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# **Augmented Reality In The Classroom**

**using iPads, iPhones  
and iDeas!**

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**... Discover a Glimpse into the Fu-  
ture of Learning and Teaching ...**



This work is meant as an introduction to concepts of making use of printed materials and/or geographic locations for implementing Augmented Reality in an educational setting (K through Post Secondary).

It is **not** meant to be an in-depth training guide or comprehensive instructional document but merely an introduction to basic concepts, tools and methods for understanding Augmented Reality and how it can easily and effectively be incorporated into your classrooms through lessons and curriculums.

The savvy reader might notice that I've left out the word "technology" and its other forms from the title page. Once understood, I hope you will concur that **A.R. in Classrooms** is NOT a story about technology, but rather, shows the present-day entrance into the inevitable reality of classrooms of the FUTURE.

Most importantly of all, have fun with the creative process and the power you can bring to teaching and learning by exploring and very soon thereafter, implementing your own A.R. experiences for your students.

Doug  
2015

# WHAT is “Augmented Reality”?

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What does this actually mean and where and when did it make its entrance in the technology world?

# Hard to explain?

**Augmented Reality can be a challenge to explain, depending on the context. See the side bar on the right for an explanation ...**

Examples and details can be found on the remaining pages of this book.

You can also visit my A.R. web page at [www.ar4learning.com](http://www.ar4learning.com) where you will find examples and demonstrations of Augmented Reality. ENJOY THE RIDE!

## In simple terms ..

..."augmented reality" is a live view of a physical, world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data. It is related to a more general concept called mediated reality, in which a view of reality is modified by a computer. As a result, the technology works by enhancing one's current perception of reality.

By contrast, "virtual reality" replaces the real world with a simulated one. Augmentation is mostly in real-time and in a semantic context with real-world elements, such as sports scores on TV during a sporting event. With the help of advanced A.R. technology, the information about the surrounding real world of the user becomes interactive and digitally manipulable.

## Simpler still ...

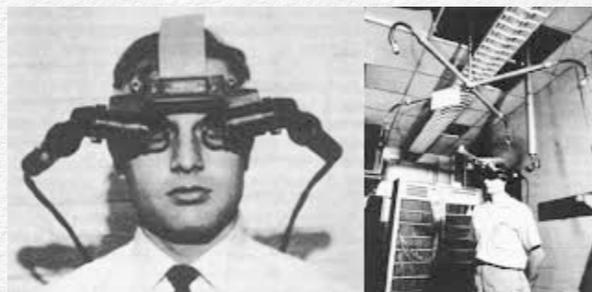
Try to think of A.R. as digital information or objects about the environment overlaid on a scan of the real world, as viewed through some kind of device (via a camera for instance). This becomes a "bridge" between the real world and the digital world - a powerful conduit for the transfer, transformation and managing of information.

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# The History of “Augmented Reality” ...

As with most innovations, often there isn't one precise moment that can be attributed to an exact starting point when something has entered into existence. The history of augmented reality is no exception in that the ideas and concepts leading up to the current concepts happened over a period of time. Nonetheless, today's idea of A.R. can be traced back to 1990 and work undertaken by Professor Tom Caudell as part of a neural systems project at Boeing. This project hoped to discover new ways to improve and advance engineering processes at Boeing and involved the use of virtual reality.

Caudell developed software which displayed the position of important cabling during construction which removed the need for complex user manuals.



**This was the first example of augmented reality.**

Caudell began progressing these concepts and more augmented reality work appears in 1992. This included work undertaken by L.B. Rosenberg on a user directed system for the US Air Force; and an ‘augmented reality’ manual for using a printer which enabled people to load paper into the printer and perform other tasks without having to use a manual. This was produced by Blair MacIntyre, Stephen Feiner and Doree Seligmann.

Augmented Reality remained firmly in the research and scientific worlds until the end of the 1990's when Hirokazu Kato released an A.R. toolkit which contains a tracking system, camera calibration code and source code. This is designed to be used with a headset and different operating systems, e.g. Linux, Mac, and Windows etc. It enables 3D images to be displayed onto the real world. This latter description typifies our notions and ideas on A.R. or “Augmented Reality” as they pertain to the mobile device world of today. We'll see how I use it with my students and iPads in the classroom in the following pages of this Book.

# **WHY use Augmented Reality in Education?**

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**What benefits can be realized by introducing A.R. into the technology lives of students? Does it or can it really transform teaching and learning for students and teachers?**

## Section 1

# This much I know ...

An 'augmented' textbook ...



## In My Classroom ...

I am making effective use of A.R. implementations that work directly with printed or static surfaces (as targets or triggers for example). These can include:

- Textbooks
- Novel and book covers
- Posters/Maps/Pamphlets/Visual art/PDFs/Digital Documents
- Hand drawn graphics/notes/worksheets

## (Continued)

- Architectural surfaces like walls, doors, decorative features, plaques
- I've even enriched the trunk of a Sugar Maple! (it will change rather rapidly though so keep that in mind).
- Floors/Ceilings/Walls, all with dissimilar visual appearances
- My scientific calculators also have been "augmented".
- EVEN SmartBoards and computer screens ... ( I haven't tried augmenting the screen of an iPad but it should work to some degree or another).

## What A.R. In The Classroom Is NOT ...

1. A replacement for good teaching
2. A gimmick used as a classroom management solution for challenging students
3. A requirement for all aspects of content at any grade level
4. Too difficult to implement and use in your classrooms
5. Another passing technology fad ...

# The Return on A.R. In Class ...

## For Example ...

At the middle school level, I spend a considerable amount of time helping students understand the process of - and the reasons for - doing research. Never before has so much information been accessible for all of us. Learning to navigate that information, usually brought about by accessing the online community, is a daunting task for most of us and especially the young, curious and developing minds of elementary and junior high school students.

Google search results seem often to be misunderstood, unexplored or merely glanced at. When I design an augmentation on a trigger intended for my students, I can transport their attentions to a specific area, location/page or even a specific piece of information. The clarity that this provides, along with the amount of time saved from either misunderstanding the target information and the maps to find it on the internet quickly add up.

Teaching students to do basic research is critical to the advancement of their education. I do, however, view that as a separate skill set and find it necessary to separate that task from the acquisition of the information needed to complete an academic task. At another time and setting, I can work specifically on traversing the internet with an emphasis on how that is best accomplished.

These design choices, targets and decisions around pertinent information become new and very dynamic additions to the art of lesson planning. They become the “augmentations” of Augmented Reality and are the concepts that change what and how students learn. Stating the obvious, they also change how and what we teach simultaneously.

The creative work and processes of A.R. design and implementation in the educational setting does not need to be limited to age groups, teaching/learning styles or content areas. The onus of successful A.R. implementations lies in the creativity and industry of the teacher/designer. Once understood, it should be apparent that the technologies, vendors, or building platforms are merely the enablers that allow the proposed increase in learning and teaching to take place. At the end of the day, we can perhaps agree that it's not about the technology -- **it's about the teaching and the learning.**

# HOW do I use Augmented Reality

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# 3

Let's look at some examples that show:

1. Working with A.R. for your students.
2. What NOT to do with A.R. for your students.
3. What skillsets are required to effectively implement Augmented Reality concepts and solutions?

## Section 1

# How do I ... ?

## How To Use A.R. In Your Classroom: - Examples

1. For my math students who use a standard text book, I like to use the book cover, front & back perhaps , along with chapter title pages as A.R. targets to provide enriched or augmented content.
2. The Cold War target page created in iBooks/Pages is an example of a single page that has been augmented for a History Class. The use of 3D objects and specific websites offers provocative journeys into the world of internet research.

3. Like a great many classrooms, the walls are covered with content of one nature or another. As long as the resources are within reach, they make great targets for embellishing and augmenting both teaching and student learning.

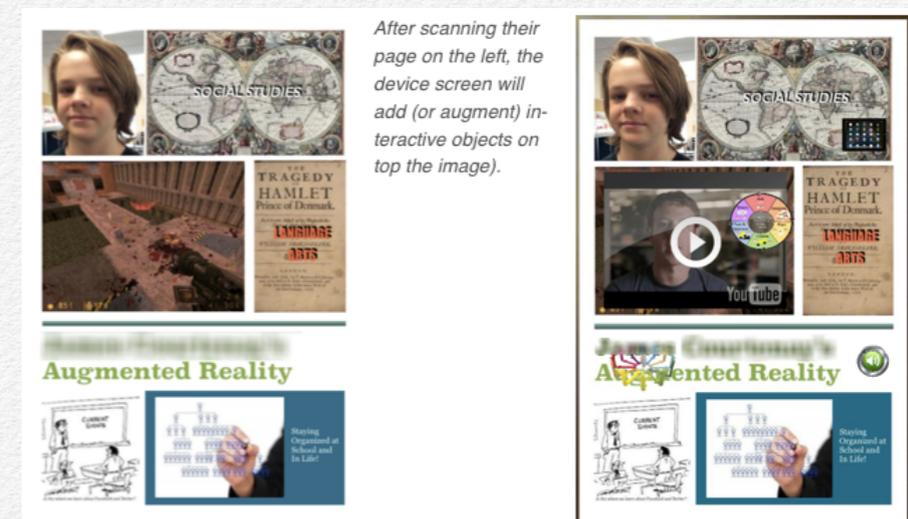


## How I've used A.R. in my classroom ...

**Ex. 1:** Each of my students has an "A.R." page hanging on the wall in class. When they scan their page, they will now have



many different digital enhancements - audio from their teacher, video to view, assignments, websites to utilize, all limited only by student/teacher creativity. Clicking on a student photo will show the A.R. page of some students.



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## The “Don’ts”: Ask yourself ...

**IS MY A.R. CREATION** actually educational? What (or where) am I trying to do (or go) with this?

Teachers, et.al, new to creating A.R. implementations for their students, have a very manageable learning curve in front of them.

When they actually put an A.R. experience in front of their students, it’s fascinating to see the high level of engagement that takes place. Students new to iPads, and smart devices are ‘hooked’ almost immediately when they encounter A.R. on their device.

I must say, however, that it can happen that the end result is lost in the initial excitement - we forget the purpose of the experience is to deepen, extend and/or “augment” the learning objectives for students.

That *augmentation of learning* fully depends on the (chosen or created) content that our A.R. interactions are connected to and that ultimately become the goal of the learning objectives.

I have observed that A.R. triggers and interactions will soon become tiresome and uninteresting for most students if the A.R. interaction is merely “eye-candy” with no substantive content to engage in.

After a while, the *risk* of actually *lessening* that wonderful sense of engagement as a way to move further into learning begins to *increase*.



Students who are lucky enough to regularly interact with your A.R. implementations become quite accustomed to the idea.

They quickly become unwitting participants in the extension or expansion of their own learning. Like I did, you may realize the incredible power and exhilaration of truly *transformative teaching and learning*.

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## Skill Sets:

**Required:** At a minimum, you should be comfortable using your computer to negotiate web pages, manage files, understand the language of the Internet (e.g. URL, web addresses, etc.) and find enjoyment and inspiration in the creative design process - or making stuff! You should also be comfortable producing digital documentation like PDFs or similar. This document was made using Apple's iBooks Author, a fantastic tool for interactive documentation for instance.

Also, digital cameras seem to grace all our devices these days. Knowing your way around your camera(s) will be a common tool for creating A.R. triggers and interactions.

**Nice To Have:** If you have experience with using digital imaging software (Acorn, Gimp, Photoshop, etc.), this skill will come in very handy for making AR implementations.

**Great to Have:** Having experience with software that works in the 3D object domain can really provide the AR specialist with amazing objects for use in augmented reality experiences.

Some of the very best tool sets are open source platforms (usually free to the user): Here's a small sampling of some amazing tools on the internet. Youtube tutorials are plentiful and extremely helpful to hasten the learning curve. Lastly, having some coding experience, especially in markup languages like HTML and Javascript will allow you to develop advanced interactions to augment the digital experience.

**BLENDER** - is a great 3D modeling tool. This will allow you to download or create 3D objects that can be AR objects in your implementations.

**UNITY** - is also a great 3D design tool, and a favorite for developers who are interesting developing video or mobile device games.

**Google SKETCHUP** - SketchUP is also a wonderful tool used for creating 3D objects and is somewhat more user friendly than most other tools. It also connects to a 3D object repository where free downloads of premade 3D objects can be downloaded and used in your own work.

# APPS/TOOLS to create Augmented Reality

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When I started with A.R., (Spring 2012) there were very few vendors that offered A.R. tools sets. Today, there are several options, all with their own unique strengths and weaknesses. This chapter will review some of the majors to help you get started (as of Winter 2016).

# AR Development & Vendors ...

### At This Point In Time ...

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... there are several technology companies that provide terrific A.R. development tools, all with different pricing tiers (with some leniency for educational users - many are free for example). All of them focus on ease of use and a computer/mobile device pairing: the former for developing the implementations and the devices for the end users.

Some of them began designing their products tailored for a particular market sector, such as the retail sales world, or engineering, etc. As A.R. concepts are realized so to does the scope for their implementations. The education sector, is a perfect platform for the creative teacher and his/her students. The list that follows is merely a sampling of the current players as others will join and some others perhaps fade away.

## Layar (layAR) (Blippar)

[www.layar.com](http://www.layar.com)



Layar (or layAR) is a dutch company that has been leading the way in A.R. offerings as of late. They have recently been acquired by another group from the UK, Blippar (A.R. specializing in retail) but continue to operate under their own trademarks, etc. I think their tool (Layar Creator) is the most feature rich, but their business model is still skewed to customers in the retail world. They have made the standard for A.R. combined with printed materials (not GPS based).

## Blippar (layAR)

[www.blippar.com](http://www.blippar.com)



Blippar is a London based company that has grown in the last couple of years, especially in the retail sales sector. More notably, they have acquired Layar this year and the 2 groups have merged and are in the processing of combining their products slated for delivery sometime late in 2016.

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## Aurasma



[www.aurasma.com](http://www.aurasma.com)

Aurasma is a fairly new entrant into the A.R. development space. Their tool is aligned with the education sector and is perhaps the least cumbersome toolset. Given their newness, however, I expect to see a lot of growth and toolset changes in the near future, a moving target to the learning curves. This tool also provides an 'educator' registration and is basically a free tool.

## Daqri

[www.daqri.com](http://www.daqri.com)



Daqri and/or Daqri4D is also a fairly new product in the A.R. development space. Their toolset is very robust and targets a variety of business sectors like construction, aerospace, etc. in addition to the education sector. Again, I expect to see a lot of growth and toolset changes

ahead. The Daqri tools also incorporate 3rd party development platforms for the 3D object creation world for use as A.R. objects:

UNITY - an open source gaming development engine;

BLENDER - open source 3D object development platform;

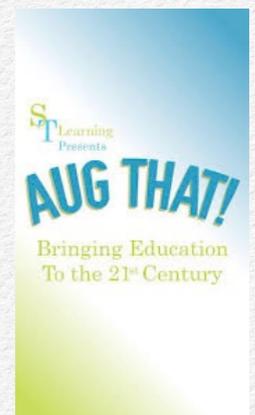
GIMP - open source graphics generator;

This product shows some real potential and separates itself from the platforms with a much more versatile pricing scheme. As of this writing however, they DAQRI platforms are in the midst of a shift which seems to cater more to engineering and professional sectors and less of an emphasis on the education sector.

## AugThat

[www.augthat.com](http://www.augthat.com)

AugThat (Supreme Tutoring) is a new company that provides "off-the-shelf" A.R. packages geared for K-8 education settings. Teachers can produce and submit their own custom content via the "Teacher Connect" portal,



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AugThat Ambassadors, - or - purchase custom apps that are classroom-ready A.R. implementations. The emphasis is on providing out of the box experiences for teachers who may not be adept at the design and implementation processes to produce their own solutions and adaptations. Search the web for “Supreme Tutoring” for further information on the New Jersey based outfit.

## **Social Media**

There are many avenues to explore regarding A.R. resources and the popular social media experiences. Twitter has many different opportunities to follow active content using A.R. although most of this is not necessarily “education” based activity. The aforementioned vendors all have Twitter accounts that have large active posters and followers.

Google + also has some terrific ways to expand your personal learning network in this field. Communities such as “Augmented Reality for Education” (thank you Katie Ann Wilson for [www.diaryofatechiechick.com](http://www.diaryofatechiechick.com)), for instance, are active on the media channels and becomes a great way to meet with others online and share resources, ideas and acquire information. These types of

initiatives are popping up all the time it seems, so keeping an ear to the track in the online media world will be beneficial.

Some teaching/administrative professionals also keep active Facebook pages with sections devoted to A.R. work and resources as well.

## **and finally,**

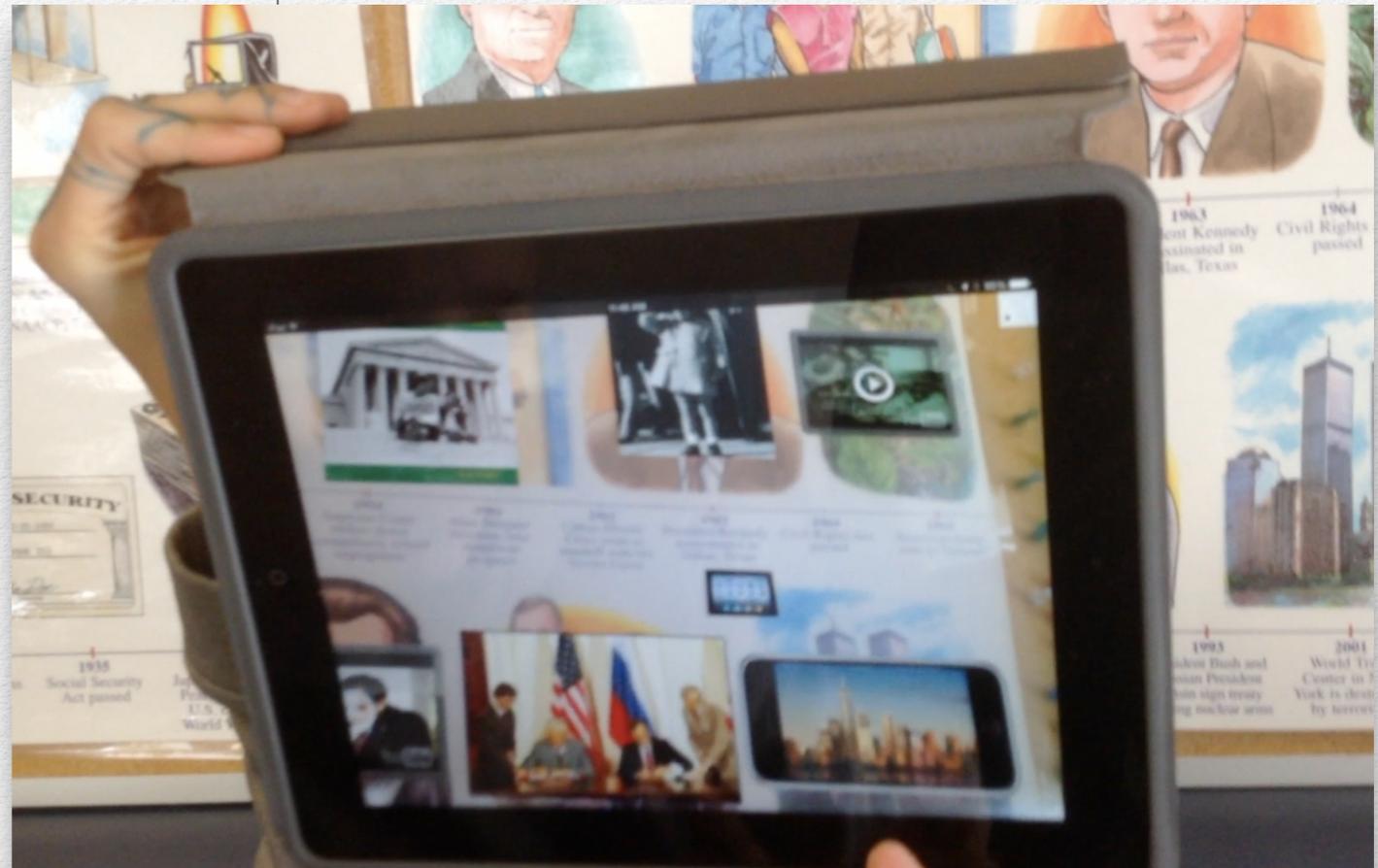
Many vendors are moving quickly to enter the A.R. space. We see A.R. beginning to emerge in many areas; the evening news, real estate, manufacturing, printed media (newspapers and magazines), and certainly the world of retail marketing and sales, just to mention a few. In the education sector, training and funding can be particularly challenging as the education field is not really a revenue generator. A.R. technology and the companies that provide it are in a mode of hyper change - new players appear seemingly overnight while familiar names and products retool, repurpose or suddenly drop of the map entirely. As an educator in this emerging endeavor, we really need to be aware of these transformations by staying connected with other education professionals

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and the A.R. space that enables our own A.R. implementations for our students.

If you would like to contact me for further information or discussion regarding Augmented Reality for your classrooms, the copyright page has a way for you to reach out!

I'm looking forward to the next sets of ideas for A.R. in our schools and I hope you are also!



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# A.R.

The abbreviation used for “Augmented Reality”.

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## Related Glossary Terms

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**Index**

Find Term

# A.R. Trigger

An “A.R. Trigger” or trigger is the document or image that a user scans to invoke the A.R. interactions (or targets).

Trigger (poster, e.g.)



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## Related Glossary Terms

Drag related terms here

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Find Term

# Augmented Reality

A technology concept that uses GPS, object or relational databases (internet accessible) and cameras on smart devices (smartphones, tablets, etc.) to enhance or enrich what a user can interact with on the device's display.

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## Related Glossary Terms

Drag related terms here

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**Index**

Find Term

# GPS

An acronym for “Global Positioning System”. A.R. often uses the GPS capabilities built into most smartphones and tablets to provide geographical information (the location of the device for instance) for an augmented reality app, website or application.

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## Related Glossary Terms

Drag related terms here

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**Index**

Find Term