

4. Does language play roles of equal importance in different areas of knowledge?
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In the four areas of knowledge – science, math, history, and art – language is a medium by which concepts are grasped and communicated. Specifically, language is a *tool*, which has an ability to work with precision and yet a tendency to be ambiguous and vague. The importance of language's role in knowledge depends on its level of contribution toward the understanding, practice, and development of the area of knowledge. Thus, language has vastly different levels of importance in each area; while it is essential to history and science, language is used to a lesser extent in math and aesthetics.

Language plays the greatest role in historical knowledge. Since history is intangible, historical knowledge is comprised of words which represent historical concepts. The job of a historian is comparable to the task of putting together a puzzle of an infinite number of pieces, but without ever having seen the picture of how the finished puzzle should look. Since there are so many pieces to put together, there are several historians that work within one special area. Within this area, they begin to gather evidence and come to a consensus of the placement of each piece. However, since historical events are intertwined in causes, effects, and influences, the historians from different studies act as authorities in their study by communicating their knowledge. They put their small sections of the puzzle together to form a more comprehensive – yet inevitably unfinished – picture of the past. Therefore, in order to acquire historical knowledge, historians use reason, *consensus gentium*, and authority – all of which require language. Reason requires language because one must think in words when considering critical concepts and connections. *Consensus gentium* and authority require language as a means of communicating ideas.

Just as the colors of the pieces affect how a puzzle is constructed, perception of history is bent according to the words and connotations used to describe it. For example, the famous line of the United States Declaration of Independence states, "All men are created equal." It is the statement on which the

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United States government was built; yet, as simple as it seems, its interpretation is debatable. Does the word “men” refer to men only or to mankind, which encompasses women as well? To what extent are people equal? In this way, history is dependent on language, even as the ambiguity of language is a barrier to historical knowledge.

The implication is that without language, knowledge of history could not exist. The uncertainty is that since language bends the perception of history, and history is comprised of language, there exists a problem of the knowledge that language actually lends to history.

While language is crucial to science, its role is strikingly different than in history. A scientist gains knowledge through the scientific method: he makes an observation, forms an hypothesis, completes a reproducible test of the hypothesis, analyzes the results, and communicates the results to other scientists who attempt to replicate them. Conclusions cannot be considered knowledge until they are confirmed so many times that they are considered accurate – so that scientists may claim not that their conclusions are proven, but that “they were never proven false.” Thus, scientific knowledge is based on sense perception, reasoning, *consensus gentium*, and authority. Sense perception and reasoning are primarily utilized, but without consensus, scientific conclusions could not be considered true knowledge. Since reason requires language for the development of complex concepts, the very essence of scientific knowledge requires language. The more complex science becomes, the more necessary language becomes as a tool for understanding.

The difference between language’s role in science and history is that the vocabulary used in science is tailored for precision. Many scientific terms, such as the names of organisms, are given Latin names so that they are not subject to change. Since language in science must be concise, words are not a barrier to scientific understanding, but a tool for scientific development. However, this does not lessen the importance of its role. For example, a feeler gauge is a tool used to measure the gaps between spark

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plugs; each of its blades is set with measurements to the thousandths of an inch. It is a tool that requires precision, yet its job is uniquely important because, after all, one could not make the same measurements with a standard ruler. Such is the role of language in science; it could not effectively be replaced by cruder methods of communication.

That language is simply a tool for science implies that science itself could exist without language if there were a different tool to accomplish the same tasks. There is also an implication that science utilizes only language that is tailored to precision. However, the uncertainty is that there are still disagreements over the definitions of scientific terms. For instance, my science teacher once asked for the difference between prokaryotic and eukaryotic cells. I answered that prokaryotic cells lack a nucleus. She corrected me, saying that prokaryotic cells do not have any organelles. I argued that prokaryotic cells contain ribosomes, and she conceded that only *some* biologists consider ribosomes organelles. She then corrected herself, saying that prokaryotic cells lack “membrane-bound organelles”; when one term was imprecise, it was replaced.

Language is least important to mathematics. This is because, unlike science, math is considered to be proven. The procedures and rules in math are so constant in their application and results that their reliability or meanings are not questioned. Nonetheless, language has a role in math because mathematical knowledge is gained through reason and authority. It must be noted that the reasoning in math is different than that of science or history. It is not formulated with words, but with values; these exist intrinsically, even without names. In fact, words are inadequate in grasping mathematical concepts – such as the concept of infinity. It goes beyond what can be explained, and when it is used mathematically, its name is insignificant. For example, when working with limits in calculus, any number divided by “zero+” (an infinitesimally small number) is equal to infinity. Language cannot define the value of “zero+” or adequately explain why dividing by such an unimaginably small number

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creates such an unimaginably large one. “Unimaginably small” and “unimaginably large” are still such general phrases, while the nature of math is exact.

Authority, however, requires language and is necessary to the teaching of math; but even in teaching, language’s role is minimal. This can be seen in a math textbook, in which a small segment of written directions is followed by an entire page of symbols that students can work through without language.

The implication is that while language is needed to learn the basic functions of math – once those functions are understood, language is almost obsolete because the same mathematical functions will work without language. An uncertainty is that language fails to fully describe mathematical concepts, such as with infinity and “zero+”.

Finally, the role of language in aesthetics is the most difficult to gauge because aesthetics includes visual arts, literature, music, and performing arts; the role of language varies in each subsection. However, the different areas of aesthetics are linked in their goal to incite certain feelings in their audiences. Knowledge in aesthetics is gained primarily through sense perception and introspection, but can also be gained through *consensus gentium* and authority. While language is required for knowing through consensus and authority, it is unimportant to sense perception, and as with mathematical concepts, it is inadequate in introspection. For example, when considering Bach’s *Gavotte en Rondeau*, I know that it is a dance from the Baroque era, it is in the key of E major, and it should be played with a light staccato. While this demonstrates a very concrete knowledge of music, art goes beyond what is concrete: what I cannot explain is why I love the piece or what feeling of attachment I experience when I play or hear it. This is where language fails aesthetical knowledge.

This implies that art communicates its most critical knowledge without language. However, it is uncertain whether language plays a role in introspection; after all, I do not recall my emotions before I

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was able to name them. This, however, may indicate that language is important to memory, not introspection, because the fact that they are not remembered does not mean that they were not felt and recognized.

In order to make the counterclaim that language plays equal roles in each area of knowledge, one would have to argue that authority and *consensus gentium* are equally crucial to math, science, history, and aesthetics. However, while authority and consensus contribute to each area, they are necessary only to science and history. Since historical conclusions cannot be tested, knowledge must be verified by consensus and communicated by authority. In science, information cannot become knowledge until it is repeatedly confirmed (consensus). Authority is less crucial because most scientific knowledge can be confirmed by retesting. On the other hand, consensus is not necessary to math because mathematical knowledge is proven. Even the teaching of math through authority is more dependent on demonstration than language. Because aesthetical knowledge is dependent mainly on introspection, the concrete knowledge gained through authority and consensus are less important.

Language does not play roles of equal importance in every area of knowledge. It is a tool for thought and communication, but it seems that in different areas of knowledge, thought occurs differently and communication becomes less crucial. Still, the versatility of language allows it to seep into every area of knowledge regardless of its role.