Xi'an Shiyou Daxue Xuebao (Ziran Kexue Ban)/
Journal of Xi'an Shiyou University, Natural Sciences Edition
ISSN: 1673-064X
E-Publication: Online Open Access
Vol: 66 Issue 05 | 2023
DOI 10.17605/OSF.IO/JXUQY

TECHNOMATHEMATICS SYSTEMS APPROACH: EFFECTS ON THE MILLENNIAL LEARNER'S ACADEMIC PERFORMANCE DURING THE PANDEMICS

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Abstract

This paper presents the pandemic techno-learning systems in mathematics courses called technomathematics, and their academic performance using technologically enhanced learning methods. This study aims to determine the techno-learning procedures of millennial college students in their mathematics classes and their effects on their academic performance. This study used qualitative and quantitative methods and descriptive-correlational and descriptive-comparative research methods involving 72 college students taking mathematics courses. The results show that the majority strongly agreed that they preferred using technologies such as Online Library Google, Wikipedia, social web applications, Facebook, Myspace, YouTube, and other virtual sources. Students' academic performance improved when the e-learning system was used, and it was found that their academic grades differed significantly from when technomathematics systems approached traditional learning systems. The technomathematics systems style is recommended as part of an alternative approach and methods in teaching mathematics in this millennium.

Keywords: Millennial learners, E-mathematics, Technomathematics systems, Techno-learning, Academic performance.

1. INTRODUCTION

The Millennial generation, also known as the "Next Generation", are those that have been raised in an era of instant access (Coomes & DeBard, 2004; Lancaster & Stillman, 2002) and is the most computer-literate generation (Lancaster & Stillman, 2002). Their learning and communication style is through multi-media; and their forms of communication are text messaging and instant messaging through their devices (e.g. cell phones). They have been described as techno-literate, techno-savvy, technologically fluent, and even dependent on technology (Lewis, 2003; McGhee, 2006; Zemke, Raines, & Filipczak, 2000). In a nationwide survey of 1,171 college students, 97% of these Millennials owned cell phones, and over two-thirds had sent text messages on them. Over half of the students in the study said that "instant messaging was their top choice of communication" (McCasland, 2005, p.8). They download podcasts and music, can take photos with their phones, and text message one another in their created messaging language (McCasland, 2005).

Millennials have a "curious blend of collaboration, interdependence, and networking to achieve their ends" (Alch, 2000, p. 4), and their technology seems to bring them and keep them together. Instant messaging, text messaging, and chat rooms may be essential to urban and suburban millennial connectivity (Cox, 2004). Their style is high-tech and highly

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networked, and they "will want to be able to work quickly and creatively, and they want to do it their way" (Zemke, Raines, & Filipczak, 2000, p. 143). Their creativity and investigation of electronic media, free expression, strong views, and the need for independence without restraint are noted facets of their generation (Alch, 2000).

There is some concern about the effects on their learning process. According to Frand (2000), most young people are accustomed to watching TV, talking on the phone, doing homework, eating, and interacting with their parents all at the same time. Routine multitasking behavior may have shortened their attention span and caused them to lack critical thinking skills and introspection (Murray, 1997). Although there may be a concern for Millennials' analysis of the material, there is confidence in their usage of media that can be a tool for learning. Constance Yowell, MacArthur Foundation's Director for Digital Media, Learning, and education, noted that digital technology, "a peer-driven learning", is very familiar to this generational cohort as "young people are way ahead of the adults in understanding how to use these tools" (Trei, 2006, p.2). Yowell asks, "In 10 to 15 years, will kids coming into public education be thinking, behaving or acting differently, or expecting different things because they've been engaged in digital media?" (Trei, 2006, p.1). According to the foundation's statistics, they will be, as nearly seventy-five percent of young people use instant messaging and eighty-three percent play video games (Trei, 2006) – a certain indication of changed attitudes towards learning and interaction.

2. METHOD

This paper will address the questions regarding the learning preferences of the Millennials such as "What are the Millennials' preferences for learning methods?" "Which teaching format is preferred?" "How do they try to improve their learning?" Students taking up mathematics courses were invited to participate in a survey. Among the respondents, 72 were Millennials and used for this study. The response rate was less for some items that were skipped/missed, but all surveys used included the respondents' demographic data. The survey instrument included some items adapted from a previous study by Messineo, Gaither, Bott & Ritchey (2007) that focused on college students' preferences for learning class material, specifically for active learning in large classes. Additional created items included locations of studying and attitudes toward Service-Learning work that is not a part of this paper.

Although large enough to generalize about attitudes, the sample size of Millennials may reflect a distinguishable attitude of state universities. The sample also only included those Millennials in the advanced stages of education, an opportunity not available for all Millennials. Within this cohort, there are still some "have-nots" regarding access to technology (Brownstein, 2000). The study also only reached those with Internet access. Web-based surveys may not get responses from those who are not comfortable with technology (Shannon, Johnson, Searcy & Lott, 2002).

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3. RESULTS

Of the 72 respondents, 44 were female, and 28 were male. This disparity is not surprising considering the school's demographics—only about 39% of students are males. Google was rated as frequently used when asked on the types of resources utilized for their assignments. Other resources such as e-journals, websites, blogs/wikis, Wikipedia, and YouTube were rated as seldom used, while e-books and e-mails were rated as do not use.

Table 1: Preferred Electronic Resources of Millennial Students

	Mean	**Remarks**
E-books	2.28	DU
E-journals	2.58	S
E-mails	2.49	DU
Websites	3.10	S
Blogs/wikis	2.61	S
Google	**3.82**	F
Wikipedia	2.99	S
Social web /YouTube	2.60	S

DU- Do Not Use; F- Frequently Used; S- Seldom Used

Facebook is always used with a mean of 4.92; followed by YouTube (4.49), Wikipedia (3.94), Google (3.75), and social web applications (3.63), which are noted as most often used. Myspace, online library, and other sources were noted as sometimes used. An additional item reiterated the preferences of Google and "other" search engines over library resources when asked how an information search was started.

Table 2: Electronic Resources Preferred in Doing Assignments

	Mean	**Remarks**
Online library	3.32	S
Google	3.75	MO
Wikipedia	3.94	MO
Social web applications	3.63	MO
Facebook	**4.92**	**A**
Myspace	2.72	S
YouTube	4.49	MO
Other sources (Zoom, Google Meet, video conferencing, online or virtual)	3.43	S

A- Always Used; MO- Moderately Used; S- Seldom Used

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Table 3: Important Study Methods Perceived to Improve Their Learning of Course Material

	Mean	**Remarks**
Online dyad	1.74	SWI
Online peer tutoring	2.40	SWI
Online minute paper	2.07	SWI
Online lectures	2.00	SWI
Online discussion	2.03	SWI
Online game-based learning	2.81	E
Online gake home Test	1.85	SWI
Web group discussion	2.40	SWI
Online chat	2.58	E
Online-based learning	**2.86**	**E**
Online team-based Solving	2.44	SWI
Online problem-based Learning	2.47	SWI

E- Essentials; SWI- Somewhat Important

Online-based learning (2.86), online game-based learning (2.81), and online chat (2.58) were rated as essential, while others were rated as somewhat important. It is notable that online lectures, online discussion, and online minute paper methods were rated as the lowest among the rest. This could be the result of the efforts of the student using the material and/or the design and method of the material itself.

Table 4: Level of Academic Performance in Mathematics during Pretest

Academic performance	Controlled Group (modular)		Experimental Group (virtual/online)	
	Pre-test	Level	Pre-Test	Level
Mean	72.74	Failed	73.42	Failed
Standard Deviation	2.00		3.47	

Pre-test and post-test were done to determine the level of academic performance of the students in mathematics after the modular lecture (controlled group) and virtual or online lecture (experimental group). A mean of 72.74 in the controlled group, and 73.42 in the experimental group, implies that both experimental and controlled groups belong to the developing level or stage of academic performance during the pretest, and the standard deviation shows the homogeneity of the student's academic performance during the pre-test.

Table 5: Level of Academic Performance in Mathematics during Post-test

Academic performance	Controlled Group (Modular)		Experimental Group (Virtual/Online)	
	Post-test	Level	Post-Test	Level
Mean	75.26	Passed	84.56	Passed
Standard Deviation	3.99		4.56	

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The results of the mean scores of both groups in the post-test increased significantly. The posttest results of the experimental group is 9.3 percent higher than those in the controlled group. This means that teaching using technologies or virtual or online enhances the student's academic performance in mathematics compared to modular types. This signifies that teaching, with the aid of technology, is more effective than the modular type.

4. CONCLUSIONS

The result of this study indicates that there are many uses of technology, such as typing notes in class and searching online. As for research, the low percentage of scholarly research sites is a concern. In a 2007 study, millennial students used Google frequently, and thought Google a more useful tool than those provided by the library and frequently used Wikipedia for assignments. (Nicholas & Lewis).

Mathematics students utilize technologies in learning and somewhat easily get bored with the traditional and conventional ways (i.e. modular). Technomathematics is their current preference for learning, and this includes research-based where they are aces at "searching" and discovering information. Learning methods will have to continually adapt to engage and educate this generation. There was indication that these respondents did value online group work, online problem solving, and case analysis and but indicate short term memory and poor knowledge retention for future needs and analysis.

5. RECOMMENDATIONS

There are several opportunities for future research about this generation and their learning preferences. Certainly, a larger sample could be used, and yearly comparisons could yield more information. An assessment of learning could be measured. Comparison with other generations and faculty attitudes as well as the personality of the participants and gender differences could be discerned. This kind of learning is one that should be investigated. Web sites may become more popular with learning methods. Just as e-learning has shown a cost savings for workplaces (Macpherson, 2004), educational institutions may recognize a benefit both financially and in student learning through new technological methods. Educator and managers will have to adapt to new means of engagement to attract and retain the millennial students and workforce.

References

1. Alch, M.L. (2000). Get ready for a new type of worker in the workplace: The net generation. SuperVision 61(4), 3-7.
2. Coomes, M. D., & DeBard, R. eds. (2004). Serving the millennial generation.San Francisco. Jossey-Bass.
3. Frand, J.L. (2000). "Information age mindset: Changes in students and implications for higher education." Educause Review, 35, 16 -24.

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4. Lancaster, L. C., & Stillman, D. (2002). When generations collide. New York: HarperCollins Publishers Inc.
5. Marston, C. (2005). Motivating the “what’s in it for me?” workforce: Managing across the generational divide. Cam Marston.
6. McCasland, M. (2005). Mobile marketing to millennials. Young Consumers, Quarter 2, 8-15.
7. Messineo, M. Gaither, G. Bolt, J. & Ritchey, K. (2007) “Inexperienced versus experienced students’ expectations for active learning in large classes.” College Teaching, 55(3), 125-133.
8. Murray, J. P. (2004). Nursing: The next generation. Nursing Education Perspectives, 25(3), 106.
9. Nicholas, A.J. & Lewis, J.K. (2008), “Millennial Attitudes toward Books and E- Books.” The International Journal of the Book, 5(2), 81-92.
10. Shannon, D. M., Johnson, T. E., Searcy, S. & Lott, A. (2002). Survey professionals using electronic surveys. ERIC Digests, EDO-TM-02-02 4 pages.
11. Trei, L. (November 15, 2006). “Researchers study how technology shapes the ways in which students learn. ”Stanford Report. Retrieved December, 2007. http://news-service.stanford.edu/news/2006/november15/barron- 111506.html
12. Zemke, R. Raines, C., & Filipczak, B. (2000). Generations at work: Managing the clash of veterans, baby boomers, xers, and nexters in you workplace. New York: American Management Association.