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Research Article

A Study of Generation Z on Their Learning Styles, Online Learning Methods, and Search Strategies

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Abstract: The traits and learning preferences of different generations differ. Less research has been done on Generation Z (Gen Z), the next generation of employees and consumers. This study attempts to shed light on the learning styles and preferences of Gen Z along with their views on both structured and unstructured online learning, and their searching strategies. Open-ended surveys and knowledge search tasks were conducted, observed, and analyzed. The results showed that Gen Z students tend to prefer visual and kinesthetic learning. Moreover, individual goals influence both structured and unstructured online learning methods. The search strategies used by Gen Z students are using a combination of short keywords and focus features (functions) that they want to perform. Moreover, they selected the search results by looking at search engine rankings, website reputation, the amount of views, and the more recent links. The findings of this study will be valuable for creating online courses that adopt the best strategies for Gen Z students. The paper concluded with recommendations on online learning design with knowledge-searching implications.

1 Introduction

Generation difference causes different points of view toward attitudes, beliefs, and values (Valickas and Jakštaitė, 2017). Generation Z (Gen Z) is the generation born after 1996 (Manzoni et al., 2021) and known as the population that grew with the web and technology. Gen Z is the future of the next workforce and has a high impact on society. Knowing how they engage in learning, such as their learning preferences and knowledge search strategies, is critical to designing effective learning experiences.

For the Gen Z generation, learning must be more informal, participatory, and experience-based. They are active learners and multimodal students. Massive open online courses (MOOCs), YouTube videos, short-term training, and other contemporary learning options are considered by Gen Z as credible alternatives to traditional schooling and as means of receiving a good education (Giray, 2022, Manzoni et al., 2021). Moreover, Gen Z tends to prefer online interaction via social media and communicates with others using images (PrakashYadav, & Rai, 2017). Additionally, Gen Z prefers to learn by themselves, rather than being taught by a teacher (Iftode, 2019).

However, there is a lack of academic research on those topics on learning characteristics for Gen Z. To fill some gaps, this study was conducted to identify the learning styles, and learning preferences of Gen Z, their views on the advantages and disadvantages of structured and unstructured online learning, and their searching strategies through project-based learning in computer science projects. In more detail, the following research questions will be focused on in this study:

- How do Gen Z students approach learning and their preferred learning styles?
- What are the preferences of Gen Z students for online learning (structured or unstructured online learning), and what are the benefits and drawbacks of both types of online learning?
- How do Gen Z students find information from the web and what are the design implications that can be drawn from the observations made throughout the search tasks?

For better online learning design, a discussion and recommendations will be provided. In the next section literature reviews will be described.

2. Literature Review

This section explains learning styles, types of online learning, and search characteristics.

2.1 Learning Styles: The VARK Model

It is widely believed that both students and teachers can benefit from knowing a student's preferred learning style, for

example students will have better achievements if their teachers' styles or learning approach match their own learning style (Awla, 2014). This study will emphasize the VARK learning style model of Fleming (2006) since it is used worldwide and is easy to understand.

The VARK learning style model classifies students into four different learning styles, namely visual (V), aural (A), read/write (R), and kinesthetic (K). The following are the descriptions for each learning style:

Visual (V) learners: Visual learners prefer to think in pictures and learn by watching videos and looking at diagrams.

Aural (A) learners: Aural learners could learn or gain information from aural channels like conversations and listening to others speak.

Read/write (R) learners: Read/write learners favor reading and writing as their primary methods of knowledge acquisition.

Kinesthetic (K) learners: Kinesthetic learners prefer learning by doing. They like to use practical examples, perform operations, and gain real-world experience to learn something new or take in information.

When students are aware of their preferred learning style, they will integrate it into their learning process. As a result, they will know how to learn faster and easier (Awla, 2014).

2.2 Structured and Unstructured Online Learning

This study separated online learning methods into two types as follows:

Structured online learning: This paper defines structured online learning as participating in a structured system or platform in formal learning environments. Normally, this type of learning requires students to register before accessing the system. The teachers must organize their materials, pre-sequence the instruction, and structure their content (Stanton & Stammers, 1990). Moreover, a pre-test and post-test will be provided to assess students' performance. Students could receive certificates after completing the courses. The massive open online courses (MOOCs), like those provided by Coursera and Kasetsart University, could be seen as this type of online learning.

Unstructured online learning: This paper defines unstructured online learning, based on the work of Onwujekwe, Osei-Bryson, & Ngwum (2020), as gaining knowledge from a variety of unstructured online information ranging from textual data from social networks, online forums, discussion boards, and reviews, to image and video data, such as those on YouTube. The learners can choose how the information and instructions are presented to them, in a manner that suits their learning styles and preferences without any structured course curriculum.

This study seeks to determine how Gen Z perceives these two types of online learning and identify the advantages and disadvantages of both types of learning.

Searching Strategies

There are two main search strategies: breadth and depth search queries.

Breadth search query: This search strategy could be conceptualized into three means of searching: keyword search, wide search definition, and general knowledge. Normally, this strategy is applied by less experienced users with little knowledge of the search topics and search techniques.

Depth search query: This search strategy could be conceptualized into three strategies: using complex search (i.e., using more specific keywords), using computer conventions, and Boolean operators. This strategy is usually employed by users who are experienced and knowledgeable of search tasks and techniques.

It was found that greater familiarity with the search content, tools, and strategies, as well as deeper query information, led to more successful and satisfying the search results (Yamin, Ramayah, & Ishak, 2013).

3. Methods

This study conducts a two-phased method design: open-ended questionnaires and an experiment on search tasks. The first phase of this study involved collecting data on Gen Z's opinions on their learning styles and online learning. In total, 94 students from the Department of Computer Science, aged between 20 and 22, took part in open-ended questionnaires, and 11 students were chosen to participate in search tasks and interviews. For the questionnaires, the following open-ended questions were asked:

- What are your preferred learning styles?
- What are your preferences for online learning (structured or unstructured online learning) and what are the benefits and drawbacks of both types of online learning?

This study asked students directly about their preferred learning styles and online learning because it could make students aware of and employ the right strategies to gain knowledge that suits their preferences. In the second phase of the study, knowledge search tasks were conducted and observed by instructing the chosen 11 students to search for material relevant to their course projects. Before participating in the tasks, the objectives of the study were explained. After performing the tasks, interviews were conducted to clarify their search strategies for about 15 minutes for each student.

4. RESULTS AND DISCUSSION

4.1 Open-Ended Questionnaires

For data analysis, content analysis was performed. The responses collected from participants are presented in Tables 1-3.

Table 1. Gen Z learning style preferences

Learning Styles	Number of students	Percentage (%)	Notes
V	6	6.38	Visual learners
A	3	3.19	Aural learners
R	4	4.26	Read/Write learners
K	19	20.21	Kinesthetic learners
V+A	8	8.51	
V+R	12	12.77	
V+K	20	21.28	
A+R	1	1.06	
A+K	5	5.31	
R+K	2	2.13	
V+A+R	3	3.19	
V+A+K	5	5.31	
R+K+V	3	3.19	
A+R+K	2	2.13	
V+A+R+K	1	1.06	

Answering research question number one on the learning styles' preference, it could be found that the most preferred learning style for Gen Z is the combination of visual learning and kinesthetic learning (21.28% shown in Table 1). For overall results, it was clear that Gen Z students prefer learning things from pictures and video clips (visual learners), and from practical examples and experience (kinesthetic learners).

Answering research question number two on online learning preference (shown in Table 2), it could be found that the number of students who prefer structured online learning (53%) is slightly higher than the ones who prefer unstructured online learning (47%). The most important reasons for the preference for structured online learning are the students could have a channel to consult their instructors, and they could get certificates after attending a course. Moreover, this structured learning provides some exercises and tests that help them understand more about the topics. The most important motivators for the preference for unstructured online learning are its convenience, up-to-date content, and cost-free nature. Therefore, individual goals influence both structured and unstructured online learning practices.

Table 2. Gen Z online learning preference

Online learning	Numbers of students	Percentage (%)	Reasons
Structured	50	53.19	- The course platform provides some channels to consult the instructors. - There are course certificates provided after finishing a course. - It can be re-accessed. - It provides course material and clear topics. - The course contents are complete and clear.
Unstructured	44	46.80	- It is easy and convenient to access this type of online knowledge via YouTube at any time. - The content is up to date. - It takes little time to access. - There is no fee for access. - There are no restrictions and rules to access. - There are various instructors and instruction types. - The media can be accessed at any time without following a sequence of steps.

Table 3. Structured and unstructured online learning: benefits and drawbacks

Online learning	Benefits	Drawbacks
Structured	- Normally, it provides course certificates. - It provides exercises and tests to gain more understanding of the topics. - There are some channels to consult with the instructors. - Course contents are complete, profound, and accurate. - There are step-by-step instructions starting from basic topics. - The course platform provides some channels to consult with an instructor. - Course materials are provided.	- It takes time to finish the course. - Some courses have a set time limit. - Before participating, students must register. - Normally, students have to pay to access courses. - It might have fewer instructors and content. - Its content might not be up-to-date.
Unstructured	- It takes less time to access. - There are various instructors and instruction. - It is convenient to access. - It is free. - There is no time limit to access.	- It can cause a lack of motivation to access. - There are no exercises or tests. - It takes time to search for the right content. - It could contain inaccurate, incomplete, or untrusted content. - Its content might not be profound.

Answering research question number two on the benefits and drawbacks of both online learning (shown in Table 3), it could be found that Gen Z students perceive the benefits and drawbacks of both types of online learning. The benefits of structured online learning are that it provides a way to communicate and consult with instructors, trusted materials, exercises, and certificates. Moreover, it is easy to follow as there is a progression of training from basic to advanced themes. However, the drawbacks are that it takes time to register to the system, and normally, participation is subject to payment. Additionally, the course content might not be up-to-date and diverse. On the other hand, the benefits of unstructured online learning via video clips are that it is more flexible, free, up-to-date, and easier to access. However, there are some drawbacks which are its materials could contain inaccurate, incomplete, uncomplicated, and untrusted content.

Observations and Interviews during the Search Tasks Session

This phase of the search tasks aims to identify the research question on how Gen Z students find information from the web and what design implications can be drawn from the observations. The chosen 11 students were asked to perform search tasks about topics relevant to their course projects in computer science. They were then asked to explain the reasons why they chose the link results that followed.

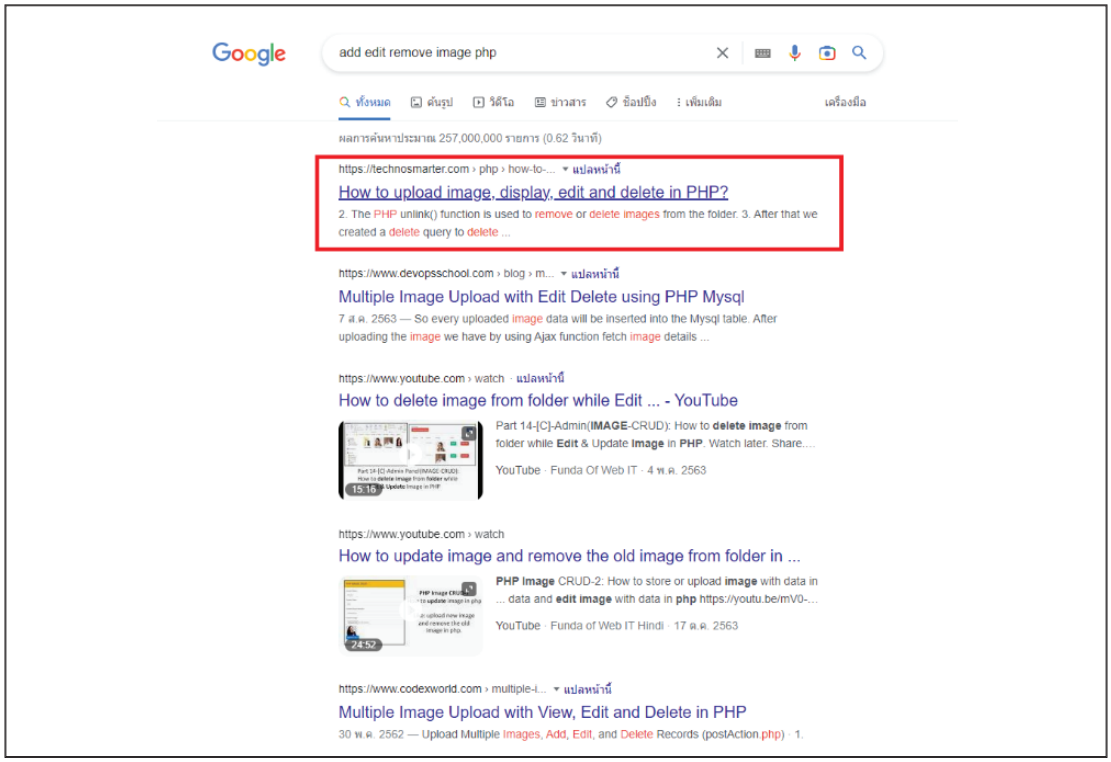

Figure 1. A student performed search tasks via the Google search engine

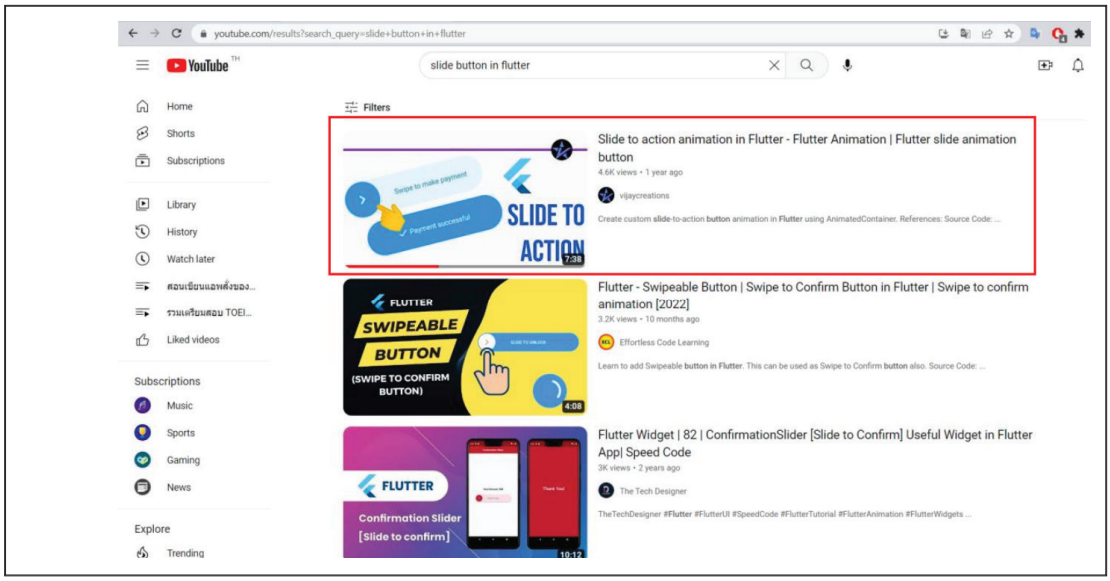

Figure 2. A student performed search tasks via YouTube

Figures 1 and 2 show some of the results that were captured. It can be seen that Gen Z students are familiar with using the Google search engine and YouTube as tools to search for information. By using a combination of keywords (a short query in 1-3 terms (Aula, 2005)), they chose the first link that matched those keywords and they used a combination of keywords such as “add edit remove image PHP” (shown in the red letters in Figure 1). In Figure 2, instead of the Google search engine, the student employed the YouTube search tool. They used the combination of keywords and functions of the programming language that they wanted to use, “slide button in Flutter”, then selected the link with the most views and presented as the top-ranked result.

From these observations, students performed the search tasks by searching for relevant content via the Google search engine and relevant video clips via YouTube. All 11 students employed breadth search query strategies with a combination of keywords without using any Boolean search operators (as an in-depth search query). Boolean search operators such as “+”, “AND”, and “OR” could increase more exact and relevant results (Aliyu, 2017). Some of the students use natural language with many stop words (Zhang, 2014). For example, they asked questions such as “How to make auto-complete in MVC” in query terms. However, a combination of specific keywords that they used could help them find their results because there are many people making content in the field of computers. After interviews about how the students chose the site to visit, it was found that the number of views, the more up-to-date links, search ranking via search algorithms, and the reputation of websites have an impact on their decision.

5. Conclusions

The main findings and implications from the study were the following:

- Gen Z students tend to prefer visual and kinesthetic learning. Therefore, instructors could adapt their teaching styles and materials to be consistent with students' preferences by using more video clips and exercises that they can follow and re-access.
- Individual goals influence both structured and unstructured online learning practices. However, interaction with instructors, such as consulting, is an important factor for Gen Z students to participate in learning. The instructors could combine the benefits of both structured and unstructured online learning. For instance, in the beginning, teachers might create a free and open environment so that students could easily access the course materials. For premium requirements, such as when students seek certificates or more in-depth content, registration, tests, and payment may then be required. Online education will thus be appropriate for students' objectives.

Gen Z students are familiar with the search tools like Google and YouTube. However, if they have more knowledge about searching features and techniques such as using Boolean search operators, they will gain more satisfactory and effective search results. Furthermore, as students use natural language and questions like "how to" in query terms, system designers could offer a more "natural" interface to encourage users to ask questions and an algorithm to provide more relevant to natural language inquiries (Zhang, 2014). Search engines are the most important starting points for using information on the Web, therefore encouraging and training students to gain more knowledge on search systems and the depth search query strategy will contribute to more successful search results and search satisfaction (Yamin, Ramayah, & Ishak, 2013).

In addition, apart from search rankings, the reputation of websites (for example, if the search result came from the Borntodev website, students showed greater preference), and the more up-to-date websites, some social opinions also have an impact on the search strategies, such as the number of views of the video clips. Therefore, instructors could employ the number of views and reviews in their course materials. Furthermore, as visual and kinesthetic learners, instructors should include techniques to support exploratory search like interactive visualizations in their materials for Gen Z students (Athukorala et al., 2013).

This study is based on empirical data on learning style preferences, online learning opinions, and search strategies for Gen Z students. Some implications mentioned above can be considered by instructors and developers to design their course materials and learning environments. However, this study has limitations due to the limited number of convenient subjects employed.

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