

Within areas of knowledge, how can we differentiate between change and progress? Answer with reference to two areas of knowledge.



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While change and progress seem to be undifferentiable, they can be separated from the perspectives of time, effectiveness, and the areas of knowledge in which the change or the progress occurred, including the natural sciences and history. Change is an alteration of the original knowledge that can occur with or without a specific goal. It can lead to different results, one of them being progress, or improvement that leads to more authenticity of the knowledge. Therefore, change and progress can be differentiated by different time settings, results, and their roles in the natural sciences and history, which will be further explored through Shang Yang's reformation, Leeuwenhoek's invention of microscopes, the Orbiting Carbon Observatory satellite, the Constitutio Antoniniana, the construction of the Three Gorges Dam, and Qin Shihuang's cultural relics.

The first area of knowledge that will explore is history. In the short term, change is a single alteration, yet when viewed in the long term, change can become progress, as demonstrated by Shang Yang's proposal for fundamental reform in Qin state China in the fourth century B.C.E. As a reformer serving the State of Qin, Shang Yang issued policies that strengthened the administration and economy of the Qin state. 135 years after his reform, Qin conquered six rival states, unifying China into a centralized rule under the Qin dynasty for the first time. The policies that he made are changes, as they altered some of the most fundamental elements of society. From the short term perspective, the reformation cannot be identified as progress, because these controversial policies were experimental changes with unpredictable results — progress or degradation. Due to the continuous implementation of

these policies, Qin state was able to unify China after 135 years. These policies were successful and thus constituted progress in terms of the development of the country. Therefore, when viewed from the short term, these policies are just changes, yet when viewed from the long term, these policies become progress.

However, the invention of the first optical microscope suggests that change and progress can happen simultaneously even when viewed from the same perspective of time. Antonie van Leeuwenhoek invented the world's first optical microscope in 1674. Antonie van Leeuwenhoek invented the world's first optical microscope in 1674 by manufacturing two small glass spheres which became the magnifying lenses of the new microscope (*Leeuwenhoek replica*). Later, he used his invention to observe red blood cells for the first time, which was considered a breakthrough. Earlier microscopes were not optical, and by altering some components of the original microscope, Leeuwenhoek made a change. This change could also be considered progress, since Leeuwenhoek was able to observe red blood cells, which started a new field of studies in microorganism. Such observations count as major progress towards improving biological knowledge. Therefore, in history, progress occurs in the long term, and change is in the short term. However for the natural sciences, change and progress can happen simultaneously.

Besides time, the effectiveness of change — whether an alteration affects the original knowledge or entity — also differentiates change and progress. If a change is ineffective, then the knowledge would retain its original authenticity leading to consistency rather than progress, as demonstrated by NASA's failure of the Orbiting Carbon Observatory (OCO) satellite mission. The OCO satellite was meant to help scientists explore how carbon dioxide moves in the atmosphere so that they could understand more about climate change. Yet the

mission failed, since OCO did not make it into the intended orbit, so scientists did not gain new knowledge about carbon dioxide and climate change (Fox). Scientists wanted to know more about climate change, so they made this change, sending the OCO to space. Owing to its inability to reach the destined orbit, this change failed to be effective. Therefore, no new information was collected and the original knowledge on climate change remained unchanged. Consequently, the failure resulted in consistency of the original knowledge on climate change. Contrarily, the Constitutio Antoniniana, which caused the decline of the Roman Empire, is an effective change, an alteration that influences the original knowledge leading to degradation rather than progress. The Emperor Caracalla of the Roman Empire issued Constitutio Antoniniana in 202 A.D., granting all the Roman people civil rights (*Constitutio Antoniniana: United Nations Educational, Scientific and Cultural Organization*). Before 202 A.D., only a few people had Roman citizenship and the superior position and rights to vote. While such an act seemed like progress towards democracy, it also destroyed the pride and the identity of Roman citizens, because people no longer needed to contribute to access citizenship. This over-generalized democracy eventually led to the decline of the Roman Empire. Constitutio Antoniniana, as an effective change, granted citizenship to all Romans and altered people's original knowledge. The number of citizens increased rapidly. However, as it destroyed Rome's core national consciousness, the sense of honor of citizens, and the traditional order of participation in politics, the Constitutio Antoniniana finally led to endless civil wars that destroyed the empire. Therefore, the Constitutio Antoniniana was a change that led to degradation rather than progress. To summarize, only an effective change, or a successful alteration of the original knowledge, can produce results, whether it is progress or degradation. Ineffective changes, on the other hand, do not improve knowledge.

Lastly, in different areas of knowledge, changes can have different effects on the original knowledge. Changes can lead to improvements in natural sciences but degradation in history, with the Three Gorges Dam as an example. The Three Gorges Dam is the largest hydroelectric power station in the world and it took twelve years to construct. It is located in the Three Gorges Reservoir, which is the center of Bachu culture that has the oldest human fossil site in China-Longgupo site in Wushan, the tomb of the king of Ba-Xiao Tian Xia tombs in Fuling, the Baihe Tower in Fuling, and the Daxi Neolithic site (China). However, in order to build the Three Gorges Dam, these historical sites were all destroyed before they could be studied (See). Three Gorges Dam can be regarded as a progress in the area of natural science since it solved the problem of flood while using hydropower to generate electricity which reduces carbon dioxide emissions. With the permanent loss of historical sites that were rich with the Bachu culture and history, the Three Gorges Dam caused degradation in the discipline of history. Therefore, the construction of the dam led to progress in natural science, but degradation in the area of history.

In contrast, change can lead to both improvement and degradation in the same field, shown by Qin Shihuang's cultural relics. While the burial pit of Qin Shihuang's Mausoleum was excavated by archaeologists, the terracotta warriors, horses, and other ancient relics buried for thousands of years began to fade in color (Global Times). Since they had been sealed underground for such a long time, once they came into contact with air and other environmental factors, they were quickly oxidized. Yet with excavation, the rest of the relics were preserved well in museums with the best humidity, temperature, etc. In this situation, change is excavation of the cultural relics. The inevitable exposure to air during the process causes damage, or degradation. Although excavations done by archaeologists aimed to protect the cultural relics to improve the authenticity of historical knowledge, excavations

ended up causing detrimental effects on the relics. Yet with excavations, these artifacts are now preserved in environments much better than the underground. Therefore, excavations done by archeologists can lead to both improvement and degradation.

Thus, effective change can have different effects in different areas of knowledge. Instead of simply causing progress or degradation, both can occur. Referring to different effects differentiates change and progress: progress leads to improvement, but change causes multiple effects.

Different viewpoints, effectiveness, and results separate change and progress. The real-life situations, such as Shang Yang's reformation, invention of the first optical microscopes, the Orbiting Carbon Observatory satellite, the Constitutio Antoniniana, construction of the Three Gorges Dam, and Qin Shihuang's cultural relics, show how change and progress can be separated or remain undifferentiable in certain areas of knowledge. In conclusion, change and progress can be distinguished by the perspective of time. Moreover, change can also be separated into effective change or ineffective change. Effective change can lead to progress or degradation of original knowledge, but ineffective change results in consistency. Effective change can have dual effects in different areas or in the same area of knowledge. In contrast, progress only has a single effect since progress itself is a positive result of change.

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