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Side Effects of Google

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Abstract: Throughout history, humans and technology have developed simultaneously. The internet is one of the most modern examples of this phenomenon and researchers have noticed that as the internet becomes increasingly available, humans rely on it more. As a result, people seem to retain less information, and what they do remember is often false or misleading. This article examines the impact the internet has had on memory, education, and healthcare.

Throughout history, we have seen evidence of human cognitive skills and technology growing together. It is believed that the use of tools correlated with early hominid development nearly 2.5 million years ago, distinguishing them from other animals.[1,2,3] Although this idea is debatable, as there is no tangible evidence for it. It is thought that the development of tools indicated the beginnings of human culture, cognitive neuroscience, and developmental psychology.[2,3] This trend of technology and human capabilities developing simultaneously continues into the Industrial Revolution. The rapid technological advancement of this time period made mass production cheaper, increased access to many goods, and improved transportation and communication.[4] Additionally, it allowed for quick access to information. More recently, search engines like Google™ have demonstrated similarly profound effects on our everyday lives by increasing the ease of access to boundless information and resources. Specifically, searching the internet can increase people's confidence in their own knowledge and create transactive memory, or a "shared memory system" with the internet.[5] As a result, using the internet provides clear advantages to students, doctors, and patients alike in their day to day tasks. Despite the convenience of searching the web, forming a transactive memory system with the internet can have both positive and negative effects on an individual's edification and memory.

In terms of education, instant access to the web provides numerous advantages in the classroom. Nearly 16 million students regularly use the internet at school.[6] Some classes even use a non-traditional style where students learn material at home using online videos and then spend classroom time doing homework. This flipped classroom approach allows students to make mistakes on their homework with the teacher nearby to help. It also gives students the opportunity to become more familiar with the material through primary exposure at home and secondary exposure at school. Though the teacher may not be able to make sure the students are comprehending the lectures initially, this format grants the students extra time to process the material at home and return to class with more developed questions. Consequently, classrooms that use this model have noticed an increase in student performance, preparedness, and teacher satisfaction.[7]

The internet can also be a great resource for educating healthcare professionals and patients alike. Healthcare professionals are in constant need of staying up to date on novel drug discoveries or learning new information for drugs already on the market. For example, several pharmaceutical companies recently issued a recall for the blood pressure medication losartan due to contamination with cancer-causing impurities.[8] In this case, the internet is a quick and efficient way to notify millions of healthcare providers about an important patient safety concern. Similarly, using the internet as a health resource helps patients improve their understanding of a disease or treatment. Subsequently, this enhances the dialogue with their doctor and increases the patients' abilities to manage their disease more effectively.[9]

While many use the internet as a valuable resource for school in order to gather information, it can also be a hindrance. In particular, researchers found that students who are addicted to using the internet have less motivation to study. Consequently, this lack of motivation can negatively impact grades.[10] Another study reported that teenagers spend approximately 7.8 hours each week talking to friends using a device and about 10.3 hours talking to friends in person.[11] The way students interact with the internet, both in and out of the classroom, can create a sense of dependency that negatively affects motivation, focus, and social interaction.

Another concern over internet use is the uncertainty that information we are accessing is accurate and unbiased. Not only does this pertain to students, but it is also a concern for patients that seek medical information on the internet. Many easily accessible, health-based websites provide inaccurate or outdated information. Readers are often misled with advertisements that promote products or services.[9] In fact, studies have shown that 32% of patients who found medical information on the internet received deceptive or false information. Despite these statistics, another study found that nearly 82% of participants believe the information they find on the internet is better than what is obtained at healthcare provider offices.[9] Patients often consult the internet because it is convenient and feel their providers' offices do not have the information they want, either in print or from a consultation. A lack of accessible, understandable, and accurate health information is particularly dangerous if patients prolong reaching out to a health care professional in hopes of remedying their symptoms on their own.

Constant use of the internet has clear implications on memory and retention rate as well.[12] Researchers found that participants with access to electronically stored information unintentionally forget trivia but do recall how to access that information.[13] In this case the brain thinks the process of finding information is more advantageous than remembering it. Similar results were reported in another study where retention rates using the internet and an encyclopedia for fact-finding were compared. Although study participants found information faster using the internet, they retained it for far less time compared to an encyclopedia.[14] The brain may recognize that it takes longer to find information with an encyclopedia, so it would save time by remembering the information instead. In contrast, the electronically stored information is much easier to access and therefore not as important for the brain to remember.

In addition, internet searches have been shown to inflate overall confidence in the researcher's knowledge of that subject. For example, according to studies surveying the effects of internet use on the patient-doctor relationship, participants rated their knowledge on topics higher when they had access to the internet to confirm their understanding than when they did not.[15,16] Ultimately, their awareness of the subject may not have changed, but the ability to fact check increased their assertiveness. In a similar study, when researchers asked the participants where they got the information, they often unintentionally claimed the information as their own, forgetting that it was obtained from the internet.[11] This demonstrates how the lines between our own knowledge and that obtained from the internet are not always clear.

As our society advances, using technology and the internet seems unavoidable. It has clear advantages: supplementing student education in the classroom, staying up to date on current healthcare topics, and answering almost any question instantly. Despite these clear advantages, the internet does not come without some negative side effects. Internet usage can reduce memory retention, decrease study motivation, and result in misinformation. While it may not be possible or even practical to quit using the internet completely, it is important to examine how it is used and critically examine website content. The internet can be an invaluable tool, if it is used correctly.

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