Relationships of Learning Styles to Bloom's Taxonomy of Gen Z

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This research investigates a cohort of Gen Z students' learning attributes to understand their learning styles. In this study, we applied Bloom's Taxonomy as a framework to understand the cognitive learning strategies of Gen Z students and explore the development of corresponding and effective learning and appropriate assessment approaches for their academic success. A survey of Business students at a medium-sized southeastern (US) university was conducted. The results indicate a significant positive relationship between the dependent variable, taking information apart, and exploring relationships to some of the Bloom Taxonomy attributes as independent variables.

Keywords: learning styles, Bloom's Taxonomy, Gen Z

INTRODUCTION

Generations are typically divided into categories, namely, baby boomers, generation X, millennials, and Generation Z. Generation Z, also known as iGen or the post-millennial generation, comprises individuals born between the mid-1990s and the early 2010s (Critical, V. 2016). Research on their learning styles is still emerging. Still, some studies (Iftode, D. 2019, Howe, N., & Strauss, W. 2000) suggest that they are more attuned and readily disposed to visual and interactive forms of learning. There is a general belief that they strongly desire instant gratification and feedback and are more adept at multitasking than previous generations (Howe & Strauss, 2000; Koulopoulos et al., D. 2016). Additionally, Generation Z is thought to be highly influenced by technology and social media, which may impact their learning preferences and personal habits (Leonard, B. 2014).

Whereas older generations strengthen their digital abilities through continuous learning and adapting to change, the Gen Z generation has a natural flair for new technologies. They are passionate about

technology, speed, efficiency, and a learning style specific to online channels (Howe et al.; W., 2000). Learning

generally, requires new skills, knowledge, and abilities. Most people continue this process as a lifelong activity to remain competitive. The learning process is typically influenced by cultural, social, economic, and even psychological factors (Lyons et al.; L., 2014). Each individual has a unique learning style influenced by their milieu, strengths, and weaknesses. These factors also impact Generation Z students' learning styles and enhance information flow during formative learning (Iftode, D.2019). Researchers (Leonard, B. 2014). have been interested in the learning styles of different generations for decades. However, more studies are needed to fully understand how Generation Z has adapted to technological evolution and digitalization more readily than other generations. This study attempts to contribute to the phenomenon.

The goals of this study are (a) to attempt to isolate some of the factors promoting and further understand how Gen Zs achieve success in their quest to learn in their academic environments and (b) to offer modestly best practices in advancing and improving their learning, particularly in this era of disruptive and emerging technologies. This paper focuses explicitly on Generation Z, those born after the mid-1990s. This paper is divided into five (5) sections: literature review, methodology, survey results, data analysis, and sample description, research model, and conclusions and recommendations.

LITERATURE REVIEW

People born in the late 1990s or the early 21st century are perceived as familiar with digital technology, the Internet, and social media from a young age. Generation Z (Gen Z), or "Zoomers," is the demographic cohort succeeding Millennials and preceding Generation Alpha. The word 'boomer' is a short form of 'baby boomer.' Researchers and popular media use the mid-to-late 1990s as the starting birth years and the early 2010s as the ending birth years for this generation. Baby boomers are defined as those born between 1946 and 1964, and they are the generation who carry out easily rationalizable tasks and like to learn new skills independently (Polakov & Klímova, 2019, & Levonius, D. 2015). Generation X (1965–1980) is known to be different, focused, independent, self-directed, tech-sophisticated, open-minded, and comfortable with authority (Lissitsa et al., 2016).

Empirical evidence supports that Gen Z students learn distinctly from how previous generations learned (Cilliers, E.J.et al., 2017). Gen Z students expect the classroom environment to be more interactive and conducive to thinking and creativity (Cilliers, E.J. et al., 2017). This generation differs from previous generations, as they arrived at the inception of the Internet and when the private and public sectors widely adopted the technology. No doubt, the Internet helps to integrate disparate cultures globally. Information and Communication Technologies (ICTs) and the Internet facilitate seamless and fast communication with smartphones, digital devices, and other gaming devices (Manzoni et al. (2021). Generation Z's learning style suggests it is heavily influenced by technology and, primarily, has been influenced by social media. Individuals belonging to different cohorts of generations have been shown to display other personality traits in terms of interests (personal values) and learning styles (Manzoni et al. (2021).

Generational differences impact various aspects of life, including work ethics, teamwork, career, leadership attitude, and organizational commitment. (Lyons, S., & Kuron, L. 2014, & Magni, F., & Manzoni, B. 2019). Based on Bloom's taxonomy, this study evaluated e-learning through Blackboard by surveying undergraduate students at a medium-sized university in the southeastern United States (Bloom, B.S. et al., 1956). The study concluded that individual and instructional factors do not play a significant role in learning (Halawi, L.A et al., 2009). However, in another related study, Bloom's taxonomy was applied to assess computer science programs, especially in designing examinations to improve the quality of assessment in computer programming courses (Thompson, E. et al., 2008). The authors discussed each of the Bloom classification categories and provided an interpretation with examples to facilitate and assist science educators in utilizing Bloom's Taxonomy for programming assessment.

It is common knowledge that Generation Z is interested in technology and social media. In another study (Turner, A. 2015), the author recommends that parents, teachers, and clinicians use technology not

as an enhancement but as a replacement to connect with a Gen Z child. In addition to understanding how Gen Z uses technology, acquiring a deeper awareness of a different generation's frame of reference might help bridge the gap when building personal relationships. (Turner, A. 2015). Gen Z students are considered to be native users of technology and are unfamiliar with a non-digital world, a world without smart devices and the Internet (Cameron et al.; M., 2017). Hence, their approach to learning, studying, and grasping concepts, as well as processing information, is different and constantly changing relative to previous generations. It is, therefore, not far-fetched to encourage parents, teachers, and clinicians to consider a paradigm shift when interacting with Gen Z students, especially in learning situations.

Research suggests that Gen Z students' learning styles involve visual, auditory, and kinesthetic dimensions (Cameron et al.; M., 2017). Hence, it is necessary to improvise and enhance current techniques that incorporate these newer learning styles, which may help establish an effective connection with Gen Z (Cameron et al.; M., 2017). Moreover, Gen Z is one of the profound catalysts to changes that happened to business and society (Pires, C. 2017); therefore, one must attempt to understand the Gen Z effect on the six forces: *breaking generations, hyper-connectivity, slingshotting, technology, adopting the world as my classroom, and Lifehacking,* that propel such effect as these forces are shaping the future of business (Koulopoulos et al., D. 2016). Not only are Gen Z the future of the global economy, but they are career-focused, believe in diversity, are expert online researchers and shoppers, and are ethnically diverse (Critical, V. 2016). Therefore, nurturing them at a younger age, understanding how they learn and comprehend and apply information for decision-making, and devising methods to educate them that fit their learning styles will result in preparing Gen Z students for the future and yield immeasurable dividends to society. Also, Gen Z will eventually be the target market for companies recruiting them, and in large numbers, since 70 million Baby Boomers will retire by 2025 (Leonard, B. 2014). To attract such a large workforce with different and diverse characteristics, companies should prepare themselves by changing how they recruit Gen Z (Pires, C. 2017). Companies need to change and invent innovative recruitment methods to attract Gen Z. Top recruitment techniques that may attract Gen Z include emphasizing upward mobility, offering volunteer opportunities through work, recognizing their entrepreneurial spirit and the desire to have self-directed projects, and valuing face-to-face communication (Pires, C. 2017). University and college faculty, staff, and administrators should gear up to meet, understand, teach, and guide Gen Z to become contributor citizens worldwide, particularly in the workforce.

This paper and the study's focus rest on the six (6) cognitive levels of the knowledge-based domain from Bloom's Taxonomy (Armstrong, P. 2010).

FIGURE 1
BLOOM'S TAXONOMY: SIX LEVELS OF COGNITIVE LEARNING

https://educarepk.com/the-revised-blooms-taxonomy.html
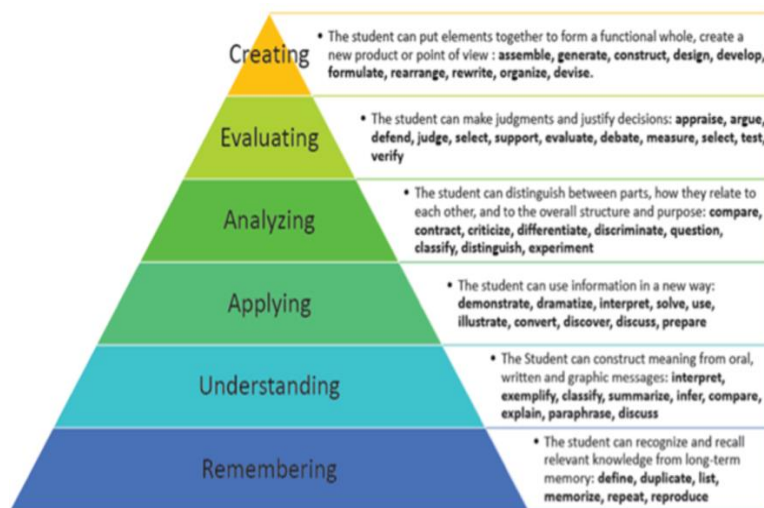
Bloom identified six levels within the cognitive domain, from simple remembering, at the lowest level, through increasingly more complex and abstract mental tasks, to the highest order, classified as creating (Armstrong, P. 2010). The original Bloom's taxonomy was revised by cognitive psychologists, curriculum theorists, instructional researchers, and testing and assessment specialists in 2001 (Anderson, L.W.et al. 2001). The reason for the revision was to draw attention away from the static notion of "educational objectives" (in Bloom's original title) to a more dynamic conception of classification (Anderson, L.W.et al. 2001). The revised Bloom's taxonomy (See Figure 1) emphasizes the use of "action words" to describe the cognitive processes that thinkers encounter and apply for knowledge acquisition (Anderson, L.W.et al. 2001).

METHODOLOGY

The research plan consisted of a sample survey, with the resulting data subjected to descriptive statistics, statistical regression methods, and inferences. Examples of analysis deployed descriptive statistics are frequency count analysis, chi-square tests, and nominal logistic regression analysis.

The sample was drawn from Gen Z students of an HBCU in the mid-southern part of the United States, with a sample size of 113. The university is a growth-oriented Historically Black College and University (HBCU) with over 5,000 matriculated students. The University could primarily pass for a small to middle-sized undergraduate university; several master's degrees and two doctoral programs are offered. The sample was mainly a Business Administration Freshmen and Sophomores (Pre-Business) cohort with varying planned future academic majors such as Business Management, Accounting, Finance, and Computer Information Systems.

Variables and Measures

African-American Gen Z Business students' self-reported achievement of learning success was gauged using a survey developed utilizing a survey tool – Qualtrics- and administered through the university's e-mail system. The survey, consisting of 33 questions, focused, among other things, on GenZ's learning preferences (See Appendix 1, 2, and 3). Questions the survey items covered include demographics and respondents' perception of their social background, education, and learning styles, as other relevant attributes such as creating something new from existing information, applying information to a unique setting, improving one's computing skills, to remember information, etc., using a 5-point Likert scale. One hundred thirteen complete, usable questionnaires were received. These were used in the final data analyses.

Sample Profile

The survey demographics break down as 91% are Generation Z (born after 1996), with a distribution of 50% in the 17 to 20 years age range, 41% in the 21 to 25 years range, and 9% above 25 years of age. The gender breakdown was 59% females and 41% males. The participants were undergraduates (10% freshmen, 19% sophomores, 31% juniors, and 40% seniors).

SURVEY RESULTS, DATA ANALYSIS, AND SAMPLE DESCRIPTION

See Table 1 for the demographics of the respondents.

TABLE 1
DEMOGRAPHIC DATA SUMMARY

AGE GROUP	RESPONSES (%)	
17-20	50%	
21-25	41%	
25 and Older	9%	
GENDER	RESPONSES (%)	
Male	41%	
Female	59%	
STANDING	RESPONSES (%)	
Freshman	10%	
Sophomore	19%	
Juniors	31%	
Seniors	40%	

RESEARCH MODEL

When there are many independent variables to choose from, and the researcher does not know with certainty which explanatory variables are better candidates in a multiple regression model, stepwise regression is the preferable method in mining the variable to select the significant variables (Smith, 2018). The algorithms use forward, backward, and mixed elimination of explanatory variables. We used different dependent and independent variables for this research to select the most statistically significant model.

The techniques of forward stepwise regression add variables one at a time until there are no remaining statistically significant variables to add. A backward elimination method initially includes all variables in the model and then removes the nonsignificant variables one by one. (Smith 2018) states, "The discarding stops when each variable remaining in the equation is statistically significant. Backward elimination is challenging if there is a large number of candidate variables and impossible if the number of candidate variables is larger than the number of observations."

For brevity, the research model can be represented by a regression equation:

$$'Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_i X_i + e \tag{1}$$

Our research model selected the dependent and independent variables using the stepwise regression (mixed backward and forward) method to fit a model with significant relationships between the variables. The dependent variable, "taking information apart and exploring relationships," was explained by the four independent variables listed below:

Dependent Variable
   Y = (*Q34*): *'Take information apart and explore.'*

Independent Variables
   X_1 = (*Q36*): '*to create something new from existing information.*'
   X_2 = (*Q33*): *'to apply information to a new setting.*'
   X_3 = (*Q24*): '*to improve my computing skills.*'
   X_4 = (*Q31*): '*to remember information*'
   e= *Error Term*

Results of the study using a stepwise linear regression model suggest a significant relationship between the dependent and *independent variables*. The regression model shows the relationship between the

dependent and independent variables (See Figure 2). The p-value estimate was less than 5% for all the variables (Q24, Q31, Q33, and Q36) (See Table 2).

FIGURE 2
REGRESSION MODEL

TABLE 2
REGRESSION PARAMETERS ESTIMATES

Parameter	Estimate	nDF	SS	F-Ratio	p-value
Q24	0.16161	1	11.022	7.864	0.006
Q31	0.01259	1	6.13226	4.521	0.03583
Q33	0.37415	1	20.0102	14.277	0.00026
Q36	0.61268	1	60.1366	42.907	0.000002

CONCLUSIONS AND IMPLICATIONS

The model results indicate that there is a significant relationship between the dependent variable, *Question Q34, '*Taking information apart and exploring relationships', and the independent variables: *Question Q36 - '*Create something new from existing information,' *Question Q33 - '*Apply information to a new setting,' *Question Q31 - '*Remembering information,' and *Question Q24 - '*Use of Blackboard helped me improve my computing skills.' This relationship strengthens the theory of Bloom's Taxonomy of remembering, applying, and creating information and its impact on learning styles. Incidentally, the lowest level of retaining, mid-pyramid using, and the highest level of creating Bloom's taxonomy are significant variables. The remaining variables, understanding, analyzing, and evaluating, were insignificant to the data used.

To the extent that inferences could be drawn about the population Gen Z college students from the population, these inferences portray a picture of these specific Gen Z students having and displaying similar dynamics in their learning styles relative to the larger Gen Z populations.

Based on the empirical results, new strategies to improve Gen Z's learning style should be adopted to take advantage of emerging technological innovations. Since Gen Z learning styles are constantly evolving, new pedagogies should be introduced to meet their needs if these groups of learners are to get the most optimal outcomes from their learning. Different learning styles by discipline could be explored and examined to match the learning styles of Gen Z to make the most of available opportunities. Also, developing a new theoretical framework based on these results could help achieve the need for new pedagogies. These future directions could allow educators to initiate vital change strategies in guiding, supporting, and nurturing students across generations, particularly Gen Z (Armstrong, P. 2010).

All research has inherent shortcomings, and this study is no exception. One of the main limitations of this study is the relatively small sample size, which has implications for the power of the results. Other areas for improvement are seen as revolving around the research design, sampling technique, data collection methodology, and the research setting itself. However, the study has several strong points and merit. Foremost is the focus of the research – African-American Gen Z Business students. Much of the research

in this area has in the recent past focused mainly on majority Caucasian Gen Z populations; it is therefore intuitively obvious that focus needs to shift, if in a little way, on their African-American counterparts. Given the above limitations, further studies that adopt mixed-methods or qualitative design research methods using Bloom's Taxonomy variables with a larger sample size are encouraged in the future to get deeper insights into Gen Z learning styles and eventually examine the effectiveness of technology integration and Gen Z learning styles. Additional data from cross-sectional sources of social strata should be collected to validate this model as the data used is from a student cohort that is homogenous in social, economic, and other variables, and in no way should the conclusions of this research be extrapolated to generalize the findings.

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APPENDIX 1: BLACKBOARD QUESTIONS

QUESTION	BLACKBOARD LMS QUESTIONS ASKED IN THE SURVEY
Q5	Approximately how many hours have you spent on Blackboard during a week?
Q9	Use of Blackboard in this course changed how I learn.
Q15	Discussions, private mail, and calendar were used effectively in Blackboard course.
Q16	I was well informed about my grades on Blackboard.
Q17	User ID and password in Blackboard worked efficiently.
Q18	I received proper instructions on the use of Blackboard for this course.
Q19	My knowledge of computers was enough for performing the functions required of the Blackboard course.
Q20	The use of Blackboard has helped me develop new skills.
Q23	Using Blackboard has helped me to learn my subject more quickly.
Q24	Use of Blackboard has helped me improve my computing skills
Q27	Overall, I was satisfied with the Blackboard course.
Q29	Blackboard made it difficult to know what was expected of me in this course.

APPENDIX 2: SURVEY QUESTIONS

QUESTION	DESCRIPTION
Q1	Which age group do you belong to?
Q2	Are you a male or a female?
Q3	What is your classification?
Q4	Approximately how many courses have you taken that required the use of Blackboard?
Q5	Approximately how many hours have you spent on Blackboard during a week?
Q6	Your level of ease in using a computer for your course(s)
Q7	How many years have you been using computers
Q8	Have you ever taken a certified computer course?
Q9	Use of Blackboard in this course changed how I learn.
Q10	I had a strong desire to take this course.
Q11	I had sufficient computer resources for use to access my course on Blackboard.
Q12	That I had to find and use a computer to participate in this course was a source of annoyance to me.
Q13	The tools used in the course were effective.
Q14	The tools used to give exams were effective
Q15	Discussions, private mail, and calendar were used effectively in Blackboard course.
Q16	I was well informed about my grades on Blackboard.
Q17	User ID and password in Blackboard worked efficiently.
Q18	I received proper instructions on the use of Blackboard for this course.

Q19	My knowledge of computers was enough for performing the functions required of the Blackboard course.
Q20	The use of Blackboard has helped me develop new skills.
Q21	I learned a good amount of factual material in this course.
Q22	The amount of work required was appropriate for the credits received for this course.
Q23	Using Blackboard has helped me to learn my subject more quickly.
Q24	Use of Blackboard has helped me improve my computing skills
Q25	I feel that I will be able to apply what I learned in this course to other courses in the school.
Q26	The mode of delivery was user-friendly.
Q27	Overall, I was satisfied with the Blackboard course.
Q28	Being able to connect to Web sites that provide information helped me learn material better.
Q29	Blackboard made it difficult to know what was expected of me in this course.
Q30	It is easier to read from a textbook than to read the same amount of material on Blackboard.
Q31	Which of the following activities do you use to remember information?
Q32	Which of the following activities do you use to understand and make sense out of information?
Q33	Which of the following activities do you use to apply information to a new setting
Q34	Which of the following activities do you use to take information apart explore relationships?
Q35	Which of the following activities do you use to examine information and make judgments?
Q36	Which of the following activities do you use to create something new from existing information?

APPENDIX 3: BLOOM'S TAXONOMY QUESTIONS

QUESTION	QUESTIONS ON BLOOM'S TAXONOMY
Q31	Remembering information
Q32	Understanding and make sense out of information
Q33	Applying information to a new setting
Q34	Taking information apart, exploring relationships
Q35	Examining information-making judgments
Q36	Creating something new from existing information