

MEMORY RETENTION

A Wonder Expo study comparing virtual reality to real-life



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INTRODUCTION

Memorization and observation are both critical abilities in learning and life. We are interested in finding out more effective ways to perform both of these general functions using virtual reality (VR). Although most people would likely think that VR's purpose is only gaming and entertainment, new developments in the metaverse have shown otherwise. In fact, VR has proven to be a useful tool in the past as well. The military has used VR for flight and combat training, while NASA has used VR for simulating space missions and interacting in space. We think this study will become more meaningful in the upcoming years, as VR will soon be more commercialized, and the industry will grow.

PROBLEM

Students often forget information in education quickly, which renders current learning methods ineffective in some cases. By forgetting information quickly, students will have worse results in education.

PURPOSE

The purpose of our experiment is to find out if utilizing VR for educational purposes will be more effective than current methods of memorizing data and information.

DRIVING QUESTION

Do experiences in VR stimulate more memorable memories than experiences in real life?

BACKGROUND RESEARCH

We learned many new facts about virtual reality, augmented reality, the metaverse, and how memory and learning work during our Wonder Expo topic research. We know that many inventions have tried to create virtual reality ever since author Neal Stephenson and even before he coined the term “metaverse.” In fact, Morton Heilig created the first virtual world with his “Sensorama” in 1957, which he called “the cinema of the future,” while Ivan Sutherland made the world’s first virtual reality headset in 1968. Although the primary and initial reason for virtual reality was entertainment and mainly for cinemas, we have learned that the new developments in virtual reality (“the metaverse”) will serve many purposes. Nowadays, there are many different devices you can access the virtual world with such as Oculus devices. However, VR devices are quite expensive and aren’t as commercially available right now. Thinking forward, education is being developed into the newly developing metaverse, since virtual reality is more immersive and flexible than traditional education. After full development, a person should be able to do many activities including, learning, business interactions, gaming, entertainment activities, exercise, and social connections. In conclusion, we have gained a substantial amount of information about functions in VR.

We have also learned how people memorize and learn facts more or less effectively. We have learned that studying during the mornings and before sleep is good for memorizing. We also know that people forget information due to memory interference or loss of rehearsing. Memory loss also occurs more seriously during old age. Most importantly, we know what conditions could also improve memorization such as rehearsing memories and taking notes. Interestingly, there are also strategies to forget information. People intentionally forget information because some memories may be linked to negative emotions (grief, anger, etc.). Additionally, we have learned that the quantity of sleep, exercise, and fewer amounts of stress can also improve your memory. Overall, we have gained substantial knowledge about what affects memorization and forgetfulness.

INTERVIEW



To learn more about how younger students learn in education, we decided to interview Mrs. Fitzpatrick.

Mrs. Fitzpatrick is a teacher with 22 years in the field of education. She has worked in multiple boy and girl schools in both Toronto and Vancouver. Currently, she is working as a grade 7 teacher at St. Georges's School.

Questions:

Q1: What techniques or implementations do you use so students can memorize their learning or instructions?

- A: Organizing a structured classroom, assignments, and learning management systems (canvas) helps make sure that everyone is focused and paying attention; encouraging students to chunk their homework and scaffolding assignments.
- A: Usage of memory devices and acronyms like BEDMAS (for order of operations) so students can remember concepts.
- A: Class discussions to rehearse information.
- A: Elaboration on learning allows learning to be stored more indelibly.
- A: Relating to old information to build on old knowledge.
- A: Visual learning (Videos, diagrams).
- A: Note-taking (better writing on paper) during lectures and videos.
- A: Asking other individuals to read out loud to engage students.

Follow-up: How important are these strategies?

- A: Very crucial because these “best practices” help everyone in the learning environment.
- A: We have many strategies because of different learning styles and their contributions toward learning.

Q2: Do you think auditory/visual learning is more effective in memorization?

- A: Learning style largely affects whether auditory or visual learning is more effective, so the different people will either learn better visually or use auditory learning.
- A: Because of differences in learning styles, schools offer many different opportunities for learning.

Follow-up: Do you think some specific subjects will be more effectively learned with visual or auditory learning?

- A: Again, learning style definitely is the largest factor in which kind of learning is best.
- A: An individual is also not only entitled to one learning style. A student may learn best using auditory learning in science and learn best visually in social studies.

Q3: As a teacher, do you think memorization plays an important role in education?

- A: Memory is important in education because it builds up mastery in subjects.
- A: If we can lock information in our memory more efficiently and effectively, the more mastery we can have.
- A: Mastery is important in education because it shows that you understand something. Mastery is often present if you are able to teach the concept to someone else.

- A: However, memorizing data doesn't mean efficient learning. Information is easily accessible currently, but being able to understand the information at a level is important.

Q4: Has memorization personally affected you in education and your life?

- A: Memory has played an important role in building up my skills because to learn more advanced information, you must have the fundamentals first.
- A: Students (when Ms. Fitzpatrick was at school) are often tested for information at school.
- A: Inquiry-based learning is quite crucial, which builds on your memory. So memory plays an important role in types of inquiry-based learning.

Q5: Do you think that learning using virtual reality is better than learning physically?

- A: I think being able to learn with your peers and teachers is very helpful and important for learning.
- A: VR does not provide the same learning experience as the classroom environment.

- A: Although a more individualized learner may benefit from learning in VR.
- A: Again, this depends on the learner themselves, as a more collaborative learner will enjoy a classroom environment with peers and teachers.

Follow-up: Do you think depending on age category, VR or classroom learning would be a more effective approach?

- A: I think VR could serve personalized learning for older individuals ($\approx 40+$) because you can move at your own pace.
- A: For younger individuals, students would miss out on social interaction opportunities like clubs and being able to interact in class.

Follow-up: Do you think different subjects may take a VR approach more effectively

- A: Again, depending on the individuals' learning style, they may find VR good when learning about biology but not when working on mental math.
 - A: Some people learn by doing. VR offers many experiences that allow you to do or complete a task as if you were actually doing it (a surgery).

- A: An aspect of effective learning is practice. If apps on VR are able to provide good practice material, it may be good for some subjects.

HYPOTHESIS

If we allow students to learn and memorize in the same environment (with the same content) in VR and in real life, **then** the student using VR will memorize more information in the environment **because** research has shown that unique and special memories are more indelibly stored in the human brain. A VR experience will also most likely trigger a more vivid memory and present a calmer environment; which allows the student to focus more fully; which may enable the brain to potentially store the information more effectively.



MATERIALS

1. Oculus Quest 2 Headset 128GB
2. 2x Oculus Quest 2 Controllers
3. Youtube VR app (Download from Oculus Apps)
4. Consent/Waiver form (Attached in Appendix)
 - a. Waiver form should outline dangers in using VR devices
5. A Stable Internet Connection (At least a Signal of 3 Bars)
6. A space that is at least 5 sq. m
7. Brachiosaurus Information Sheet (Attached in Appendix)
8. American Civil War Information Sheet (Attached in Appendix)
9. Memory Quiz based on brachiosaurus (Attached in Appendix)
10. Memory Quiz based on American Civil War (Attached in Appendix)
11. A spreadsheet to record data

PROCEDURE

SETUP

1. Gather all materials
2. Go to Apps
3. Search “Youtube VR”
4. Click download
5. Wait until Download the finishes before proceeding
6. Gather 22 individuals that are fluent in English and do not meet any of these conditions:
 - a. Intense or mild motion sickness
 - b. Seizures
 - c. Contagious eye conditions
 - d. Mentally unstable
 - e. Impaired memory
 - f. Hypochondriasis (Anxiety Disorders)

EXPERIMENTAL PROCESS (VR Portion)

7. Fully Charge VR headset
8. Turn on the virtual headset
9. Setup the guardian boundary system
10. Make sure that there are no objects inside the guardian boundary system
11. Go into the apps menu
12. Press YouTube VR
13. Go into the search bar and search “Jurassic Encyclopedia #7”



14. Click on this video:
15. Pause the video.
16. Bring the individual within the guardian boundary.
17. Ask the individual to read and agree to the waiver.
18. Inform the individual to put down the headset if they are dizzy, have blurry vision, or are at degrees of discomfort.
19. Inform them of the guardian boundary system, and if they see the walls of the boundary stop moving.

20. Tell the individual to adjust the headset to comfort and enter the headset.
21. Upon entering the headset, start playing the video.
22. Ask the volunteer to observe and listen to what is happening in the video that they are watching.
23. Tell them to memorize what they have observed.
24. Remove the headset at the end of the video.
25. Wait 30 seconds, and tell the individual to recall the information they have learned from the video.
26. After 30 seconds have passed, give them the corresponding test (Brachiosaurus or Civil War)
27. Give them 5 minutes to complete the test before taking it away.
28. Clean the headset(s) with a dry cloth.
29. Repeat steps 10 to 25 for 11 participants.
30. For the remaining 11 participants, replace steps 9 and 10 with steps 28 and 29.
31. Go into the search bar and search “Civil War 1864: A Virtual Reality Experience, On Patrol”
32. Click on this video:



33. After finishing the VR section, start the physical part.

Experimental Process (Physical Part)

34. Bring one of the participants who did the VR portion of the civil war to any remotely quiet space.

35. Give the participant the Brachiosaurus Information Sheet

- a. The physical copy of the video is the document that contains all of the information included in the video

36. Let the participant read the document for 5 minutes

37. After 5 minutes, remove the document from them

38. Let the participant have 30 seconds to reflect on the document

39. After one minute, give the participant Brachiosaurus Quiz

40. Remove the test from the participant after they are finished

41. After removing the test from the participant, give the participant a questionnaire about their experience.

42. After finishing the questionnaire, remove it from the participant.

43. Repeat steps 31 to 39 for all the participants who did the VR portion of the Civil War questions.

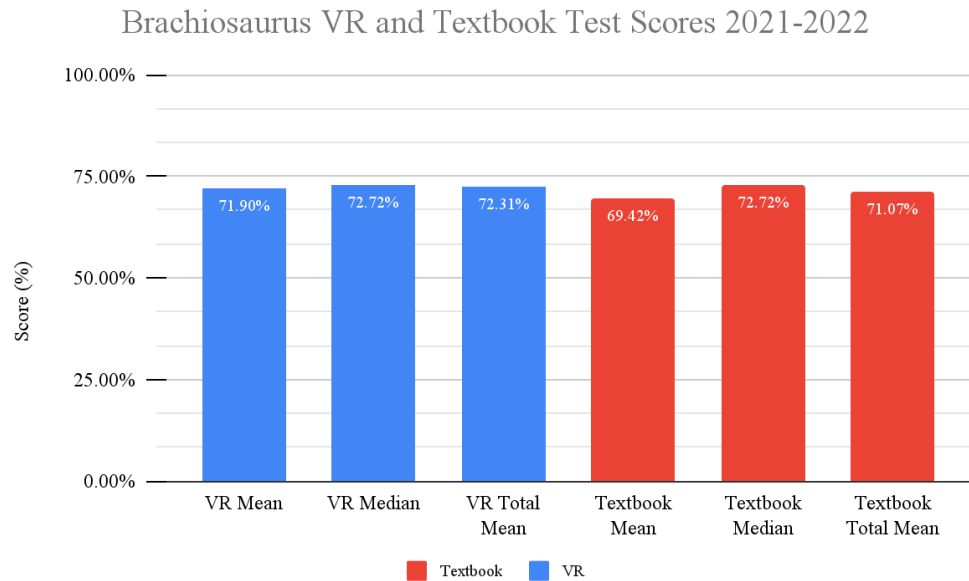
44. For those volunteers who did the VR portion for the Brachiosaurus, repeat steps 31 to 39. Instead of step 32, let the participant complete step 42; instead of step 36, let the remaining individuals complete step 43.

45. Give the participant the American Civil War Information Sheet

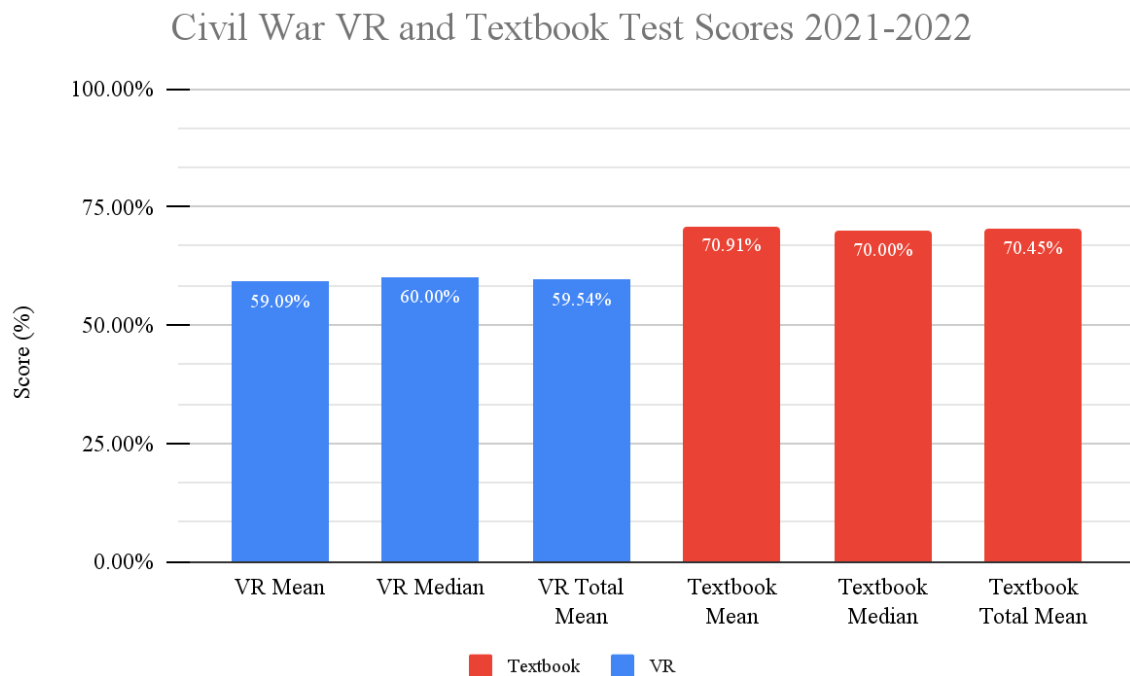
- a. The physical copy of the video is the document that contains all of the information said in the video.

46. After one minute, give the participant the American Civil War Quiz

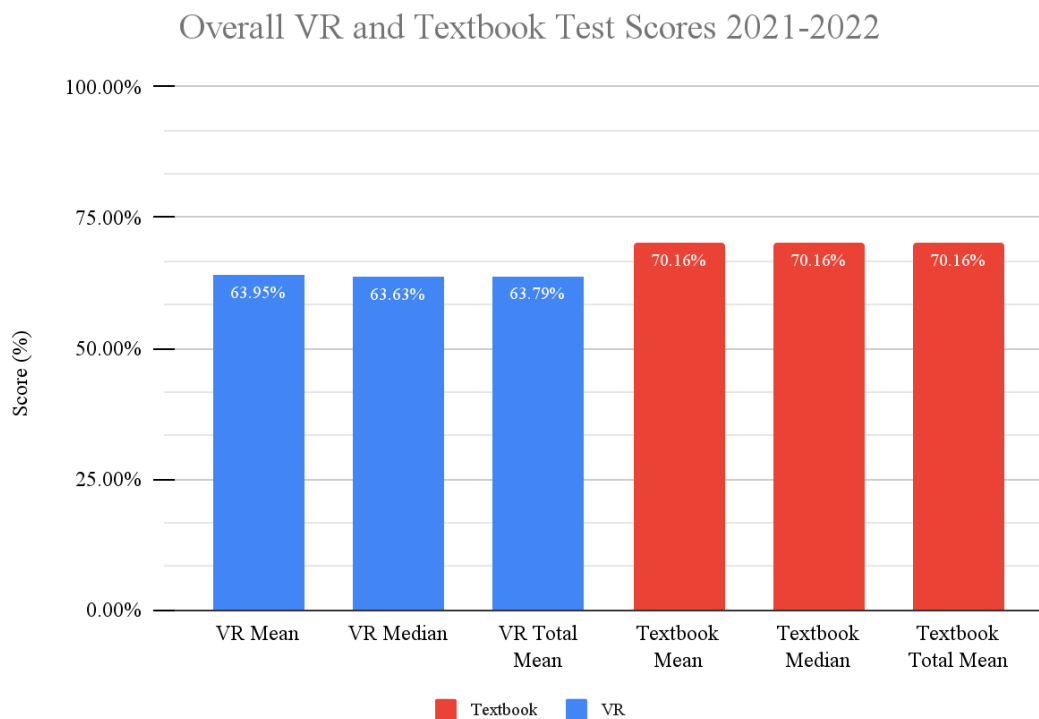
DATA ANALYSIS



The data collected with the brachiosaurus topic suggests that using VR is marginally better for memorizing the content. The average VR test result is **71.90%**, while the average using the textbook is **69.42%**. So VR is better in terms of the average result. Due to outliers in our study, we have also decided to consider the median of the results as well as the average. For the brachiosaurus topic, the median for both the VR and textbook tests is **72.72%**, which still proves that VR is better. After averaging the median and mean for VR and textbook, VR shows slightly higher results at **72.31%** compared to the textbook's total average of **71.07%**.



For the civil war topic, textbook results are substantially higher than VR results. The mean score for someone using VR is **59.09%**, while the average of people looking at the textbook sits at **70.91%**. The median score reflects the average quite well. The VR median was **60%** while the textbook median is **70%**. After averaging the median and mean for both VR and textbook, VR's total score is **59.54%**, while textbook's score is **70.45%**.



After considering both topics, textbook results are slightly higher than VR results. The VR average is **63.95%**, and the textbook average is **70.16%**. The median also reflects the average quite well with the VR median at **63.63%** and textbook median at **70.16%**. Lastly, by averaging the mean and median, textbook again is slightly better than VR at **70.16%** compared to **63.79%**

DISCUSSION

In our experiment, we tested 22 different individuals who each participated in 2 tests, one inside virtual reality and one physically. Each test also had a different topic. One test was about the American Civil War and the other was about brachiosaurus, a dinosaur. If one participant does a test about the Civil War in virtual reality, he/she will do the brachiosaurus test physically and vice versa. In the virtual reality test, we made our participants watch a 360° video (in VR) and asked them to memorize the facts presented to them. In the physical test, we let the participants read an article with the same content presented in the video. After each participant has finished their video or article, they would take a test corresponding to what they have read/seen.

There are also many other experiments that could be conducted in the future. We could have tested gaming performance in virtual reality compared to gaming in real life. There are also many other possible experiments that could be conducted in the future. Experiments may compare communication, entertainment, social interaction, fitness, and many more.

Before starting our experiment, we hypothesized that virtual reality will have a better learning experience. Looking at the overall test results, we have realized that that is not the case. Memorizing information physically is better than memorizing information inside virtual reality.

Additionally, there are many different commonly held beliefs about education inside virtual reality. One such belief is that virtual reality can not be used to enhance learning. Looking back at the data comparing the brachiosaurus virtual reality and brachiosaurus textbook results, we have seen that the mean of the virtual reality test results is higher than the textbook and the median is the exact same. This is not the case in the Civil War test but we have a theory why in one of the paragraphs below. Different topics may also be better to learn with VR, which may be why the topics showed different results.

During our testing, there were a few things that influenced our results. If we were to improve and solve the issues below, our study could be immensely improved.

Due to time concerns, we tested varying age groups; that may influence the overall average for a couple of reasons. Since some individuals are older, they may be more capable of finding important information and memorizing it. Older individuals also may have impaired memory, which could affect the results as well. Younger people also might have an advantage over older people because they have less to think about such as adult responsibilities. We could have solved this issue if we started doing testing earlier, so we would have enough individuals of the same age category.

One issue that might have affected our results was that during the VR part for the Civil War test, it might have been too hard to make observations during the video. This might be because in the video, information would appear around you and you would have to look around to see the information. This problem would have caused some individuals to get bad results during the test. This issue could be solved because when a piece of information would be displayed, a sound would play prompting you to look around. However, we only knew this information halfway through data collection.

Another issue faced during our testing was that some of the individuals were more excited about using VR than doing the physical portion of the testing. These individuals would not focus as much on the physical portion and would be distracted while in the VR headset. To counteract this issue, we decided to give them the motivation to do well by promising a favour for anyone averaging a score over 80%. This solution did help slightly and we have seen more motivation of participants during the physical portion of the testing. Although, we could have further solved this problem by getting more serious individuals in the testing.

An issue that occurred during our testing was that some test subjects were visually impaired (glasses). If an individual was visually impaired, they would be unable to complete the VR portion of our experiment. Therefore, some individuals would have read both textbooks, and some individuals would have used VR twice, so then we would have equal amounts of data on textbook and VR. The problem with this is that individuals have varying degrees of memory, focus, and knowledge. So the counterbalancing individuals (those who did both VR or textbook) could potentially influence results.

From observations and feedback from participants, we also found out that the quality (pixel rendering, lag, etc.) of the VR videos was not very good. This happened because we had noticed that the Wifi signal had not been able to support high-quality video (4K, 8K, and HD), so we decided to lower the pixel resolution in the videos. However, this caused the information (shown visually) to be quite blurry and hard to read, and also lowered the realism of the experience. We could easily solve this problem by testing in spaces with a more stable internet connection.

Another issue that might have occurred during the testing is that we tested in different places. This might be a problem because there would be different amounts of distractions that would cause the test to be inaccurate. For example, during the testing, when we were testing in a hallway, many people passed by and tried to distract the viewer. This would make some results inaccurate because the person being tested might have shifted their focus to something other than what is happening inside the VR. Again, this issue is quite easily solved if we just control a private and remote area/environment.

One issue that could have affected our results but is very insignificant is at what time of the day we tested. For example, some people remember information better during the morning and some people remember information in the afternoon. This would be hard to solve, since individuals have different schedules, but can still be solved by finding a time that is optimal for everyone. Additionally, if our participants did not sleep well last night, it might carry over to the day we were testing. Not enough sleep could affect test results because they might be sleepy, meaning that they won't be able to retain information like other people and they also won't be as focused. Controlling our volunteers' sleep (prior to testing) is quite hard, but this issue can still be solved. We have to set the testing to a day when the individual goes to bed earlier (8 - 10 pm) and wakes up later (7 - 8 am).

Another insignificant issue pertains to bias of the individuals we tested. Although we did not tell or inform our volunteers of our objectives, they could've still tried better while doing VR and worse on the textbook portion. This issue is quite difficult to solve as there is no way to conceal the VR headset. The best we could think to improve this issue, is to specify on the waiver to not tamper with our tests.

If we were to conduct the experiment again, we would have tried to solve the issues mentioned above, and also increase our sample size for a more accurate experiment. We could also test two different age categories depending on the amount of time we have to compare if virtual reality is better for learning in different age groups. Adding to that, we would also use more topics than just two (brachiosaurus, civil war).

Lastly, since there were multiple outliers in our study, we decided to consider the median in addition to the mean to give a more accurate result. We then calculated the mean of the average and median results to get the comparison score.

CONCLUSION

The results of our experiment have shown our hypothesis is incorrect. Prior to testing, we thought that content presented in VR would be more memorable than content presented in a textbook article. We thought VR would be more effective since it is a more unique and immersive experience, and unique experiences are committed to memory better. After conducting our experiments, the average memorized content using a textbook was better. We believe that special memories are only one variable, and many other variables affect our results. One thing we failed to realize in the beginning was that VR divides their focus because of so many events occurring in the video. VR will also trigger more intense emotions. Intense emotions will cause the memory to be remembered, but the details will be blurry. For comparison, a textbook is much easier to focus on as you are just reading. However, our study does not determine that VR is less effective in presenting content for everyone. VR could potentially be more effective when presenting certain topics. In our study, VR actually performed better than textbooks for our brachiosaurus topic. After averaging both topics, VR performed marginally worse. There were also multiple aforementioned flaws in our experiment.

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APPENDIX

BRACHIOSAURUS TEST QUESTIONS

Q1: What does the brachiosaurus feed on?

A1: Meat from Other Dinosaur (Scavenged)

A2: Fungi, Insects, and Microorganisms

A3: Ferns, Herbs, and Leaves - CORRECT

A4: All of the Above

Q2: How Many Meters Long is The Brachiosaurus Roughly?

A1: 14 - 17

A2: 18 - 21 - CORRECT

A3: 22 - 25

A4: 26 - 31

Q3: In which period of Time did the Brachiosaurus live?

A1: Triassic

A2: Jurassic - CORRECT

A3: Cretaceous

Q4: How many years ago did the brachiosaurus live?

A1: 1 - 50 million years

A2: 51 - 100 million years

A3: 101+ million years - CORRECT

Q5: In which region were brachiosaurus remains first found?

A1: South America

A2: Asia

A3: North America - CORRECT

A4: Middle East

A5: Oceania

A6: Africa

A7: Europe

Q6: True or False: Titanosauria are estimated to be larger and heavier than brachiosaurus?

A1: True - CORRECT

A2: False

Q7: The brachiosaurus heart weighs...

A1: 300kg

A2: 400kg - CORRECT

A3: 4 Metric Tons

A4: 5 Metric Tons

A5: None of the above

Q8: The brachiosaurus neck reaches up to...

A1: Eight Meters

A2: A Three-story Building - CORRECT

A3: Nineteen Meters

A4: A Two-story Building

A5: None of the above

Q9: What are some of the features of the brachiosaurus? (Check all that apply)

A1: Long Neck - CORRECT

A2: High Chest - CORRECT

A3: Small Head - CORRECT

A4: Proportionally Short Tail - CORRECT

A5: Longer Hind Legs

Q10: What genus of dinosaurs does it belong to?

A1: Ceratopsians

A2: Sauropods - CORRECT

A3: Theropods

A4: Pachycephalosaurus

A5: Ornithopods

Q11: The dinosaur's weight can be compared to...

A1: 10 Rhinoceros

A2: 4 Humpback Whales

A3: 7 Elephants - CORRECT

A4: 6 Hippopotamus

A5: 13 Buffalos

CIVIL WAR TEST QUESTIONS

Q1: What year(s) does the American Civil War take place? (Check all that Apply)

A1: 1860

A2: 1874

A3: 1784

A4: 1812

A5: None of the Above - **CORRECT**

Q2: What are the two armies fighting?

A1: Loyalists vs. Patriots (for American Independence)

A2: The Union army vs. Confederate army (over slavery) - **CORRECT**

A3: Great Britain vs. United States & Indigenous Allies (Border disputes)

Q3: Hygiene was poor on the battlefield, so ____ were common.

A1: Ticks

A2: Bacteria

A3: Lice - CORRECT

A4: Mosquitoes

A5: Diarrhea

A6: Rodents

Q4: Non-commissioned officers consists of ...

A1: Sergeants and Corporals - CORRECT

A2: Generals and Colonels

A3: Majors, Lieutenants, and Privates (Soldiers)

A4: Field Officers and Privates (Soldiers)

Q5: What action did the army do at the end of the war?

A1: They stopped burying the dead bodies

A2: They stopped picking lice since it was too dangerous

A3: They started drafting younger teenagers because of shortages -

CORRECT

A4: Soldiers started combat in the open instead of trench warfare

Q6: An experienced soldier would reload in roughly 10 seconds.

A1: True

A2: False - CORRECT

Q7: Confederate soldiers wanted revenge against ____ because of the pillaging of their homes.

A1: General Robert Lee's corps

A2: General Sherman's army - CORRECT

A3: General Ulysses S. Grant's company

A4: General George Thomas's division

A5: General Winfield's brigade

Q8: True or False: Soldiers preferred trench warfare instead of patrolling on open ground.

A1: True - CORRECT

A2: False

Q9: The collective term “Field Officers” refers to...

A1: Lieutenants, Corporals, and Majors

A2: Generals, Sergeants, and Corporals

A3: Lieutenants, Corporals, and Sergeants

A4: Generals, Majors, and Colonels - CORRECT

Q10: Bullets shells are described to...(Check all the apply)

A1: Explode upon impact - CORRECT

A2: Scatter Shrapnel - CORRECT

A3: Damage the barrel

BRACHIOSAURUS INFORMATION SHEET:

Brachiosaurus

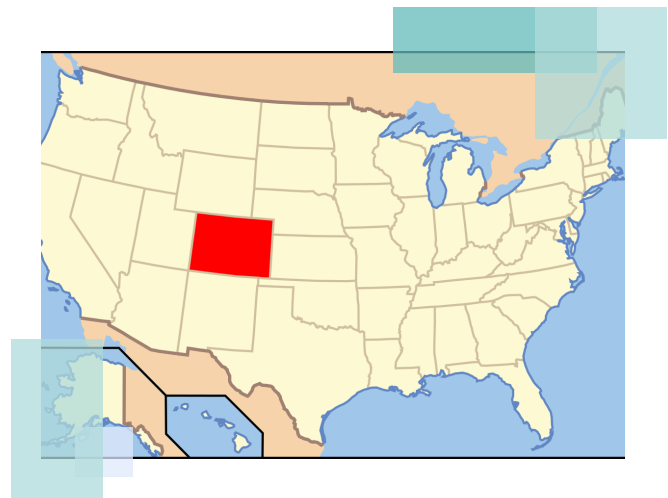
The brachiosaurus is a dinosaur that lived 154 to 153 million years ago in the late Jurassic period. It belongs to a genus of dinosaurs called sauropods which all had long necks, long tails, small heads, and four pillar-like legs. One of the characteristics of the brachiosaurus was the forelimbs that were longer than the hind legs which resulted in a steeply inclined trunk and a proportionally shorter tail. For a long time, it was believed to be one of the largest dinosaurs to ever exist. However, a group of dinosaurs called titanosauria is believed to be even bigger, as much as even twice longer and heavier. Brachiosaurus was one of the largest that ever lived. It is estimated to have been 18 and 21 meters. Weight estimates range between 28.3 to 58 metric tonnes which is as much as seven average elephants. It is believed that it was a high browser which means that it fed



on trees and leaves even as high as 9 meters off the ground which is as high as the third story of a building. It has been used as an example of a dinosaur that was mostly ectothermic which means it relies on external sources of heat to warm its body. However, more recent research suggests it was warm-blooded.

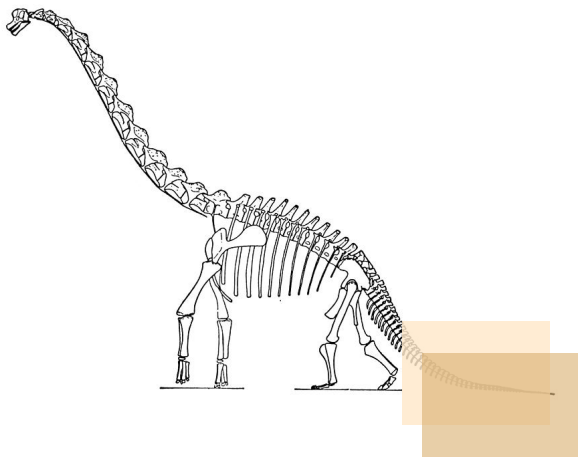
Brachiosaurus

First brachiosaurus remains were discovered in 1900 in the valley of the Colorado River near Fruita, Colorado. The first thing that was discovered was a humerus (bone) which was first misidentified as a deformed femur (bone) due to its size until a real femur of the same skeleton had been later discovered. Further discoveries of brachiosaurus fossils in North America were uncommon and consist of a few bones. They have been uncovered in Colorado, Oklahoma, Utah, and Wyoming. In 1909 and 1912, an expedition to German East Africa (Modern-day Tanzania) uncovered two subspecies of brachiosaurus. In 1947, another subspecies was discovered in Atalia, Portugal. The last sub-species to have been discovered were uncovered in 1958 in the Algerian part of the Sahara Desert. It was believed throughout the 19th and early 20th centuries that sauropods like brachiosaurus were too massive to support their own weight on dry land and instead lived partly submerged underwater. However, some paleontologists pointed out that their hollow vertebrae have no analog in living in aquatic or semi-aquatic animals and their long limbs and compact feet indicate specialization for terrestrial locomotion. Brachiosaurus would have been better adapted than other sauropods to a fully terrestrial lifestyle through its slender limbs, high chest, wide hips, high ilia, and short tail.



Brachiosaurus

Ongoing debate revolves around the neck posture of the brachiosaurus with estimates ranging from near vertical to horizontal orientations. The idea of near-vertical postures in sauropods, in general, was popular until 1999 when some paleontologists argued that the sauropod neck was not flexible enough to be held in an upright s-curve pose and instead was held horizontally. Reflecting this research, various newspapers ran



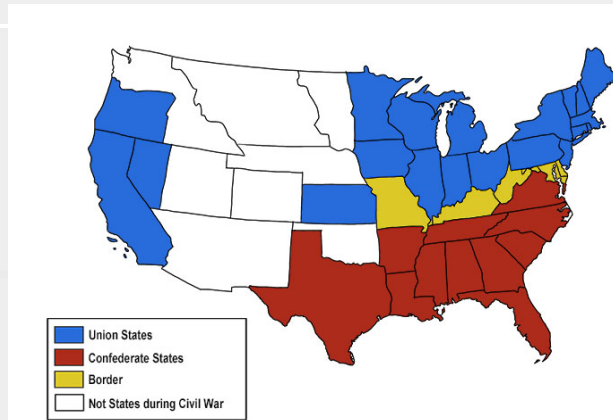
stories criticizing the field museum brachiosaurus mount for having an upward curving neck. Museum paleontologists defended the posture in 1999 noting the long forelimbs and the sloping backbone. They also stated that the most developed neural spines for muscle attachment being positioned in the region of the shoulder girdle would have permitted the neck to be raised in a giraffe-like posture. With their heads held high above the heart, the

brachiosaurus would have had stressed cardiovascular systems. It is estimated that the heart of the brachiosaurus would have to pump double the blood pressure of a giraffe to reach the brain and possibly weighed 400 kilograms which is as much as an average zebra.

AMERICAN CIVIL WAR INFORMATION SHEET

1861-1865 American Civil War Introduction

The American Civil War was a four-year war between the southern and northern states on the stance of slavery. The war had started when the northern states (more industrialized) had wanted to abolish slavery in southern states. However, the southern states (not as developed) had still heavily relied on slavery for their economy. The eleven southern states had split off from the northern states to form the confederate states of America, while the northern states formed the Union states. At a quick glance, the American Civil War seemed like a one-sided battle since the north consisted of 21 million people, while the south consisted of 9 million people. The Union states also had a significantly more amount of manufacturing plants, railroads, arms production, financial resources, and available man-power. However, the southern confederate states were not a lost cause though, they had impressive fighting on interior lines, and such odds have been present (United States vs. Great Britain in the independence war).



1861-1865 American Civil War

The war officially began in 1861 after the successful confederate bombardment of Fort Sumter in South Carolina. By 1864 many civil war soldiers fought from the protection of extensive fortifications. Since, soldiers preferred trench warfare instead of carrying out dangerous missions like patrolling. Spotters in trenches would be able to snipe at targets by looking for puffs of smoke. This strategy is viable since shells explode on impact scattering shrapnel. Patrolling was safe for the most part, but sometimes proved deadly. A patrol group would consist of experienced soldiers who, under fire, could reload in roughly 20 seconds.



During the war, field officers (Majors, colonels, and generals) would issue orders to their squads to tend to dangerous assignments like patrolling or infiltration of enemy lines, while non-commissioned officers such as sergeants and corporals would manage the small squads carrying out the tasks.

Since the confederate armies often were not as financially supported, the conditions of the soldiers were quite low causing bad hygiene. This can be shown from the confederate uniforms, which were made out of cheap jeans cloth, a representation of modern day denim jeans. Bad hygiene had caused outbreaks of lice in many small squadrons for both the confederate and union armies.

1861-1865 American Civil War

The war presented many casualties either from patrol, attacks, or being sniped from a long distance, so many bodies would have to wait a long time to be buried from previous attacks. Since there were losses on both sides, later in the war, younger teenage boys started being drafted into the war to fill the depleted ranks of the army. The confederate armies were incredibly determined because of their loyalty to their states. Many soldiers also wanted revenge because of General Sherman and his union army's pillaging of many cities and towns. This created the well-known rebel yell, which was the distinct confederate soldiers' battle cry. Even from a long distance, the cry could unnerve Union army soldiers.



WAIVER FORM:

VIRTUAL REALITY'S EFFECTS ON MEMORY RETENTION

RELEASE AND WAIVER OF LIABILITY, ASSUMPTION OF RISK AND INDEMNITY AGREEMENT

BY PARTICIPATING IN THE VIRTUAL REALITY EXPERIENCE, I AM INDICATING, THAT I UNDERSTAND THE NATURE OF THIS ACTIVITY AND THAT I AM QUALIFIED, IN GOOD HEALTH, AND IN PROPER PHYSICAL CONDITION TO PARTICIPATE IN SUCH ACTIVITY. I ACKNOWLEDGE THAT IF I BELIEVE THE EXPERIENCE IS UNSAFE, I WILL IMMEDIATELY DISCONTINUE PARTICIPATING IN THE ACTIVITY.

I AM VOLUNTARILY PARTICIPATING IN THE AFOREMENTIONED ACTIVITY AND I AM PARTICIPATING IN THE ACTIVITY ENTIRELY AT MY OWN RISK. I AM AWARE OF THE RISKS ASSOCIATED WITH PARTICIPATING IN THIS ACTIVITY, WHICH MAY INCLUDE, BUT ARE NOT LIMITED TO, PHYSICAL OR PSYCHOLOGICAL INJURY, PAIN, SUFFERING, TEMPORARY OR PERMANENT DISABILITY, ECONOMIC OR EMOTIONAL LOSS, AND DEATH. I UNDERSTAND THAT THESE INJURIES OR OUTCOMES MAY ARISE FROM MY OWN OR OTHERS' NEGLIGENCE, OR THE CONDITION OF THE ACTIVITY. NONETHELESS, I ASSUME ALL RELATED RISKS, BOTH KNOWN AND UNKNOWN TO ME, OF MY PARTICIPATION IN THIS ACTIVITY.

I HEREBY RELEASE, DISCHARGE, AND COVENANT NOT TO SUE MICHAEL AND ALVIN, ITS RESPECTIVE ADMINISTRATORS, DIRECTORS, AGENTS, OFFICERS, VOLUNTEERS, AND EMPLOYEES, OTHER PARTICIPANTS, AND IF APPLICABLE, OWNERS AND LESSORS OF PREMISES ON WHICH THE ACTIVITY TAKES PLACE, (EACH CONSIDERED ONE OF THE "RELEASES" HEREIN) FROM ALL LIABILITY, CLAIMS, DEMANDS, LOSSES, OR DAMAGES ON MY ACCOUNT CAUSED OR ALLEGED TO BE CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OR THE "RELEASES" OR OTHERWISE, INCLUDING NEGLIGENT RESCUE OPERATIONS; AND I FURTHER AGREE THAT IF, DESPITE THIS RELEASE, WAIVER OF LIABILITY, AND ASSUMPTION OF RISK I, OR ANYONE ON MY BEHALF, MAKES A CLAIM AGAINST ANY OF THE RELEASES, I WILL INDEMNIFY, SAVE, AND HOLD HARMLESS EACH OF THE RELEASES FROM ANY LOSS, LIABILITY, DAMAGE, OR COST WHICH ANY MAY INCUR AS THE RESULT OF SUCH CLAIM.

IN THE EVENT THAT I SHOULD REQUIRE MEDICAL CARE OR TREATMENT, I AGREE TO BE FINANCIALLY RESPONSIBLE FOR ANY COST INCURRED AS A RESULT OF SUCH TREATMENT. I AM AWARE AND UNDERSTAND THAT I SHOULD CARRY MY OWN HEALTH INSURANCE.

AND, IN THE EVENT THAT ANY DAMAGE TO EQUIPMENT OR FACILITIES OCCURS AS A RESULT OF MY WILLFUL ACTIONS, NEGLECT OR RECKLESSNESS, I ACKNOWLEDGE AND AGREE THAT I MAY BE HELD LIABLE FOR ANY AND ALL COSTS ASSOCIATED WITH SUCH ACTIONS.

PARENTAL CONSENT FOR MINORS UNDER 10

CHILDREN MUST BE AT LEAST 5 YEARS OF AGE TO PARTICIPATE

PLEASE NOTE: VR HEADSET MANUFACTURERS' RECOMMENDED MINIMUM AGE IS 13 AND I, UNDERSTAND THE NATURE OF THE ABOVE REFERENCED ACTIVITIES AND

THE MY EXPERIENCE AND CAPABILITIES AND BELIEVE I SHOULD BE QUALIFIED TO PARTICIPATE IN SUCH ACTIVITY. I HEREBY RELEASE, DISCHARGE, COVENANT NOT TO SUE AND AGREE TO INDEMNIFY AND SAVE AND HOLD HARMLESS EACH OF THE RELEASES FROM ALL LIABILITY, CLAIMS, DEMANDS, LOSSES, OR DAMAGES ON THE MY ACCOUNT CAUSED OR ALLEGED TO HAVE BEEN CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OF THE RELEASES OR OTHERWISE, INCLUDING NEGLIGENT RESCUE OPERATIONS, AND FURTHER AGREE THAT IF, DESPITE THIS RELEASE, I, OR ANYONE ON MY BEHALF MAKES A CLAIM AGAINST ANY OF THE ABOVE RELEASES, I WILL INDEMNIFY, SAVE AND HOLD HARMLESS EACH OF THE RELEASES FROM ANY LITIGATION EXPENSES, ATTORNEY FEES, LOSS LIABILITY, DAMAGE, OR COST ANY RELEASE MAY INCUR AS THE RESULT OF ANY SUCH CLAIM. IN THE EVENT THAT I CAUSE ANY DAMAGE TO EQUIPMENT OR FACILITIES AS A RESULT OF MY WILLFUL ACTIONS, NEGLIGENCE OR RECKLESSNESS, I ACKNOWLEDGE AND AGREE THAT I MAY BE HELD LIABLE FOR DAMAGES ASSOCIATED WITH SUCH ACTIONS MENTIONED ABOVE. AND, IN THE EVENT THAT I DO NOT ADHERE TO OR OPENLY DISREGARDS INSTRUCTIONS FROM ALVIN OR MICHAEL, I UNDERSTAND THAT I MAY BE REFUSED USAGE. I REPRESENT THAT I HAVE FULL AUTHORITY AS MYSELF TO BIND MYSELF TO THIS AGREEMENT.

I AM OKAY WITH HAVING PHOTOGRAPHS OR VIDEOS TAKEN OF ME.

UPON ENTERING THE HEADSET, I KNOWINGLY GIVE MY CONSENT FOR PHOTOGRAPH(S) AND/OR VIDEO(S) TAKEN OF ME DURING THE COURSE OF MY PRESENCE TO BE USED FOR PROOF PURPOSES. I UNDERSTAND THAT I WILL RECEIVE NO COMPENSATION FOR SUCH USES. I RETAIN THE RIGHT TO HAVE ANY PHOTOGRAPH(S) AND/OR VIDEO(S) DISCONTINUED FROM USE UPON REQUEST, AND IF, AT ANY TIME, I WISH MY PHOTOGRAPH(S) AND/OR VIDEO(S) TO BE DISCONTINUED, IT IS MY RESPONSIBILITY TO CONTACT MICHAEL OR ALVIN TO MAKE THIS REQUEST. IN ADDITION, I ALSO KNOWINGLY GIVE MY CONSENT FOR MY EMAIL TO BE USED FOR CONFIRMATION.

I WILL NOT HOLD MICHAEL OR ALVIN RESPONSIBLE FOR LOST OR STOLEN PERSONAL PROPERTY INCLUDING THE MENTAL HEALTH OF USERS.

IF THE PARTICIPANT IS A MINOR UNDER 16, I CERTIFY THAT I AM THE PARENT OR LEGAL GUARDIAN OF THE MINOR AND CONFIRM THAT THE INFORMATION I ENTERED IS ACCURATE AND TRUE. I AM AT LEAST 18 YEARS OLD AND I HAVE READ AND AGREE TO THE TERMS OF THE ABOVE AGREEMENT. BY SIGNING MY FULL NAME BELOW, I AM CERTIFYING THIS WAIVER DOCUMENT JUST AS IF I WOULD HAVE PHYSICALLY SIGNED IT IF IT WAS ON PAPER.

SIGNATURE: _____

