursework are often more engaged during instruction and take active roles in their own education. Additionally, students who capitalize on custom learning programs have been shown to show greater initiative beyond the classroom, looking for additional resources to continue their development.

Overall, VAK presents the possibility for a unique learning experience that presents information in a way that resonates with each student. Although critiques of this principle have expressed issues in implementing such a strategy, additional discussions on methods such as e-learning and machine learning will provide evidence for a future where VAK is beneficial, economical, and feasible.

Impact of Demographic Factors

Understanding the association of VAK learning styles and various student characteristics can help guide educators in finding the best pattern for their students. As stated by Rajshree S.

Vaishnav, a professor at Bajaj College in Nagpur, “Every child follows its own unique way to learn and process information. They learn material in different ways.” With this in mind, it becomes important to understand the underlying “cognitive, affective, social, and physiological” characteristics that “serve as relatively stable indicators” of learning style (R.S. Vaishnav 1). In this section we will highlight a few of these factors, shedding light on the fact that learning styles vary greatly amongst the people who encompass a large and unique set of these characteristics.

A prominent factor for consideration that has been studied with VAK is gender identity with students. In their 2007 study, E.A. Wehrwein, H.L. Lujan, and S.E. DiCarlo of Michigan State University review the distribution of VAK learning between people who personally identified as male or female. It is worth noting that the study does include a fourth type of learning style known as R, which is a subset of the Auditory section that focuses on reading/writing specifically as opposed to just visual inputs. Within the understanding that this paper focuses on the merits of specialized learning styles for students in general, the VARK model can be assumed to be an extension of the VAK model for the purposes of drawing conclusions. In their student, the researchers from Michigan administered a surveying questionnaire with a sample of roughly 80 undergraduate physiology majors (primarily juniors and seniors taken from a class of capstone coursework). The results of the study are shown in Figure 2. Please note that multi-modal refers to students who have a preference for a combination of two learning styles, creating a large number of custom combinations (one for each student) that the researchers chose to encompass in the “multi-modal” section to minimize complexity. From this visualization, we can see firsthand that the spread of preferred learning types is different across genders. Females tend to enjoy uni-model learning styles, primarily favoring Kinesthetic styles while males appear to appeal to multi-modal combinations.

Through this analysis and the remaining portions of the questionnaire, the researchers were able to postulate that “males have a preference for rational evaluation and logic, whereas females use “elaborative” processing in which they tend to seek personal relevance or individual connections with the material being taught” (Wehrwein 156). Along with countless other gender learning research, this study shows the dynamic foundations that shape the basis for learning.

Another prominent factor in understanding VAK is native language. A study by Felicia Lincoln in Arkansas studied a cluster of ESL (English as a Second Language) students and the distribution of VAK preferences in this group. In order to understand language implications, the group was concentrated with students primarily from “Mexico and El Salvador, their ages ranked from 23 to 45” (Lincoln 1). The results of the study showed that the distribution of students choosing a specific VAK learning style averages around 20%-40% per style. This indicates that even within the same ethnic and language group, there is a wide spread of learning styles, adding emphasis to the fact that education system needs to revisit the “one-size-fits-all” approach and spend time studying the potential of VAK infusion or implementation.

Subject and Field Correlation

Along with the relationships between demographic factors and VAK, there is also a relationship that exists between the course performance and VAK style classification. A study by Dobson attempted to study the breakdown of course averages for a generic class across undergraduate and graduate students. The spread of the data is available in Figure 3.

When looking over this data, it is immediately clear that there is a difference between the various VAK (R is included in this research document but is designed as a “Reading/Writing” extension of the Visual learning style) in grade averages. The most notable point is that “Bonferroni post hoc tests revealed that the scores from the K group were significantly lower than those from

the other three modality groups” (Dobson 201). This trend is easy to visualize in Figure X given the roughly 10-point lower average of the K learning style. On the other hand, the Auditory learning style averaged much higher in the course. The key driver in this disparity is use of primarily Auditory and Visual learning in this traditional classroom setting. Student who primarily relate purely to or lean towards Kinesthetic learning tend to be at a severe disadvantage in comparison to their AV counterparts. This study brings to light the fact that “students with a high kinesthetic preference for perception and learning may be at the losing end” (Ahmed 101).

Future Implications in the Classroom

One of the best ways to “improve student motivation and performance is to adapt teaching approaches to meet the different learning style preferences of [our] students.” (Wehrwein 153). As explored in other section, this statement drives the core values of VAK learning forward. However, there are two sides to any education system that need to work in sync in order to optimize learning. These two sides are the students themselves and their educators.

It is imperative for the “student to be aware of student learning style preferences to improve learning” (Ahmed 104). Recent studies have shown that undergraduate and graduate student who are aware of their VAK preference are better able to advocate for course instructors who match their style. The emergence of online professor reviews and course critiques have only built on this ideology by giving more power in the hands of the students. However, the flexibility and awareness of a post-secondary student is not commonplace in primary or secondary student groups. In order to realize the full potential of VAK, it is important to not only provide diverse learning but also provide students with the opportunities to explore their own styles.

Educators are a critical part of the future of VAK implementation. It is the responsibility to VAK-focused teachers “to assess and understand how to reach all students by understanding

how to present information in multiple models” (Ahmed 104). Many studies have shown that the average primary and secondary teacher relies heavily on purely Visual or Auditory styles, while neglecting the others. The future of VAK relies on the educator’s ability to understand that their instruction must infuse components of all learning styles.

Researcher Maulidia Tifani Alfin Nur Hardiana discusses that diversity in “delivery and training activities in the VAK model can help students explore their learning styles” (Hardiana 47). She brings to light the importance of VAK, but also highlights a key strategy that is growing in prominence. Hardiana discusses the merits of a teaching approach where “the students are not only given text, but are also given images, recording, and videos that fit the text” (Hardiana 47). The benefit of this is the ability for each student to experiment and ultimately choose the best option for them.

H.D. Surjono, a colleague of Hardiana at Yogyakarta State University, describes the potential for e-learning to play a pivotal role in the future of VAK. He proposes that this “can be defined as a delivery of learning materials through any electronic media including the Internet, intranet/extranet, satellite broadcast, audio/video tape, interactive TB, CD-ROM, and computer-based training (CBT)” in order to “enhance teaching, learning, and assessment” (Surjono 2350). In his reflection, Surjono describes that electronic modes of teaching provide the exciting opportunity to cater specific learning methods to individual students (a topic that is further discussed in a subsequent section in this paper). Although his paper was part of a 2011 research journal, the principles that Surjono advocated are very applicable in a pandemic and post-pandemic world as many education institutions turn to virtual learning platforms. In an age where face-to-face interaction has been minimized, e-learning has the potential to fill in the gaps using the bases of VAK learning styles to enhance every student’s experience.

Appearances in Neuroscience

In 2008, J.G. Sharp led a study to analyze the implications of VAK in the future of neuroscience and development. His analysis included a study of a handful of elementary (or primary) schools in Europe who had adopted VAK practices in recent years. The analysis revealed evidence of “accelerate and brain-based learning” (Sharp 1). The use of VAK learning in younger children has shown a direct increase in cognitive development and an increase in confidence and self-advocation.

Proponents of brain-hemisphere theory have also taken ranks in the supporters of VAK. This principle asserts that people are defined by one half of their brain in being either creative/artistic or analytical/logical. Advocates of this notion in neuroscience also draw parallels to VAK in its approach to cater to individual student’s strengths. Some studies have shown that a combination of Visual and Kinesthetic students tend to correlate to the more “creative-brained” individuals while Auditory and Visual learners are more analytical. By taking such notions into account, teachers can better understand their students on multiple levels.

Implications in Self-Defined Machine Learning

As previously mentioned, Surjono is a researched who is interested in the possibility of adaptive e-learning and the position it will take in the future of VAK styles and learning overall. In addition to his research, the concepts of e-learning, and specifically its adaptive nature, shed light on the potential for the application of machine learning. This phenomenon had recently begun to emerge due to the pandemic and features the potential for statistical modeling to be used to create custom student experiences. By using student preferences and performance as a training set, such programs could attempt to develop custom lesson plans that combine various types of e-learning to provide the optimal learning experience. The platforms, such as websites or broadcasts

(or more recently mobile apps), that Surjono discusses have the ability to serve as a mode of delivery for such concepts.

Future of VAK Research

Although VAK has continued to grow in popularity over the years, there is still room for research and development. Continuing to understand the benefits and characteristics of VAK will allow for future education systems to apply it effectively. Laying such a foundation will allow for improvements going forward, for teacher and students alike.

A current shortcoming in VAK research is the lack of more diverse age groups. As previously mentioned, there are a few studies that explore the impacts of VAK on adults, but there is very limited research that is being conducted on the 70-90 age group and the 90+ age group. Although people of this age are not usually categorized as “active learners” but society, an understanding of cognitive development and a neuroscience-based approach has the potential to reveal the long-lasting effects of VAK. There are some barriers to research such as an age group, often around ethics and low consent, but the benefits of such studies could help direct the future of VAK.

Another space for research in the future of VAK is the exploration of expanding VAK principles in teaching education. A variety of researchers describe the downside of engraining VAK in modern educators. However, there is room for studies to be conducted with education students by teaching VAK integration natively. This kind of research would allow for the advancements of VAK in more classrooms worldwide, but it would also allow for more research on the teachers’ perspective on VAK. Understanding the point of view of the educator would allow for more seamless integration and advancements in the future.

Closing Remarks

VAK learning advocates the need for education systems to develop custom experiences to optimize an individual student's experience. The benefits of this tactic have been shown in a variety of environments, most notably in secondary and post-secondary students. The diversity of learning styles has been studied extensively and shown that students are unique both inside and outside of specific groups (including but not limited to sexual orientation, race, ethnicity, and nationality). With such diverse possibilities in mind, the future of VAK rests on the shoulders of teachers. Modern education systems must drive forward the development of VAK with their educators in order to lead custom educational experiences that leave students with heightened acquisition and retention of new information.

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Figures

Table 1. Comparison of Data Pretest and Posttest

Data	Pretest		Posttest	
	Experimental group	Control group	Experimental group	Control group
N	30	29	30	29
Highest Score	80	80	87	81
Lowest Score	57	55	63	58
Mean	64.30	64.83	74.77	70.17

Figure 1

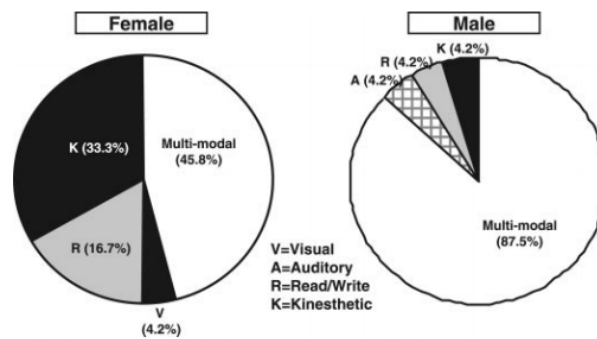


Figure 2

Table 6. Mean course scores grouped by experimental variables

Variable Level	No. of Students/Group	Mean Score
Status		
Undergraduate	50	84.88 \pm 7.49
Graduate	14	87.60 \pm 8.71
Sex		
Women	40	84.71 \pm 8.63
Men	24	86.75 \pm 6.06
Perceived sensory modality		
V	23	86.63 \pm 8.68
A	11	88.31 \pm 4.35
R	18	86.62 \pm 5.42
K	12	78.96 \pm 8.61*
Assessed sensory modality		
V	2	89.17 \pm 1.74
A	3	87.39 \pm 2.92
R	9	88.45 \pm 3.26
K	5	81.69 \pm 8.20
VK	4	87.21 \pm 5.94
AK	7	77.85 \pm 15.16
AR	1	75.71
RK	2	83.55 \pm 13.65
VAK	2	91.17 \pm 6.54
VRK	1	84.45
ARK	4	80.91 \pm 6.26
VARK	24	87.43 \pm 5.34

Figure 3