Word Processors Negatively Affect Writing Quality: A Comparison with Transgenic Crops

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Abstract
Zhao and Frank demonstrated “an ecological perspective can provide a powerful analytical framework for understanding technology uses in schools” [1]. This essay employs an ecological metaphor to illustrate the impact of using word processing to teach writing. This paper will compare the affects of planting genetically modified crops to the impacts of using word processors in education. Although their contexts are particularly different, scientists and consumers consider both revolutionary in their fields, but their use has particularly adverse consequences. This paper discusses similarities regarding their advantages, followed by parallels in their disadvantages. Consequently, this comparison establishes the need to moderate use of word processing software in schools.

1. Context
Transgenic crops currently account for over 200 million acres of agricultural land [2]. In the mid-1990s, scientists believed them to be an advantageous technological advancement [3]. Genetically modified crops are plants used in agriculture that scientists genetically altered to incorporate advantageous characteristics in their DNA [4]. These genes enable the crops to resist destructive insects and plants, increase agricultural yields and provide nutritional enhancements [4, 5, 6]. However, research has now demonstrated that they have significant negative impacts, particularly adverse health effects, herbicide-resistance and loss of biodiversity. Given their abundance, dispersing capabilities and persistence, their negative affects have been especially difficult to mitigate.

Similar to genetically modified crops, researchers thought word processors were a benign technological development. Word processors, such as Microsoft Word, Corel WordPerfect and Pages, are computer software applications used to create, revise, format and print text documents [7]. Consumers perceive them as an innovative solution to writing constraints. People use word processors in a variety of contexts, including educational settings. This is because they eliminate the need to recopy text, facilitate the development of longer documents and produce aesthetically pleasing hardcopies [8]. However, their use decreases revision, increases spelling errors and reduces handwriting use [9, 10, 11]. It is, therefore, imperative that teachers moderate use of word processors. Otherwise, their impact on student writing capabilities will be extensive and unmanageable, similar to the repercussions of genetically modified crops.

2. Positive effects
New technologies can offer a variety of benefits that improve current practices. In their respective domains, genetically modified crops and word processors decrease process requirements, increase production and improve outcome quality.

2.1. Process reduction
Advancements in genetic engineering enabled the development of transgenic crops that are resistant to undesirable insects and plants. This, thereby, reduces the need for pesticides and herbicides. “GM soybean, oil seed rape, cotton and maize varieties modified for herbicide tolerance and insect protected GM varieties of cotton reduced pesticide use by a total of 22.3 million kg” [12]. There are health benefits to decreasing the application of chemicals. The World Health Organization demonstrated there are 500,000 pesticide-related poisonings annually and approximately 5,000 of these are fatal [4, 12]. There are also economic advantages. Farmers not only save the direct costs of purchasing chemicals, but also their application costs. Every 75 hectares of agricultural land requires 205 liters of diesel for spraying [12]. This is equivalent to C$5 million in savings for farmers annually [13]. Carbon sequestration also has environmental benefits because the machinery used for chemical application does not emit carbon dioxide into the atmosphere [4]. Moreover, agricultural practices do not require raw materials and resources for manufacturing pesticides and herbicides, thereby increasing sustainability [4].
Similar to transgenic crops reducing the application of chemicals, word processors decrease the need to recopy text. Instead of manually rewriting an entire document to make changes, editing can easily be accomplished [7]. Once users enter information into the computer, it can be simply manipulated. Content can easily be added, changed and rearranged [14]. Writers do not need to create numerous drafts, but rather, one version that can be reworked. This significantly decreases the time required to edit a written document, compared to pen and paper methods. Formatting and layout can also be easily changed with word processing [14]. Students commonly forget to double-space documents. It can take hours for students to rewrite their work by hand in order to correct formatting problems, but it can be completed within minutes using a word processor.

2.2. Increases in quantity

Transgenic plants produce considerably greater crop yields, compared to natural varieties [4, 5]. This is significant given food scarcity problems, particularly in developing countries [4]. Since farmers in third-world countries are unable to apply herbicides and pesticides due to economic constraints, pests substantially reduce their crop sizes. With the invention of herbicide tolerant and insect protected plants, however, crop yields have increased dramatically [15]. The minimum increase in harvest size is approximately 50% with genetically altered crops, but it is frequently higher; for instance, the use of Bt cotton in India showed an increase of 80% in harvest size [15].

Likewise, word processors increase yields in terms of document length [8, 10]. A study conducted by Hass demonstrated that word processing enables students to write longer papers [16]. Test subjects wrote an average of 595.7 words using pen and paper, but 767.1 with a word processor [16]. This is primarily because word processing can produce written documents significantly faster than pen and paper methods. An increasing number of children have access to a computer outside of school and use it on a regular basis. As a result, most children are faster at typing than writing manually. Another reason students tend to produce longer documents using word processors is their apparent continuity [7]. When using pen and paper mediums, students typically conclude their work at the end of a page, in order to avoid beginning a new sheet [7]. Although word processors also divide documents into pages, a new sheet does not need to be used in order to start a different page.

2.3. Quality enhancements

Genetically modified plants also have quality improvements, particularly in terms of their nutritional value [2]. Over 40% of people worldwide suffer from malnutrition [17]. This is largely because the most common crops varieties do not have sufficient micronutrients to meet human needs [17]. As a result, humanitarian organizations have advocated for transgenic plants with a higher nutritional value than their natural counterparts [2] They developed Golden Rice that has a beta-carotene supplement because there are approximately 2 million cases of vitamin A deficiency annually [2]. Genetic enhancements can also help prevent cancer and cardiovascular disease [17]. Research demonstrates a positive relationship between antioxidants and reduced chronic illness [17]. Plants can be modified to have greater levels of lycopene, which is an exceptionally strong antioxidant, and this may decrease the potential for chronic health problems [17].

Similar to genetically modified crops, word processors have quality enhancements. They enable the creation of neat hardcopies that are aesthetically pleasing [8, 18]. Students with substandard penmanship can create documents that are not only legible, but resemble published material [19]. This inspires students to make a greater effort in order to create documents that resemble published works in quality as well as appearance [7, 19]. As a result, students are more likely to take pride in their finished product [7, 19]. Also, students who have special needs that impact their writing abilities benefit from text software. To use word processors, students do not require sequencing abilities or spatial organization skills [20]. This is because the computer automatically moves from left to right and spaces writing [20].

3. Adverse impacts

Because of their advantages, technologies are often mass distributed before researchers conduct thorough studies on their affects. Research now shows that genetically modified food has negative consequences, much like the use of word processors. Both products have a deficiency in evaluation, cause unwanted alterations and decrease vital elements in their environment.

3.1. Lack of examination

The government conducted insufficient research regarding the impacts of transgenic crops prior to their use, specifically with respect to human health affects [21]. Although genetically modified food has to pass tests in order to be sold to consumers, the government does not require long-term studies or clinical trials [21]. Unfortunately, now that transgenic foods are on the market, there is evidence they cause adverse health effects [4, 5]. Research demonstrates that genetically modified food can cause antibiotic resistant bacteria in the digestive system, stimulate the development of cancerous cells and cause allergic reactions [2, 21].
Because of these consequences, it is essential that transgenic crops undergo more rigorous evaluation prior to distribution [21].

Unlike transgenic crops, word processors do not require additional examination before distribution. Rather, it is their use that causes a decrease in analysis. Studies demonstrate the extent of preparation and revision students conduct is significantly less when they use word processors compared to manual methods. Hass’ research on the writing process proved electronic mediums impede revision [16]. She demonstrated that students conducted considerably less preparation before starting to write and substantially reduced conceptual planning with the use of word processors [16]. Hass argued this is because word processors are not conducive to taking notes and, therefore, students spend less time organizing their thoughts and structuring their arguments [16]. Writers also do not need to reread and rewrite their documents in order to make changes [10, 22]. Dall’Alba & Barnacle indicated the fact that modifications can be easily made to written documents causes reduced revision [23]. Consequently, decisiveness is not necessary during the planning phase [23].

3.2. Undesired modifications

Transgenic crops cause undesirable changes to DNA sequences [5]. They cross-pollinate with natural varieties, resulting in a hybrid of the two species [5]. Because of this, plants genetically modified for herbicide and pesticide tolerance are able to transfer this DNA coding to their wild counterparts. After successive cross-pollination with wild species, native plants can become multi-resistant to various pesticides and herbicides [24]. In Alberta, scientists found weeds that are triple-resistant to three different herbicides [24]. This limits the chemicals that can affect these plants [25]. It also means their populations are especially difficult for farmers to control [25].

Word processors also cause unwanted modifications. In this case, however, they increase the likelihood of certain spelling errors. The majority of students falsely believe that word processors correct all spelling mistakes. While the spellchecking tool enables some errors to be corrected, it also creates others. This teaches students incorrect spellings. A study presented by Linke demonstrated that word processors automatically change unrecognized vocabulary to similar, known words; for example, the amino acid “proline” changes to “praline” in Microsoft Word [11]. Moreover, the default setting for spellcheck is United States English. When Canadian students use this tool, they often fail to change the language setting. As a result, their documents frequently include American spellings; for instance, the Canadian spelling of “behaviour” automatically changes to “behavior”. This leads students to assume the correct, Canadian spelling is “behavior”.

3.3. Component elimination

As discussed with respect to herbicide resistance, transgenic crops produce hybrids with native organisms [4, 25]. By cross-pollinating with non-target species, they can eliminate natural gene sequences and cause loss of genetic biodiversity in plants [5]. In addition to procreation, genetically modified plants also reduce biodiversity by harming other species [3]. The toxins released by transgenic plants, which enable them to resist pests, affect non-target organisms; for instance, Bt corn releases Cry toxins designed to protect against the corn root-worm, which are also poisonous to Monarch butterflies [3]. Furthermore, Cry toxins reduce maturation and reproduction in caddisflies, which is particularly devastating because they are an essential food source in stream ecosystems [3].

Text software also decreases elements in its environment. Specifically, it reduces or eliminates handwriting practice in schools. Educators often bypass cursive writing in favour of word processing. Consequently, the quality of student script has declined dramatically and, in some cases, students do not know how to handwrite. Technology advocates argue that manually written documents are no longer needed in Western society’s technology-driven culture. However, there are many advantages to handwriting; for example, Berninger et al. demonstrated that some students write longer essays in less time when writing manually [9]. Studies also prove that students use more advanced vocabulary and sophisticated sentence structure when using pen and paper methods [9].

4. Conclusion

Scientists thought genetically modified plants would transform the nature of agriculture by eliminating the need for pesticides and herbicides, increasing harvest size and providing additional nutrients. After use on a large scale and for an extended time, scientists realized they have significant disadvantages. However, at this point, it is nearly impossible to control their adverse effects. Similar to transgenic crops, word processors offer numerous advantages and their use also has negative consequences. The example of genetically modified plants and their hazardous affects should be taken into consideration when planning the use of word processing software. It is imperative that educators be careful of the degree to which they use typing applications. As demonstrated, overusing word processors is to the detriment of student writing capabilities. It is, therefore, essential that teachers are mindful of word processor limitations and consider them.
as one of many tools that assist students with writing, instead of as a universal writing method.

5. References