IDE 611 Collaborative Technology Project (Final Report)

Virtual Reality: A Learning Concept to Improve Classroom Performance

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Submitted to:

The Chief of Education of the Sergeants Major Course and Instructional Designers

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Project Title

Virtual Reality (VR): A Learning Concept to Improve Classroom Performance

Brief Summary

The purpose of this project is to explore VR for future success in academia as a proven technology by improving students' learning skills in multiple environments. Educators and students must be adaptive and capable of integrating into multiple educational environments [virtual and live classroom]; it will be critical to engage in successful teaching methods and develop new learning skills. With a knowledge gap present in today's learning environment, VR can bridge the gap using instructional learning materials and supportive technologies.

This issue is about bridging a gap that has been evident since the emergence of COVID-19 in the knowledge area, which supports the virtual and live-classroom spaces highlighting student motivation, skills, and performance. This collaborative project will address how to incorporate VR into the classroom, effectively addressing a learning-knowledge gap imposed by COVID-19 in the K-12 learning environment and further demonstrated in the Sergeants Major Course (SMC). However, the 'need' usually clearly presents itself in challenging environments. As society faced during the COVID-19 pandemic, the concepts of meaningful learning through a classroom [live] environment or even through distance learning [virtual] can shape a learner's interest and ability to stay motivated and engaged towards successful development. The key in any educational environment is to keep students engaged, motivated, and interested; VR can significantly change many aspects of the learner environment. VR can bring new, positive, and innovative tools adaptable in synchronous/asynchronous learning environments.

Clearly, there is a gap in the learning environment, which has been evident in academics during and after the COVID-19 pandemic. However, this problem was not considered a need until the demand was pushed to a necessity for social survival. Academics are increasing their demand towards developing situations where students need to learn in adaptable environments [virtual and live classroom]. Now, institutions face challenges from the current political, economic, and social conditions. Nevertheless, Instructional Designers (IDs) must understand the 'need' and explain the 'how we know' of the critical observations to bridge the gap towards future success.

This project is built on a technology solution; however, the framework is supported by structured learning materials, lesson activities, and formative assessment planning to achieve its goals. Our team conducted interviews and surveys with IDD&E professionals and educators at the SMC [a regionally accredited bachelor's degree institute] to frame the needs assessment successfully. This was to find out the need and how the surveys can highlight discussion topics on (1) finding out what they know, (2) what they want to incorporate into VR supported classrooms, and (3) what would be required to conduct VR workshops [SMC and K-12 institutions]. The surveys' initial findings helped define the gaps and a need. They also framed the outcomes to achieve the desired end state in our defined goals and objectives. Lastly, the final project results were achievable with definable outcomes while gaining some notable lessons learned along the way.

Introduction

The project aims to explore VR for future success in academia as a proven technology for the next generational learning and experiences by improving students' learning skills and teachers' abilities to project in multiple environments. Being adaptive is critical, and VR provides a synchronous, asynchronous, and blended approach to learning. Considerations in learning development will always be a top priority as we better prepare our society for future roadblocks that hinder success at home, the office, and school. Educators and students must be adaptive and capable of integrating into multiple educational environments [virtual and live-classroom]; it will be critical to engage in successful teaching methods and develop new learning skills. With a knowledge gap present in today's learning environment, VR can bridge the gap using instructional learning materials and supportive technologies.

Project Team

The project team consists of Jason Hellstrom, Joseph Denny, Justin Hood, and Rockwell Botchway. All team members are Sergeants Majors of the U.S. Army Fellowship Program, Cohort 7, and students attending Syracuse University M.S. Instructional Design, Development & Evaluation (IDD&E) Program. Each member had the following roles in the project:

1) ***Jason Hellstrom*** – Project manager, paper introduction, development and research guidance, design integration, project reflections, and Appendix A & F design.

2) ***Joe Denny*** – Section development in applications of VR in school education with areas of development in remote learning, application barriers, and Appendix C & D design.

3) ***Justin Hood*** – Section development in applications of VR in school education with areas of development in interviews, surveys, and Appendix A & B design.

4) ***Rockwell Botchway*** – Section development in applications of VR in school education with areas of development in research analysis and Appendix E design.

Needs Assessment

The Issue – A Problem in Today's Learning Environment

There are areas in education and in the current learning environment where teachers need more substantial supportive learning materials to improve learning engagements with students for their future success. This issue is about bridging a gap that has been evident since the emergence of COVID-19 in the knowledge area, which supports the virtual and live-classroom spaces that supports student motivation, skills, and performance. This collaborative project will address how to incorporate VR into the classroom, effectively addressing a learning-knowledge gap imposed by COVID-19 in the K-12 learning environment.

Globally, our society was faced with a gap in the learning environment during the COVID-19 pandemic. However, this problem was not considered a need until the demand was pushed to a necessity for social survival. Academics are increasing their demand towards developing situations where students need to learn in adaptable environments [virtual and live-classroom]. However, institutions face challenges from the current political, economic, and social conditions. Nevertheless, IDs must understand the 'need' and the how 'we know' of the critical observations to bridge the gap towards future success.

As an ID, their role in the curriculum development process is essential; specifically, they are the experts in the learning process and advocate for the learner and the developmental process (Dick, 1987). As such, IDs can provide insight into (1) Conducting needs assessments of what the learner(s) need to know and frame the understanding of the knowledge gap, (2) Identifying the learning environment needs, and (3) How the learners view the learning material (A Pass Educational Group, 2021). With the ever-evolving environment and enhanced technology, improved learning methods can enhance the learning materials and delivery by integrating VR technology into education learning models and classroom use.

Education and learning are about the transmission of knowledge. In challenging environments, the 'need' usually presents itself very clearly. As society faced during the COVID-19 pandemic, the concepts of meaningful learning through a classroom [live] environment or even through distance learning [virtual] can shape a learner's interest and ability to stay motivated and engaged towards successful development. The key in any educational environment is to keep students engaged, motivated, and interested; VR can significantly change many aspects of the learner environment. VR can bring new, positive, and innovative tools adaptable in synchronous/asynchronous learning environments.

In education, the how 'we know' was visible during the school year 2020-2021. The National Center for Education Statistics (NCES) and The Department of Education (2021) reported: "31% of districts were reportedly offering more than five hours of live instruction for their fourth-graders learning remotely, with 34% offering the same for eighth-graders during remote learning" (p.412, par.1). Nationally, remote learning is still a need, not just a necessity. Yet, the same academic statistics show that the learning environments in both virtual and live spaces can be closed with a technology solution. Lastly, the NCES concluded that, on average, during remote learning, grades significantly dropped due to a lack of motivation, engagement, and interest in participating in the virtual space (The Department of Education, 2021).

Finding the Need Through Survey Analysis

Our team conducted two interviews/ surveys with IDD&E professionals and educators at the SMC to frame the needs assessment successfully. This was to find out the need and how the surveys can highlight discussion topics on (1) finding out what they know, (2) what they want to incorporate into VR supported classrooms, and (3) what would be required to conduct VR workshops [SMC and K-12 institutions]. The surveys' initial findings helped define the gaps and a need. They also framed the outcomes. ***Appendix A (Survey & Questionnaire)*** details the complete results; however, the critical areas discovered in our findings told us the following:

Discovery #1– VR Can Re-Shape the Learning Environment. ***VR can be helpful if the learning materials are developed and placed in the right learning environment.*** For example, using VR in 'The Department of Professional Studies,' which looks at history, case studies, and lessons learned, students benefit significantly from using the system. However, using VR in 'The Department of Command Leadership' where discussions and one-on interaction are critical, VR would not be practical.

- Using the proper learning materials is key to any thriving learning environment; however, to ensure success in the classroom and to gain institutional support, teachers must see that VR is (1) trustworthy and (2) easy-to-use.

- This report has provided ***Appendix C (Instructional Materials)*** for two purposes. First, to gain *trustworthiness* by recommending a '3-Day Developmental Workshop' called 'Project Virtual Reality' to be conducted at the SMC. The intent is to introduce VR into the classroom and establish a proof of concept for a period determined by the SMC Chief of Education. The workshop will facilitate four core objectives: (1) Introduction to VR and its application in the classroom, (2) Maintenance, (3) Lesson planning and activity integration, and (4) Development/ assessment. Appendix C has the recommended workshop schedule.

- Creating a shared understanding among institutions will be essential to future success. Appendix C provides a YouTube Video Developmental Framework concept to support the workshop and connect proof of concept to other institutions.

Discovery #2 – New Tech Increases Classroom Drive. ***New technology is great to use; it increases motivation in the classroom if applied correctly.*** Used correctly if the technology is (1) simple to use so students can engage and stay interactive, (2) be reliable and stay connected on current network infrastructure, and (3) advanced enough to connect at home networks to increase eLearning environment, yet easy to on the user.

- ***Appendix E (Learning Assessment)*** provides a 'Formative Assessment Case Study' example of using simplicity, engagement, and staying interactive using VR systems. In this example, this assessment uses an Intended Learning Outcomes (ILO), which will help understand two critical questions:

    1) What will students know or be able to do?
    2) What evidence are you willing to accept that students have learned?

Such questions will help target four key areas: (1) 'Knowledge, Skills, & Dispositions,' (2) 'Elicit and Capture' to make student thinking visible, (3) 'Analyze and Infer' to make sense of what you see, and (4) 'Communicate & Use' to progress student learning.

Discovery #3 – Tailored Instruction & The Right Tech. ***Use tailored learning activities and the right supportive technologies.*** During the surveys, the IDs suggested starting in middle school, then seeing how students adapt to the learning environment. Additionally, IDs pointed out key aspects where not all institutions or teachers will be interested due to complicated VR lesson activities. However, IDs pointed out VR could be a great tool if applied correctly using the right learning activities.

- The survey hit a significant input gap—VR must target the right schools [lesson platform and ideals] and apply to the correct teacher's curriculum [appropriate learning materials]. However, the key is to initiate at the right school to develop trust and confidence in the program over time.

- The VR technology must be used correctly. The survey pointed out incorrect uses, such as if the technology (1) doesn't connect all networks, and (2) is too complicated for the teachers to manage the learning plans—a key point when running the workshop at the SMC.

- ***Appendix D (Learning Activities)*** provides an example of a modest VR lesson activity used by teachers in Stoughton High School, Massachusetts. The lesson offers three key learning aims: (1) To use VR to enable students to explore Spain and its culture, (2) To communicate in Spanish with ClassVR, and (3) To analyze Spanish landmarks and locations

(Avantis Systems, 2021a). This example shows simplicity in the VR lesson activity and a standard curriculum being adapted to institutional use.

Discovery #4– Cost is the Biggest Concern. ***The IDs had initial concerns about cost issues, not the institutions but the students.*** Initially, the primary concerns were about costs to institutions; however, students were highlighted. Students will lose and damage the technology assigned and may be liable for the charges, impacting families. Lastly, validating the equipment maintenance program is essential and could pose a gap concern in a VR program's product reliability and maintenance viability.

- This project team sat down with some IDs regarding VR costs and employment in the classroom. Some IDs were interested in the costs analysis. Today's VR systems, such as ClassVR, were cheaper to replace and fund than the issued laptops that most students use in public schools and easier to repair; see ***Appendix B (Cost Analysis)*** a statistical overview. However, below are some key considerations that were found during the analysis:

  1) When considering including VR in the classroom, multiple factors are needed to ensure success. Factors such as (1) VR is a valuable but complicated technology to implement; (2) An ID should be staffed as part of the institutional faculty before pursuing VR; (3) Equipment considerations; and (4) Product support considerations

  2) *VR equipment,* like all electronic*s*, is fragile and can break. When planning to include VR in the classroom, cost estimates should consist of spare equipment, a budget and/or contract to repair/replace broken equipment, and product support for issues not quickly resolved.

  When purchased individually, VR can be quite expensive. However, many companies offer classroom VR packages of eight or 30 at a reduced cost. We strongly recommend classroom VR packages that allow for spares, expansion, and testing. VR purchased individually requires a license and subscription for operation. Bundled VR (packages) does not for the license(s), and subscriptions are included in the package.

  3) *Product Support* is essential to equipment life and program success. For example, consider the 2013 California iPad debacle [School districts poor electronic product support resulted in forced upgrades close to $1 billion] was not enough to deter you from hastily or marginally planning to integrate VR in the classroom; unreliable and non-operational equipment will (Blume, 2013). Educators must have the opportunity to learn VR, experiment with it, and troubleshoot it before including it into the designed instruction to create assurance and expertise should they experience difficulties using VR. Those considering including VR should also consider a product support package available to everyone, not just IT Professionals.

Based on this result, the project team believes the outcomes from the surveys and interviews have a strong recommendation for serving, first, the SMC [pilot program] and second, the K-12 population [end-goal] by incorporating VR into the classroom curriculum through the help of future IDs by closing a knowledge gap. Using tailored instructional learning activities, learning materials, and precise supportive technologies, our team can establish the right goals and objectives to achieve the desired learning environments [virtual and live classroom].

Goals and Objectives of the Project

The use of VR technology has been used successfully in the typical classroom environment. However, adaptation and its inability to integrate systematically due to current traditional learning methods and the associated costs haven't been easy. IDs must see that the goals align with the advancements in computer information technology and social acceptance while linking the VR learning environment. This paper's objective will align with the central area of applying VR applications in academic institutions K-12.

Goals

The addition of VR technology into a mainstream learning environment includes three key areas that can affect the learning and teaching within K-12 academics, they are:

1) ***Main Goal.*** Introduce and demonstrate new technology to future IDs with methods for inclusion of VR into education.

2) ***Supportive Goal.*** Help K-12 educators understand how to incorporate VR into the classroom.

3) ***Sub-Goal.*** Identify and support the benefits for educators by incorporating VR into the K-12 classrooms.

Objectives

The objectives will focus on the central area of VR applications at the SMC and in academic institutions K-12. The objectives for this project are:

1) Describe and elaborate on an evolving VR technology that can support multiple learning environments, be simplistic with excellent graphics, and engage a lesson-based teaching platform that improves motivation in the classroom [virtual and live classroom].

2) Create and develop an understanding of the learning environment using VR learning activities while considering the remote opportunities and barriers affecting its implementation.

3) Deliver tangible changes in the interactive learning environment by using recommended VR assessments of learning.

4) Produce a workshop and YouTube video to engage and shape the opinions of institutions through the support of IDs and teachers' using new lesson activities and methods of instruction using VR in the classroom [virtual and live classroom].

Target Audience

The Findings and Recommendations

The target audience for this project and disseminating this technology will be primarily for IDs in academics who are (1) advocates in the curriculum development process or (2) evaluate, design, and develop material support. Secondly, the product of these findings can influence academic institutions that (1) can integrate technology with traditional learning methods (schools/ academies), and (2) the faculty, users (teachers, students) who operate in synchronous/asynchronous learning aspects.

Report Delivery and Project Scope

The goals and objectives of the technology will align with the delivery of this project scope's audience, which is intended for IDs in the fields of academic institutions K-12. However, to engage appropriately, this project report will be delivered to the Chief of Education of the SMC to create a proof of concept and involve IDs who are both curriculum developers and educators in a regionally accredited institution.

Within education, the mindset is that VR is costly, too high-tech, and the software/ hardware is complicated and too hard to manage. However, academic IDs can help shape the target audience by using the supporting VR learning model to solve current and future problems.

Technologies to be Used

Primary Framework

In this project, the primary technology discussed will develop the learning environment for the SMC and support academic institutions K-12, which is ClassVR for classrooms. To connect the direct technology and the academic institutions K-12 environment, ClassVR has over 30 creative ways to integrate students from elementary school to college able to interact through connected systems. For next-level learning, systems such as VR and digital cell worlds can interact with teachers and peers (Avantis Systems, 2021a).

ClassVR aligns itself with thousands of curriculum-based VR, AR, and MR content relevant to educating students of all ages to achieve various social networking, computing, and academic gaming levels. Additionally, the systems are designed to be simplistic and proven successful in synchronous and asynchronous learning environments. Students can engage from home networks or use school computing with stand-alone operating systems. ***Appendix F (VR Comparison)*** shows why ClassVR outperforms all current VR systems and is the most simplistic and reliable technology on the market today.

Supplementary Framework

Other supportive technology aspects of this project will include using YouTube to distribute the means to the IDs and teachers while shaping academic institution opinions over time. The additional digital support will consist of:

- ***Laptops.*** Provides the ability to support VR software and integrates lesson activities, materials, and assessment materials vital to the implementation plan.
- ***Network Infrastructure (Internet).*** Provides the ability to support VR software in synchronous and asynchronous learning environments.

Challenges

The challenges that this team experienced while implementing the project were based on (1) Organizational design and (2) Technical experience. In some respects, the challenges may be overcome easily. In contrast, others may take time-based on U.S. Army doctrine planning considerations and may limit the current scope of the project, such as: *Time* [Additions, even minor changes to doctrine take time to affect Army curriculum]; *Financial Support* [Purchases greater than $5,000 take specific command authority; also, a time factor]; *Agency Resource Support* [Network Enterprise Center to support IT services and connectivity management].

Organizational Design

The organizational challenge was about considering how to implement this project, specifically creating a 'proof of concept' at the SMC, which requires approval from the Chief of Education over the SMC. Next, the NCO Leadership Center of Excellence (NCOLCoE) Commandant will review all recommended curriculum design changes at the Accountable Instructional System [*annually*]. Then, if approved, the action is sent to the General Staff College (CGSC) for their Commandant approval. Lastly, if approved, the change will be part of the next academic years' curriculum. Overall, the process takes 12-months to process.

Technical Experience

The technical aspect is based on the physical part of the 'Hands-on experience' as VR devices were not available to test. Each project member had their own experience with VR devices. However, the costs of platforms for supportive action were not available to conduct live tests. The sole supportive action for this project was through research, which limited the depth and breadth of the analysis. However, Annex F was added to compare all top VR systems being utilized. Multiple academic institutions highly recommended only one system with no poor reviews in (1) costs, (2) maintenance issues, and (3) reliability [ClassVR].

Lastly, instructors lack experience and knowledge in the technology to employ the system. While many IDs were enthusiastic about the program design concept, adding lesson activities to structure the VR framework could take time to start the program.

Results

Definitive research linking learning outcomes, training, and education prospects into VR can stimulate the mind through increased imagination and engagement. Improvements in learning outcomes for children and adults can support teaching methods for generational goals of cultivating emotional health and well-being (Avantis Systems, 2021b). Using a combination of quantitative and qualitative methods, such as: surveys, questionnaires, formative assessments, instructional materials [SMC Workshop & YouTube Video], learning activities, and interviews, we determined VR systems can improve a knowledge gap student performance in today's learning environment. We showed that supportive technology is just a tool; it's more than just an option to enhance teaching methods and develop new learning skills; below is an overview:

Inputs	Activities	Outputs	Outcomes	
			Short Term	Long Term
Introduce and demonstrate new technology to future IDs with methods for inclusion of VR into education	3-day Workshop (Appendix C)	Cadre familiarization and creative ways to use VR	Mastery Learning of specified learning outcomes	Students perform at higher level(s) of Blooms Taxonomy (Analyzing, Evaluating, & Creating); a level not reached without VR
Help K-12 educators understand how to incorporate VR into the classroom	Learning Assessment (Appendix D)	Educators learn ways VR is currently being used in education to develop creative ideas about how they can use VR in their classroom	Individual exploration of VR to advocate its use in their classroom/school/district	The rapid integration of VR into their learning environment(s) to improve learning outcomes and increase learning levels of Blooms Taxonomy
Identify and support the benefits for educators by incorporating VR into the K-12 classrooms	Assessment -On-going- (Appendix E)	Increased learner proficiency scores on District Assessments/ SAT Scores/ College Acceptance Rates	Increased interest by the learner to learn new topics presented and improved confidence in their involvement of learning new material	As learner confidence and scores increase, the complexity of the instruction and material presented will also increase

The research indicated IDs are vital to the success of new platforms and that cost and design of learning materials must be tailored to each institution, specifically to their individual learning needs. Additionally, as designed in the appendix, each is a template to show how simple VR can be managed regardless of whether it is a lesson activity, such as in Appendix D, or a Formative Assessment Planning, such as in Appendix E. Each can be tailored to fit each teacher's individual learning needs. As a result, the following expectations/ outcomes of this project are:

- Using improved lesson activities and formative assessments, teachers can use VR lesson materials to develop students' knowledge and skills. [Teachers]
- The interactive learning environment will help improve motivation and performance in synchronous and asynchronous learning. [Students]
- Trust and confidence over time in VR systems, and like laptops, the systems will become more readily available, ultimately reducing school district costs. [Institutional]
- The VR workshop and YouTube will create a 'proof of concept' method for trust and reliability to improve classroom performance while showing options towards the blended approach to learning various teaching methods. [Operational]

Reflection on the Experience

Lessons Learned

The collaborative project provided a unique opportunity to find a performance gap in Knowledge, Skills, and Attitudes (KSAs). As future educators, our motivation was heightened around the aspect of the knowledge base as we wanted to hone in one method of instruction on a current problem faced in today's society. Enhancing motivations, efficiency, and effectiveness while improving our own experiences related to the SMC was a bonus for both previous academy students and future instructors. In essence, we felt we were gaining a certain measure of success in every stride of this project as we took ownership as if this was a key to our future success in the classroom.

Future Work, Benefiting from Experience

Along the way, this project has shown the team that many factors, insights, and areas must be considered when developing KSA gaps, particularly when considering the five stages of a developmental process: Analysis, Design, Development, Implementation, and Evaluation (ADDIE). The significant benefits are perception and understanding that projects should be viewed as critical learning. As a group, we learned from our success, but more so from our failures. This project taught us that there are various paths to take, and not all are right; however, we must understand the customer's needs and wants and link them to the right goals and objectives.

Collaboration and Project Implementation

Our team's approach to collaboration and project implementation was the integral connection of technology use, collaboration with other IDs in the field, and finding relevant experts. For example, our project team spoke with IDs currently working at the SMC who were both instructors and curriculum designers during the interview process. Additionally, we integrated those same IDs using Googles Sites for online surveys to feed the information gaps

necessary to implement the knowledge gap for the project. Lastly, our team discussed options with the Chief of Education of the SMC on practices for curriculum development to improve student evolvement and understanding in the overall system.

In many aspects, we believe this can assist educators and the student's ability to learn and grow using various resources to achieve project success. Dr. Koszalka always highlights a critical point that "As an ID, you are not going to be the expert in the field or on a project; in fact, most of the time, you will never be… so go find them and get their expertise to work for you" [*or words to that effect*].

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Appendix A

Survey & Questionnaire

Context: Globally, our society was faced with a gap in the learning environment during the COVID-19 pandemic. However, this problem was not considered a significant issue until a demand was pushed to a necessity for social survival. Academics are increasing their demand towards developing situations where students need to learn in adaptable environments.

There are areas in education and the current learning environment where teachers need more substantial supportive learning materials to improve learning engagements with students for their future success. This issue is about bridging a gap that has been evident since the emergence of COVID-19 in the knowledge area, which supports the virtual and live-classroom spaces that supports student motivation, skills, and performance.

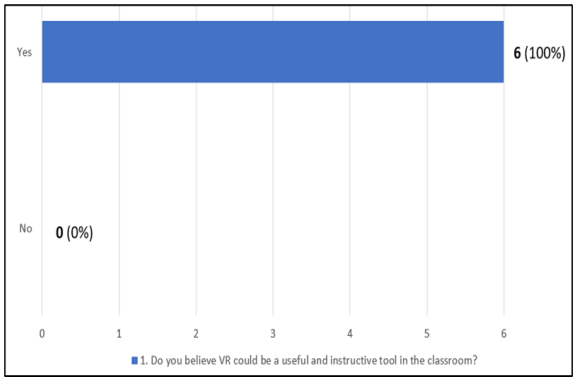
The questions below reflect the possibility of incorporating VR into the classroom and how supportive devices could address a learning-knowledge gap in the synchronous [in-classroom] and asynchronous [remote-learning] environments.

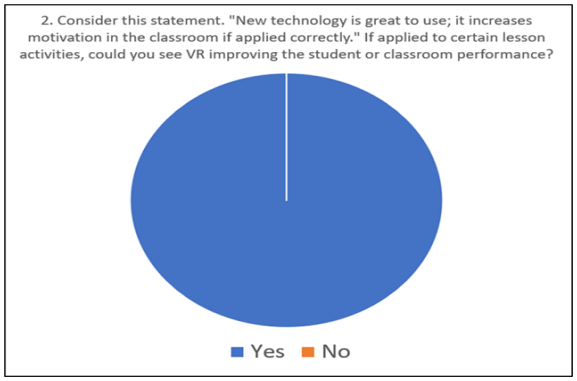
Survey Results

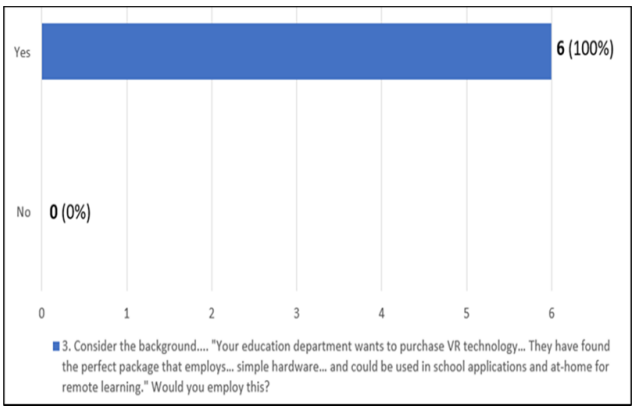
Survey Pool: Current academic instructors and curriculum developers [specifically, previous IDD&E graduates] at the Sergeants Major Course located at Fort Bliss, Texas.

Survey Timeframe: September 18, 2021 – December 04, 2021

Responses: 6







Appendix A (Continued)

Questionnaire Results

Questionnaire Pool: Current academic instructors and curriculum developers [specifically, previous IDD&E graduates] at the Sergeants Major Course located at Fort Bliss, Texas.

Questionnaire Timeframe: September 18, 2021 – December 04, 2021

Responses: 6

1. Do you believe VR can be helpful if the learning materials are developed and placed in the right learning environment…

(a) In the Sergeant Majors Academy? (If so, please provide some context).

- Yes, in areas such as the Department of Professional Studies, which key has a big focus on case studies, and lessons learned. The instructor and students can benefit significantly from using the system if adapted to the right lessons and training plan. However, using it in areas such as The Department of Command Leadership, where discussions and one-on interaction are critical, VR would not be practical.
- Yes, using simulations will help the learners apply what they have learned in the course in real time.
- I believe VR has many benefits, however, I would have to evaluate each lesson to see it's application. It's very possible for some lessons.
- I believe that it can. The possibility to enhance learning can be instrumental using VR in the classroom environment.
- Yes, new tools can change perceptions and create new learning environment based on the user and how the instructors chooses how to employ it.
- It could in the rights hands, right instructor, and applied in with the right student environment.

(b) In academic institutions K-12? (If so, please provide some context).

- Yes, using VR would be great in areas such as teaching History, in any context, or it could be tailored for a better visuals in math labs. Honestly, anything where visual learning would be excellent for a better K-12 learning environment. However, the technology would have to be easy to use; simplicity is key to success.
- Yes, same as the previous answer but in K-12 environment.
- Yes, with younger learners could replicate situations and projects the teachers are trying to explain.
- VR can be useful at the K-12 level as well. with the advancement of technology we must ensure that we continue to develop our children in the educational domain to ensure we stay current with technology.
- Yes, if applied to the right situation, area, and supported by the school program.
- Yes, when costs and student demographics [think school funding ability] are applied to the right content of learning tools. Learning outcomes must match regional goals.

6 Reponses

2. In regards to using VR as a tool to improve lesson activities and student motivation and/or performance in the classroom, please provide some pros and cons.

(a) Pros.

- The key is using VR correctly with the lesson plan and student learning level. The technology must be simple to use so students can engage and stay interactive. Also, the VR devices must be reliable and stay connected on the schools site network while be able to meet a students needs at home to connect to their home network. Doing so would of set the sizeable costs that come with most new technologies, but would add classroom tool and increase the remote learning environment success rates where most are failing
- Learns can apply knowledge to situations in real time.
- Enhance existing curriculum
- VR can enhance instruction and learning for the student. VR allows for the facilitator to show and develop students in a way you can not do without the technology.
- Its a not new system, and while used often in education, it has great potential to create an amazing environment in the classroom and at home.
- It's a tool, much like a laptop or any other technology; the pro is how the instructor employs it. Some will think outside the box, some wont, those who do, will be the ones who will clearly who advancement in their classroom with their students.

(b) Cons.

- If the VR technology doesn't connect all networks, school and home, and is too complicated for the teachers to manage the learning plans, while difficult for students to operate then the system would never be used. Additionally, the VR tech must connect to current hardware and software on our issued school computers, staff and student alike.
- Learners with disabilities.
- It requires the instructor to know how to properly employ the technology.
- Cost of technology, train up of instructors. upkeep of the VR. Technology is so fast the items may become obsolete costing more money for upkeep.
- Cost and maintenance
- Software and technology upkeep goes out fast; cost.

6 Reponses

Appendix A (Continued)

3. If your institution was to employ VR into its educational program…

(a) Where would you best employ it?

- Areas where visual learning can best engage student involvement such as history and learning about WWII tank battles or about the terrain they engaged on. With VR you could come closer to physically seeing the something as compared to just explaining over a map. During case studies in most departments, closer visual analysis of each layout could be employed some situations.
- During our Department exercise, learners apply what they learned I. A simulated deployment of a unit.
- Not entirely sure but I imagine there are specific lessons that could incorporate VR to enhance the experience.
- In the classroom environment, depending on the area of study it could be beneficial during different aspects.
- Any class that engages through and visual perceptions during discussion based learning.
- Areas that involve student engagement lesson activities.

(b) As an Instructional Designer, what would be your biggest concerns?

- A concern is the cost, both to the institution but also to the students who could maintain a device, such as maintaining a laptop. Students will lose and damage technology assigned to them and families will be liable for the charges. If employed in K-12 schools, I would start slow, like middle school, then see how teachers and students adapt to the learning environment.
- There could be a gap in product reliability, maintenance costs, teacher use, and lesson execution if the program is not employed correctly and supported by department heads.
- Knowledge of the VR equipment and cost.
- Ensuring the effectiveness of the technology and program to be more beneficial to the recipients. Does it actually make the training easier? Better? More realistic?
- The implantation of the technology and ensuring that the academy continues to utilize the program correctly and efficiently.
- Cost and learning activity modeling.

6 Reponses

Appendix B
Cost Analysis

ClassVR– Per Single Unit Cost

Ingredient	Quantity	Description	Price	Cost (Quantity x Price)
Hardware– Virtual Reality (VR) Headsets	1	VR Headsets with Harness	$329.00	$329.00
Hand Controllers	2	Required x2 hand controllers per VR Headset	$25.00	$50.00
VR Annual Subscription	1	Licensed to the district or institution.	$399.00	$399.00
Professional Development & Training (Online)	1	Hands-on & in-person instruction for set-up, implementation, and, and basic troubleshooting.	$299.00	$299.00
Charging Cart	1	Designed for portability, security, and protection of VR headsets. One cart per x30 headsets	$2500.00	$2500.00
USB Rapid Charger(s)	1	One rapid charger per charging cart	$97.89	$97.89

Tierney. (2021, December 1). Virtual & Augmented Reality - ClassVR standalone headset (155) VR bundles

SMC ClassVR- Startup Cost - Class Size: 12

Ingredient	Quantity	Description	Price	Cost (Quantity x Price)
Hardware– Virtual Reality (VR) Headsets	12	VR Headsets with Harness	$329.00	$3948.00
Hand Controllers	24	Required x2 hand controllers per VR Headset	$25.00	$600.00
VR Annual Subscription	1	Licensed to the district or institution.	$399.00	$399.00
Professional Development & Training (Online)	1	Hands-on & in-person instruction for set-up, implementation, and, and basic troubleshooting.	$299.00	$299.00
Charging Cart	1	Designed for portability, security, and protection of VR headsets. One cart per x30 headsets	$2500.00	$2500.00
USB Rapid Charger(s)	1	One rapid charger per charging cart	$97.89	$97.89
			Total	**$7843.89.00**

Tierney. (2021, December 1). Virtual & Augmented Reality - ClassVR standalone headset (155) VR bundles.

SMC ClassVR- Startup Cost - Class Size: 16

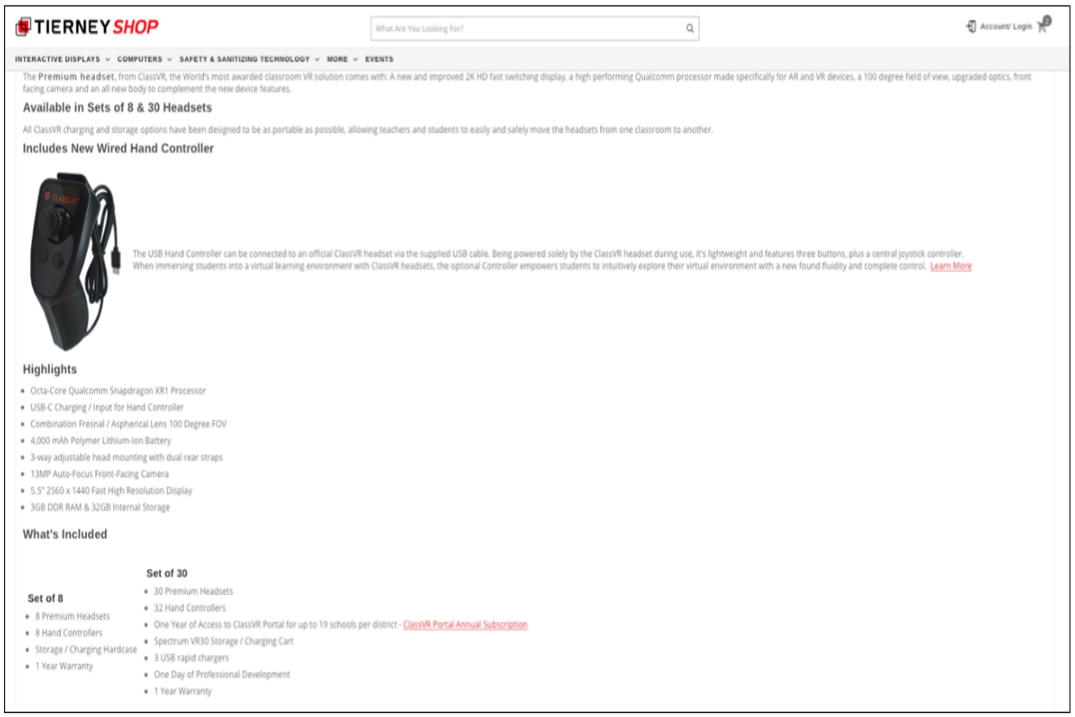
Item	Quantity	Description	Price	Cost (Quantity x Price)
Hardware– Virtual Reality (VR) Headsets	16	VR Headsets with Harness	$329.00	$5264.00
Hand Controllers	32	Required x2 hand controllers per VR Headset	$25.00	$800.00
VR Annual Subscription	1	Licensed to the district or institution.	$399.00	$399.00
Professional Development/Training (Online)	1	Hands-on & in-person instruction for set-up, implementation, and, and basic troubleshooting.	$299.00	$299.00
Charging Cart	1	Designed for portability, security, and protection of VR headsets. One cart per x30 headsets	$2500.00	$2500.00
USB Rapid Charger(s)	1	One rapid charger per charging cart	$97.89	$97.89
			Total	**$9359.89**

Tierney. (2021, December 1). Virtual & Augmented Reality - ClassVR standalone headset (155) VR bundles.

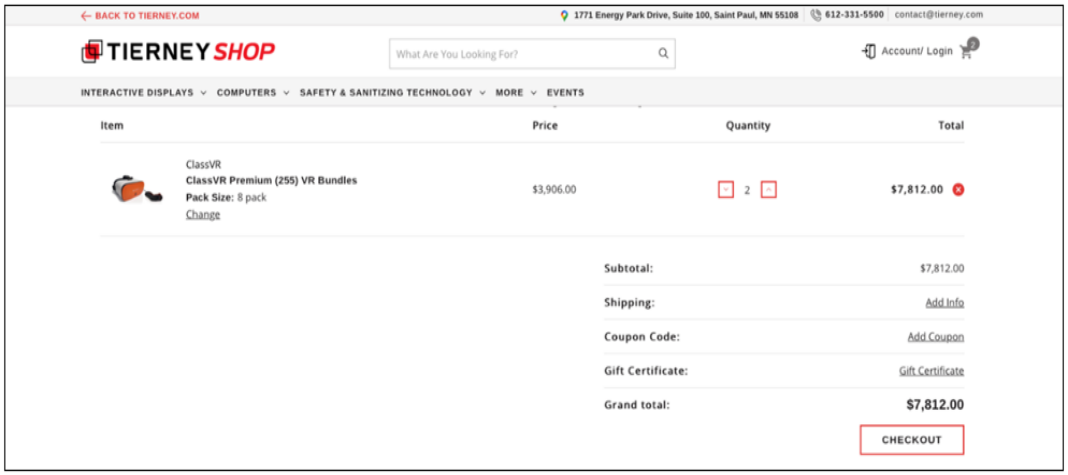
Appendix B (Continued)

SMC ClassVR (Startup Cost): Bundled Estimate – Tierney

Class Size: 12-16, ClassVR Bundle Overview, and ClassVR Bundle Cost.



Tierney. (2021, December 1). Virtual & Augmented Reality.



Tierney. (2021, December 1). Virtual & Augmented Reality.

Appendix C
Instructional Materials

SMC Workshop [3-Day]

Agenda

3-Day **Developmental Workshop** for <Project Virtual Reality>

Day-1
0800 to 1730
Sergeants Major Course (SMC)

Type of meeting:	Virtual Reality Workshop
Facilitator:	<Facilitator TBD>
Please read:	Included Materials
Please bring:	Your energy, commitment, and ideas (in addition to pen and paper)

Agenda topics

0800-0830	Introduction	Agenda, facilities, and Rules
0830-1000	Presentation	Overview, Components, System Use
1000-1200	Issue/Common features	Issue headsets, Common Features of VR headset
1200-1300	Lunch	
1300-1430	Trouble Shooting	Trouble Shooting & Common Errors
1430-1445	Break	
1445-1600	Scenario #1	Basic Scenario Training
1600-1615	Break	
1615-1730	Turn-in equipment/ Accountability/ Wrap-up	Summary, Consolidate Results

Agenda

3-Day **Developmental Workshop** for <Project Virtual Reality>

Day-2
0800 to 1700
Sergeants Major Course (SMC)

Type of meeting:	Requirements Workshop
Facilitator:	<Facilitator Name>
Please read:	Included Materials
Please bring:	Your energy, commitment, and ideas (in addition to pen and paper)

Agenda topics

0800-0830	Issue Equipment	Issue VR sets
0830-1000	Content Review	Previous Days Review
1000-1200	Scenario #2	Introduce to Scenario Based Training
1200-1300	Lunch	
1300-1430	Troubleshooting	Operators React to Troubleshoot
1430-1600	Scenario # 3	Scenario Training – Learning Activities
1630-1700	Turn-in equipment/Accountability/ Wrap-up	Summary and action items, consolidate meeting results

Appendix C (Continued)

Agenda

3-Day Developmental Workshop for <Project Virtual Reality>

Day-3
0800 to 1700
Sergeants Major Course (SMC)

Type of meeting:	Requirements Workshop
Facilitator:	<Facilitator Name>
Please read:	Included Materials
Please bring:	Your energy, commitment, and ideas (in addition to pen and paper)

Agenda topics

0800-0830	Issue Equipment	Issue VR sets
0830-1000	Scenario # 4 /Students become facilitators	Learning Activities & develop assessments
1000-1200	Scenario #5/ Students rotate as facilitators	Learning Activities & develop assessments
1200-1300	Lunch	
1300-1430	Assessment/ Students facilitators	Training Assessment
1430-1600	After Action Review/ Training Feedback	Feedback
1630-1700	Turn-in equipment/Accountability/ Wrap-up	Summary and action items, consolidate meeting results

YouTube Video – Development Framework

Re-shaping the Learning Environment Using Virtual Reality (VR)
(12-15mins)

Slide-1 (Introduction)

Provide introduction and concept learning [Framing the Video]

- Introduce Virtual Reality into the Classroom.
- Highlight who the instructors are for the eLearning Video.

Slide-2 (What Is This About? Who Needs to Know?)

Provide the why as to who is the target audience for this class.

- **Instructional Designers** in academics who are (1) advocates in the curriculum development and (2) process evaluate, design, and develop material support.
- **K-12 academic institutions** that (1) can integrate technology with traditional learning methods (***schools/ academies***), and (2) the faculty, users (***teachers, students***) who operate in synchronous/asynchronous learning aspects.

Slide-3 (Learning Scope & Goals)

- **Learning Scope.** To discuss and define VR technology as a tool in the educational domain that can assist the instructional designer, students, faculty, and educators with integration into classes and or subjects that will amplify learning.
- **Goals.**

1) Recognize and demonstrate to future IDs better ways and means on how to incorporate VR into classrooms.
2) Help K-12 educators understand how to incorporate VR into the classroom
3) Identify and support the benefits for educators by incorporating VR into the K-12 classrooms.

Slide-4 (Learning Objectives)

- **This eLearning video has four learning objectives.**

1) Describe and elaborate on an evolving VR technology that can support multiple learning environments, be simplistic with excellent graphics, and engage a lesson-based teaching platform that improves motivation in the classroom [virtual and live-classroom].
2) Create and develop an understanding of the learning environment using VR learning activities while considering the remote opportunities and barriers affecting its implementation.
3) Deliver tangible changes in the interactive learning environment by using recommended VR assessments of learning

Appendix C (Continued)

Slide-5 (Topic #1 – The Evolving VR Environment)

- **Describe and elaborate on the evolving VR technology environment.**
  - Introduction to VR, its components, and how to use them.
- **How VR supports the learning environment.**
  - Engaging Students using lesson-based teaching.
  - Improve motivation in the classroom [virtual and live-classroom].

Slide-5 (Topic #2 – Elaborate on VR learning activities)

- **Develop an understanding of the learning environment.**
  - VR learning activities in-class and shaping remote opportunities.
- **Barriers affecting its implementation.**
  - Technical, environmental, and costs.

Slide-6 (Topic #3 – Bringing Tangible Changes)

- **Delivering Change in the interactive learning environment.**
  - Assessments of learning, a tool to motivate and learn.

Slide-9 (Lesson Summary)

- Conduct a lesson summary that addresses the information key content.

Slide-10 (References)

- Provide supportive references.

Slide-11 (Questions and Contact Information)

- Provide points of contact and for information to questions for VR programs.

Appendix D

Learning Activities

Example Lesson Activity

Title	EXPLORING SPAIN AND ITS CULTURE
Subject	**Spanish**
Author	None Specific
Grade level	High School
Time duration	90 minutes
Overview	To provide students with a unique opportunity VR can be utilized to create a rare opportunity to visually see sculptures, culture, and landmarks that can only be replicated by traveling to Spain. VR gives the distant opportunity to challenge and revive learning to the next level with providing fun and interactive learning that will challenge students and spark interest for years to come.
Objective	After a lesson utilizing VR to emerge students into a virtual field trip to Spain, students will be able to identify and locate landmarks while in Spain. Furthermore, students will be able to utilize and practice on their Spanish skills.
Materials	Virtual Reality Headsets. Smartphones Wifi router
Activities and procedures	Be able to communicate using only Spanish while emerged in VR. To identify and analyze landmarks and locations while in Spain using VR. Utilize VR technology to take a virtual trip to Spain to become ingulfed into the culture and surroundings.
Conclusions	At the conclusion of the field trip, students will have demonstrated their ability to speak fluently in Spanish, identify many landmarks and describe famous sculptures.
Extra credit	Enter extra credit
Reference	Avantis Systems. (2021a, September 27). 30 Creative ways to use ClassVR in the US. https://www.classvr.com/download/30-creative-ways-to-use-classvr-in-the-us/

Appendix E

Learning Assessment

Formative Assessment Case Study. This assessment is based on an Intended Learning Outcomes (ILO), which will help understand two critical questions:

1) What will students know or be able to do?
2) What evidence are you willing to accept that students have learned?

Such questions will help target four key areas: (1) 'Knowledge, Skills, & Dispositions,' (2) 'Elicit and Capture' to make student thinking visible, (3) Analyze and Infer' to make sense of what you "see," and (4) Communicate & Use' to progress student learning.

Case Study

Combat Outpost (COP) Keating is a base occupied by a company of U.S. soldiers and Afghan National Security Forces (ANSF) Soldiers. The total number of U.S. and Coalition Forces is approximately 100 Soldiers (70 U.S. and 30 ANSF). In addition to COP Keating, there was an Observation Post (OP) that was occupied (OP Fritsche). COP Keating was in the Eastern area of Afghanistan, close to the Pakistan border. COP Keating was located at a common Taliban route that would move fighters, weapons, timber, and gems in and out of Afghanistan. U.S. soldiers have been in Afghanistan for approximately five months and have been in 45 engagements with the enemy. The base was in the process of closing in the days leading to the attack. On October 3, 2009, the Taliban conducted a coordinated attack simultaneously to attack COP Keating and OP Fritsche with over 100 Taliban. During the 16-hour fire-fight, nine U.S. soldiers and over 30 ANSF soldiers lost their lives.

Assessment Integration. Using the VR systems, you will watch the 12-minute video; however, a link is provided below for non-VR participation and those who may be visually Impaired (OEC G&V, 2012): https://www.youtube.com/watch?v=ylUzySZb3L8

As you watch the video, here are some things to consider before we begin:

1) If you were the commander of COP Keating tasked with monitoring the smuggling route around the area of COP Keating, what would you do?

2) How do you utilize OP Fritsche to support COP Keating and vice versa?

3) How would you plan a defensive position, given the location of the FOB?

Appendix E (Continued)

Formative Assessment Planning Template – COP Keating [Part-1]

Intended Learning Outcomes (What will students know or be able to do?)	Formative Assessment (What evidence are you willing to accept that students have learned?)		
Knowledge, Skills, & Dispositions	**Elicit and Capture** make student thinking visible	**Analyze & Infer** make sense of what you "see"	**Communicate & Use** progress student learning
ILO(s): Students will demonstrate understanding of FOB Keating and overall geographical location	**Technique:** Video will stop at 2:33, the class will get into small groups of 4 and will take 10 minutes to discuss the geographical location of COP Keating and OP F to discuss how the bases were positioned and the location of the sounding areas to include possible key terrain in and around the two base locations. At the end of the 10 min, the groups will use the dry erase board to discuss their findings to shar with the remaining of the class for discussion.	**Teacher** (On the fly and/or After the fact)	**Feedback** (On the fly and/or After the fact)
	Purpose: Cognition (understand); Progress (preparation, progress) **Mode:** Visual, Oral **Timing:** during instruction **Preparation:** **Assessor:** Teacher & Students **Assessed:** Student Groups of 4	**Student(s)**	**Instructional Decision Making** (On the fly and/or After the fact)

Formative Assessment Planning Template – COP Keating [Part-2]

Intended Learning Outcomes (What will students know or be able to do?)	Formative Assessment (What evidence are you willing to accept that students have learned?)		
Knowledge, Skills, & Dispositions	**Elicit and Capture** make student thinking visible	**Analyze & Infer** make sense of what you "see"	**Communicate & Use** progress student learning
ILO(s): Students will analyze base security plan and describe if the plan is adequate for security.	**Technique:** Stop the tape at 3:45 **Place students into groups of 4.** Discuss security plan of the two bases. Analysis the Taliban support by fire positions. Discuss pros and cons of these positions and if the security plan of the bases were able to identify and defend against the support by fire positions the Taliban assumed. Discuss possible supporting assets you could receive from your higher headquarters.	**Teacher:** When all groups have discussed their findings. Ask open ended questions to the groups to create dialogue amongst the class.	**Feedback:** (On the fly &/or After the fact)
	Purpose: Cognition (analyze) **Mode:** written; Progress **Timing:** After Instruction; 15 minutes **Preparation:** None **Assessor:** Teacher **Assessed:** Individual Student	**Do you agree with group A? Why or why not?** **Do you feel that this group captured the key areas of terrain needed to protect the bases? Why or why not?** **Students**	**Instructional Decision Making** (On the fly &/or After the fact)

Appendix E (Continued)

Formative Assessment Planning Template – COP Keating [Part-3]

Intended Learning Outcomes (What will students know or be able to do?)	Formative Assessment (What evidence are you willing to accept that students have learned?)		
Knowledge, Skills, & Dispositions	**Elicit and Capture** make student thinking visible	**Analyze & Infer** make sense of what you "see"	**Communicate & Use** progress student learning
ILO(s): Students will demonstrate understanding in data analysis.	**Technique:** After the end of the video, place students into 4 student teams to discuss the and internalize on the groups plan of how they would have defended the bases, supporting assets from their higher headquarters and will analyze these decisions to what happened during the night of 3 Oct 2009. Students will create a graph depicting the difference and will reflect on what could have been identified to prevent what occurred. **Purpose:** Cognitive (understand, apply, analyze, evaluate); Progress **Mode:** Written; Oral **Timing:** During Instruction **Preparation:** Determine which problems will generate thinking about the current topic and how to group them. Create a handout of the problems **Assessor:** Small Groups/Partners & Teacher **Assessed:** Individual Students and Small Groups	**Teacher** When all groups have discussed their findings. Ask open ended questions to the groups to create dialogue amongst the class. **Do you agree with group A?** **Why or why not?** **Do you feel that this group captured the key areas of terrain needed to protect the bases?** **Why or why not?**	**Feedback** (On the fly &/or After the fact) **Instructional Decision Making** (On the fly &/or After the fact)

Appendix F

VR Comparison

When considering any electronic device and new technology, such as VR, understanding the various options on the market is key to a successful program. Each system provides its ***advantages*** and ***limitations***, which can ultimately affect the cost on the overall determination of which system or package best suits the individual or institutional need. Below is a comprehensive summary of current commercially available VR systems (Avantis Systems, 2021b, p.18-20):

AVANTIS CLASSVR

ClassVR is the first fully dedicated end to end classroom VR & AR system. It comprises a standalone headset, a storage and charging unit, pre-installed 360 degree images and videos, a classroom management and control portal and the ability for schools to upload their own content.

CLASSVR

ADVANTAGES	LIMITATIONS
Low Cost Standalone System	No Positional Tracking
Classroom Device & Content Management	
Curriculum Aligned Resources	
Ability to Create Own Content	
Supports VR & AR	

Avantis Systems. (2021b, September 21). *White paper: A guide to AR & VR in education.*

OCULUS RIFT

The Oculus Rift was one of the very first commercially available VR headsets. Now owned by Facebook, Oculus is an integrated headset that requires a tethered connection to an external PC. Oculus is primarily a gaming device and as such has limited educational content.

oculus

ADVANTAGES	LIMITATIONS
High Performance Device	PC Required to Operate
Headset Positional Tracking	Primarily a Gaming Device
Immersive Experience	Expensive
	No Curriculum Content
	No Classroom Controls

Avantis Systems. (2021b, September 21). *White paper: A guide to AR & VR in education.*

HTC VIVE

Backed by mobile phone maker HTC, Vive is an integrated VR headset driven by a Windows PC or Mac. Vive predominantly targets the gaming market, but has recently started targeting education with the Vive Group Edition bundle of headsets and PCs.

ADVANTAGES	LIMITATIONS
Top Quality Experience	High Price
Active Developer Community	Limited Educational Content
Wide Range of Hardware Peripherals	Requires High-end PC
	Complex Setup & Management
	External Sensors Needed
	No Classroom Management

Avantis Systems. (2021b, September 21). *White paper: A guide to AR & VR in education.*

Appendix F (Continued)

SONY PLAYSTATION VR

A dedicated headset for Sony's PlayStation video games console. The PSVR headset provides a simple way for home users to experience high quality VR gaming.

ADVANTAGES	LIMITATIONS
Lower cost Relative to PC-Based Headsets	No Educational Content
Simple Setup & Configuration	Tethered by Wire to a Required PlayStation Console
High Quality Games Available	Requires Monitor or TV for Setup
	Closed Ecosystem & Content
	No Classroom Management

Avantis Systems. (2021b, September 21). *White paper: A guide to AR & VR in education.*

SAMSUNG GEAR VR

In collaboration with Oculus, Samsung GearVR combines a Samsung mobile phone with an active headset to deliver a high-quality VR experience. Access to Google Expeditions and some educational apps make it suitable for the classroom.

ADVANTAGES	LIMITATIONS
High Availability	Requires Mobile Device
Tether-free Operation	High Cost
	Overheating Devices Cause Lesson Disruption
	No Classroom Management

Avantis Systems. (2021b, September 21). *White paper: A guide to AR & VR in education.*

GOOGLE EXPEDITIONS

The Google Cardboard initiative uses mobile phones in special visors to provide an entry-level VR experience. Google are encouraging the use of Cardboard devices in schools through their Expeditions app, which provides panoramic pictures to support educational themes.

ADVANTAGES	LIMITATIONS
Low Equipment Cost	Requires Mobile Device
Tether-free Operation	Physical Setup Takes Time
Centralised Content Delivery for Expeditions	Overheating Devices Cause Lesson Disruption
	No Device Management

Avantis Systems. (2021b, September 21). *White paper: A guide to AR & VR in education.*