**The eLearning Coach Podcast #10**
**How to Design Real (Not Fake) Infographics**
**with Alberto Cairo**

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**Connie:** Hi everyone and welcome to episode ten of the eLearning Coach podcast. I'm excited about this interview because it's with visual journalist, educator, and author Alberto Cairo. We discuss the cognitive advantages of visualizing to improve understanding and how to plan information graphics that you can use for instruction or presentations; two of my favorite subjects. Now a little about Alberto, he's a professor of the professional practice at the school of communication at the University of Miami. He teaches classes on visual storytelling and info graphics. He's also the author of an awesome book, *The Functional Art: An Introduction to Information Graphics and Visualization*.

Alberto has been a professor at the University of North Carolina Chapel Hill and director of info graphics and multimedia at El Mundo, one of the main national newspapers in Spain. Also at Epoca, the second news magazine in Brazil. You can find Alberto at the functionalart.com and also on Twitter as @albertocairo. Now here's the interview, I hope you enjoy it.

Hi Alberto, thanks for being on the podcast.

**Alberto:** Thank you for having me.

**Connie:** As a journalist and an educator, and I know you are both, what similarities do you find between journalism and instruction?

**Alberto:** I think there are plenty of similarities. I approach journalism, actually, as if it were an educational task, an educational endeavor. I think that the main goal of journalism is to increase awareness of relevant issues and to increase the knowledge that citizens have about those relevant issues. The tools and the techniques that a journalist can use every day are very similar to the tools that a distant educator could use. You write, you draw, you create graphics; in my case, I create graphics, etcetera, with the goal of increasing that knowledge among the public.

**Connie:** Yeah, I think a lot of people don't realize how similar they are and until I got to meet quite a few journalists, I didn't realize it either. Certain journalistic techniques are being used, even for instructional purposes like, we're starting to see an increase in info graphics being used. Just to make sure everyone's on the same page, because I know the term info graphics is kind of getting redefined in a way that we may not like. Can you define info graphics and their purpose?

**Alberto:** Yeah, an info graphic is basically visual representation of evidence; a visual representation of information of many different kinds of information. It could be

quantitative information, quantitative data, or it could be qualitative information. Basically, what an info graphics does is to get raw information, for example, raw data, and we transform that into visual forms that the human brain can understand. That means, for instance, that we can begin by having an Excel spreadsheet with tons of numbers about unemployment, or poverty, or whatever. It is impossible to extract any meaning from that table just because it's made of just numbers and what we do that is our raw material; just as a piece of marble, you get that piece of marble and you transform your piece of marble into a statue. In order to convey an emotion or something like a piece of art and in data, we do exactly the same thing; you get the data, you get the numbers, and you shape those numbers; you transform those numbers into a visual shape that the human brain can use to extract patterns and trends into those data.

It could be a statistical graph, it could be a data map; so you can see geographic patterns in the data, etcetera. You can also have qualitative information. For instance, if you want to explain how a piece of machinery, or a car, or whatever you want; you want to explain how that works, you can transform that information rather than explain it using just words. You can use a combination of words and visuals; you can create a step-by-step visual explanation of how to operate that piece of machinery; that is an info graphic as well. The confusion today I believe and the conflict that you mention in your question about the redefinition of info graphics is that today we have many people who think that an info graphic is just a bunch of numbers on one side, very simple numbers, with a bunch of illustrations.

You put a picture gram and then a number and then another picture gram and then another number and, for me, that is not an info graphic, that is just a table; a table with illustrations. So rather than letting really see trends and patterns in the data, what you're doing basically is just creating a beautiful, nice looking poster that doesn't have readers understand the depth of the topic that you are talking about.

**Connie:** Right, those info graphics don't really add anything to your analysis or understanding, generally.

**Alberto:** That's correct. An info graphic is, basically, in my opinion, an info graphic could be a piece of visual analysis. Basically, you transform those data into a graphic or several graphics connected with an art because there is a storytelling component in info graphics as well. Those graphics need to be deep enough for the readers to be able to understand all the complexity of the data that lies behind those graphics. What happens today is that if you, just for example, if you just create an info graphic where you show average unemployment in the United States and you say the average unemployment in the United States is 16% and you put a picture gram.

That doesn't show me the complexity of the data because there are regional differences in the United States, there are differences between the different sectors of the economy, there are lots of differences in unemployment depending on the education people have. All those are parts or all those are components or all those are elements that should be present in your info graphic in order for readers to understand what the story is about. You shouldn't suggest to a single number with a

picture gram. You need to create graphics that let readers explore the complexity behind those numbers.

**Connie:** Beautifully said. In terms of cognition, what do you think the advantages are of visualizing information rather than just using words and numbers or just words alone?

**Alberto:** I usually say that if you want to communicate effectively, you have to become knowledgeable in words, in numbers obviously, and then visuals. You can't have one thing without the other. If you only know how to use words, you will be in trouble. If you only know how to use visuals, you will be in trouble as well. The reason for that is that there are certain stories can only be told through a graphic and there are certain stories that can only be told through words; both spoken and written. In terms of journalism, I usually explain to my colleagues in journalism that, let's say, you are creating this story about let's say an accident or a, I don't know, a fire or something that happens right next door; some people die in an accident, something like that. The written story can take care of the human side of the story. The victims, the relatives of the victims, what they're going through, etcetera.

That can only be explained through words because words are very good for that to deal with emotions, to deal with the uncertainty of the human side of the story. Whereas the other side of the story, which is how many accidents have happened in this place before? The timeline of the previous events similar to this one, all those things which are more evidence driven or data driven or database can be or should be better told through a graphic. So graphics and visuals and words are actually complimentary; you have to have both things. One of the advantages of visualizing information in certain cases, as I said before, there are many cases in which readers cannot understand or even researchers trained in certain areas cannot see patterns and the trends in pieces of data if they don't transform those things into graphics.

That is the reason why scientists use graphics all the time and statisticians use graphics all the time, because in some cases they cannot see connections between variables or trends and patterns if they don't have a graphic. You can only see through the graphic, using the graphic as a lens a couple of lenses to see through the complexity of the data.

**Connie:** I'm really glad you brought that whole idea of patterns because in instructional design, teaching people to perceive patterns is what can eventually turn someone from a novice into an expert because experts see patterns so quickly.

**Alberto:** They see patterns; they see connections between different events. You create connections in your brain by…a graphic can help create those connections beforehand.

**Connie:** Exactly.

**Alberto:** One of the goals of graphic design and as an extension of that, one of the goals of designing an info graphic is to anticipate what the human brain will try to do.

If you present a completely unorganized piece of information, let's say, that you throw a lot of numbers on the page; the human brain, the brain of your reader, will try immediately and automatically and unconsciously to see patterns and trends in those numbers. They will try to do that anyway even if you present those numbers in a very unorganized way. Your goal as a designer should be to organize, to transform those numbers in a way that those patterns become visible. Basically, what you are doing when you design correctly, when you create an info graphic correctly, is to save readers processing time and processing effort. You are saving cognitive resources in some sense.

**Connie:** Yeah, you're absolutely right. I love the idea of anticipating what the reader or the learner is going to want to know and do with this information. That just seems so important. That's not easy to do, is it?

**Alberto:** It is not easy at all. You have to...in many cases, you have to rely on your own intuitions of how readers will try to read or try to see. When I say readers I also mean audiences or I mean whatever you...people. I usually say readers because I am a visual journalist. If you have…basically, to have an intuition of how people are going to read that. Science can help you with that up to a certain point. You can read about cognitive psychology, there are certain things that a psychology perception has discovered how the human eye/brain system works that is I believe directly applicable to what we do. Science will not answer every single question that you have when designing an info graphic, but it can guide you up to a certain point in making certain decisions.

**Connie:** Right, it can guide you through, certainly, how most people will likely perceive something.

**Alberto:** Exactly. The classic example I include in my class, and it's a pretty obvious one, is that we know that red is the color that grabs our attention the most. For several reasons, there are many hypotheses of why that happens. Several scientists have said that red grabs our attention because it's the color of a ripe fruit and we are designed, by evolution, to find those things. Or because it arouses us because it's related somehow to sex, so there are many hypotheses; but the fact is that red attracts our attentions. Pure colors, because they are so uncommon in nature, also grab our attention much more than subdued and neutral colors.

We know that that happens, that has been proved. We know that, let's say that, let's translate that into a practical rule of design. If you are designing a map in which you are trying locate, I don't know, the supermarkets in an area, you would use a pure color you will use red to put all those things on the map to show where those supermarkets are in your area. You will use red for those phenomena, for those elements and then you will use subdued, neutral color for everything else on the scene; for the roads, for the streets, for the houses, etcetera. Everything else will be colored with a subdued color. That is anticipating what the human brain will try to do because the function of the graphic is to locate those things on the map, so the reader will try actively to find those supermarkets on the map your anticipating that

by highlighting those elements on the map. Following something that's found as science has proved already.

**Connie:** Right, if people want to get started visualizing date, there might be quite a few listeners that have never created an info graphics before. Maybe they want to use charts or graphs of some form for some instructional purpose. What kinds of questions should they be asking themselves? What do they need to clarify to themselves in the planning process?

**Alberto:** The way I usually teach info graphics, and remember that I teach info graphics to people who know nothing of graphic design first, they know quite a lot about design at the end of the semester or art shop. I think people have a lot of misunderstandings of how graphic design works or what graphic design is. They think that it's something very complex, really difficult to understand but it is not. Designing info graphics is an extension o that is not that hard at the very beginning. The learning curve is not very steep if you know certain rules of thumb. That is what I try to teach in my classes. Let's say that you have your information, you have double-checked your data already you know that your data is right, etcetera, etcetera.

That you want to present it, it's as previous as that. Let's take that for granted; you already know you have your data. How you represent your data effectively? The key thing…the key thing in that part of the process, is to ask yourself, what is it more likely that my audience, the people who are going to see this graphic are going to try to do with this graphic? Are they going to try to see you know a change through time in the data? Then I need a line graph probably. Are they going to try to compare accurately several things in this data? Then perhaps you should use a bar graph. They are going to try to see geographic patterns in the data. Then you will probably need to use a map.

That is the rational that I describe in my book with a lot of detail. Its a very simple to understand rule of thumb; it's only that you have to apply it systematically and it seems very simple, but it is not and to prove that it is not is the kinds of things you see online and in different publications today in which, for instance, a graphic that is supposed to let me compare accurately, is a map; they drew a map to do that. A map is not intended to let you compare data accurately. In a map you only see geographic patterns, geographic patterns of distributional variables. This is to give you an overview of the data if you want to compare accurately, you usually need a bar graph or a variation of the bar graph, etcetera.

That's a very simple example; the idea that you have to keep in mind when you are designing a statistical graph, a diagram or any kind of information graphics is that an information graphic is a tool. A tool for understanding, it's something that you create in order for readers to understand some patterns, some trends, to do something with the data. An info graphic is not something to be seen; an info graphic is something to be used. To be used to see things in the data or to see through the complexity of the data. What lies behind those data? You have to think about an info graphic as if it were a hammer. A hammer has a particular shape, because it has a particular

purpose. The same thing with a graphic, a graphic should have a particular shape; a map, a bar graph, a line graph, whatever it is because it has a particular purpose. You have to think about the functions of the graphic and a graphic can have more than one function. You may need to represent your data more than once if you're graphic is going to have different functions.

**Connie:** Speaking of types of graphics and goals, I know pie charts are often the first type of info graphic that people consider making. Can you explain what the perception problem is with pie charts and bubble charts? Which are those kind of circular...

**Alberto;** Yeah, there are two related problems with those kinds of graphics. Let me begin with bubble graphs. You get a data set, your turn to create a graphic in which you compare the poverty rates of the United States and you create a graphic in which you basically create several bubbles. You put those bubbles side by side representing the poverty rate in each one of the states in order for readers to compare those poverty rates. The problem with that is that that graphic, supposedly, the goal of that graphic is to let readers accurately compare the poverty rates in all those states. The problem with graphics that are based on area variation is that the human brain is not very good at comparing areas. The human brain is very good at comparing a single altitude, the length or the height of a bar, for instance. A bubble graph is not a very good choice when your goal is to let readers compare accurately.

Graphics that are based on a single baseline, usually a zero baseline in the case of a bar graph, are much more effective at letting readers compare accurately, the data. That said, people when they hear me talking about a bubble graph and how bubble graphs are usually misused in the media and in education, etcetera, they think that I am completely against bubble graphs. That is not true; bubble charts and bubble graphs have their space in info graphics and let me give you an example. Let's suppose that the goal of the graphic is not to let readers compare accurately between Arkansas and New York and between New York and Florida and between Florida and Georgia. Your goal is to show a regional pattern in poverty. Where poverty concentrates and where poverty is less concentrated. In that case, it would make sense to create a bubble map.

A map in which you put bubbles of different sizes so that readers can immediately spot where poverty concentrates. The goal of that map is not letting readers compare Miami-Dade County with the county right next door. The goal of that map is to let you see an overview of the data. There's that difference there; that's the function. Is the function giving you an overview of the data or is it a function to let you compare accurately? If the function is an overview, then a bubble map is perfectly fine. Actually, the bar graph is not as good as that. Related to that, the problem with pie charts is similar. When you are showing parts of a whole, if you only have two portions, a pie chart is fine. You don't even need a graphic for that if you only have two portions.

You just need two numbers. So, 70% 30%; I can visualize that easily. I usually tell my students I don't use pie graphs myself, because I believe that they are ineffective

if you don't read the numbers, it is really difficult to tell how big the portions of a pie graph are. The main goal of a graphic is to let you see proportions without having to read the numbers. If you need to read the numbers to understand a graphic, don't do the graphic; just do a table. That is the main problem with pie charts. I usually tell my students that if you are going to have just two or three portions in a pie graph then a pie graph is fine.

There isn't really a huge difference between a pie graph or a bar graph in that particular case. If you have more than two or three portions, you may consider a different graphic form because once you have a pie chart with five, six, seven portions and we see those out there very often, that graphic is completely useless. You can't really...I mean, perhaps you can perceive the size of the largest portion; you cannot really tell how big the next portion is compared to that. Pie charts are very ineffective. It's even worse if you put two pie charts side by side. Asking readers to visually compare the sizes of the different chunks of pie that you have in there. If you force readers to do that, you're doing it wrong. It is not better to create other kinds of graphics.

A bar graph, or a slope graph, which is an interesting variation of a line chart; there are several different graphics that could work as an alternative to the pie chart which are much more effective than the pie chart. I'm not a Taliban against pie charts but a pie chart has two portions, I'm fine with that; I don't have a problem with that. I would not do it but it's fine. If you have more than two or three portions you should consider an alternative because a pie chart becomes an illustration not a tool for understanding.

**Connie:** Right, I can imagine in a presentation some listeners, or presenters, they're stand up trainers, they make a slide...

**Alberto: …**And they want to grab the audience's attention to that and they create a huge pie chart with two portions, I'm fine with that.

**Connie:** Sure.

**Alberto:** I'm fine with that because then we lose...it grabs yours attention to the data and that's it. When you're writing the report, instead of using that same pie chart, you ay want to include more complexity there. Including more portions, more subdivisions in the graphic and, in that case, the pie chart becomes completely impossible to understand.

**Connie:** Right, I just had a client give me two pie charts to use for comparison because we were teaching about pain after surgery; pre-discharge pain after discharge pain. I sat there and I tried to compare the two pie charts, which had maybe five or six slices; I could not. Could you perceive the slice in one and then retain that size in your head, which you can't really do, and bring it over to the other…

**Alberto:** The baseline shifts; the baseline of the different portions shifts depending on how big and how small they are. They don't have a common baseline such as a bar graph. A bar graph has always the same baseline; that is the reason why you cannot correctly compare the different bars. When I say bar graph, I said also variations of the bar graph, such as the dot plot, which is similar to a bar graph but you get rid of the bar and just keep a very small dot at the tip of each bar. It's also based on a common baseline and those kinds of graphics are much easier to decode than to read.

**Connie:** I wonder if you can just walk us through a typical planning process. I realize it has to be…it's going to be a superficial, you know, more of like an overview of just a few steps that you would recommend.

**Alberto:** Actually, the process I follow for my own info graphs is quite easy to understand and I describe it in the book…and I actually give examples of how I do it. It's very simple; I basically, first of all, I do my research. I work as a reporter; if I were an educator, I would gather my data or my information. I would make sure…I would double-check with sources, I would talk with experts, etcetera. Just to make sure the information is right. I write my copy, the copy that will go in the info graphic and I actually give that to my sources just to make sure that I have everything right, etcetera, etcetera. Once I do that is when I start thinking about the structure of the graphic; that is the function of the part of the graphic I was stuck on before.

I decide what graphic forms do I need here? Do I need maps, do I need graphs, do I need…depending on what the functions of the graphics are, I pick my graphic forms. I choose the kinds of charts or diagrams that I'm going to use. I do that based on the ideas that I mentioned before; now I think about the tasks that the graphic will help me accomplish. I also think about the narrative structure of the graphic, In some cases, you may end up having an info graphic that is made of a single chart and you don't need anything else. Another case is, in order to get your message through, you have to create a set of graphics. Let's say that you're talking about poverty, you want to talk about how poverty has changed throughout the years; you want to talk about regional patterns, you want to talk about different issues, you want to talk about variables that are related to poverty; you should not just throw the data on the page.

Just one graphic after another; you should try to connect those graphics on how to create a storytelling structure; to create a narrative. That is now part of the second step of the process; trying to think about how to structure the graphics in a way that readers can understand them. How to connect one graphic to the other; how to relate one graphic to the next one and to the previous one in order to create the story. Actually, in the *Functional Art*, I give a very specific example of how I do that with a graphic about fertility rates and population patterns in Brazil. How population change relates to fertility, etcetera. I didn't just throw the data on the page; I told a story based on the graphic I was showing That is second step.

The third step is to actually create a graphic. I mean, a working…I usually tell my students I prefer them to, basically, first of all, sketch their ideas out using pen and paper. That's what I encourage people to do; sketch…pen and paper. Don't stick to

the software first. The software step comes later. First of all, you should do things with pen and paper. Then working with software and today the options are endless; there are tons and tons of different software options. I usually use Adobe Illustrator to create my info graphic and a little bit of Excel. Today you have so many tools that are easy to use to create graphics that the choices are almost endless. You basically work with the software.

This third step is where you actually apply some basic rules on graphic design. You have to think about forms, you have to htkn about color, you have to think about layout, etcetera, etcetera, etcetera. I explain that in my classes as well.

One last step is obviously publishing the graphic. It would be a good idea to show that graphic to people whoa re part of your audience. Just to make sure that the information is well understood, that everything works well. You can do that formally; you could put a group together, create perhaps a group and then a control group just to compare how well they read the graphic, etcetera. You can do this scientifically or you can do it also less scientifically just showing the graphic to people with different ages or different cultural backgrounds, etc. Just to make sure that the graphic is correctly understood and then after that, you publish the graphic. It's that simple.

**Connie:** You make it sound so easy.

**Alberto:** It's the process that I follow is the process that my students follow, or try to follow. I believe that it works. You can make mistakes, obviously and I have made many mistakes throughout my career. I believe that it's a bulletproof process.

**Connie:** Right, okay. Why don't we move on to interactive graphics, because I feel that in eLearning, anything that's online, can often be improved when it's interactive. I was wondering what criteria you use to decide that a graphic should be interactive.

**Alberto:** I usually decide that a graphic is interactive when the data or the information that I am about to display has multiple dimensions or multiple layers. I usually discourage people, designers, and also my students, to put too much information on a single slide or on a single screen of an info graphic. I prefer to divide my information into several stages or in different sections or in different scenes of a graphic, etcetera. Basically, I encourage them to take advantage of all the tools that are available in interaction design. One of the criteria that I use; first of all, layering. There is a very clear rule on a technical writing and as an extension of that on journalism as well, which is that if you're going to write a very complex story, layer the information.

First of all, you present your main facts and then you start presenting the background information related to the topic that you are talking about. That same process can be followed in interactive graphics. I see many visualizations today that present too much information at once and they can be overwhelming. They present you with a screen in which you have one hundred or one thousand or even one million data points; those graphics are basically impossible to decode. I usually say that a graphic, particularly an interactive graphic, has a presentation component and

also an exploration component, or summary component and a complexity component.

I think that both things are extremely important. You cannot have the summary without presenting the complexity but you cannot have the complexity without presenting the summary first. If you are going to create an interactive graphic, one of the main piece of advice that I give to my students, particularly those who are geekier, who like to work with programming languages, etc. is that don't throw everything at once. First of all, in the first screen, write a good headline; write a good introduction to the topic that you're working on or talking about, present the main data points and most important points in your data. Here's what the story is about; this is poverty, these are the worst regions, these are the best regions, in terms of poverty. That is the presentation side of a graphic, Then, after that is when you can present the complexity, you can present the depth of the story. First of all, you present the summary and then after presenting the summary, after readers understand what the main points of the story are, you can let them explore the data. You can create an interactive piece in which they can compare one region with another region, they can focus, they can zoom in on a particular area, or they can throw a couple of variables and see how they related to each other and how they covariate, etc.

Those are the two components; presentation and then exploration.

**Connie:** One thing I like about that approach is that it aligns perfectly with how much information working memory can process. If it can only process a small amount of information; three or four items, then having that overview really works well.

**Alberto:** You need to check your information correctly. First, you…in the summary part of the graphic you basically condense the information for the reader so that you present the main facts. In the exploration phase of the info graphic is you create a tool that lets readers create their own small pieces of the information. You let readers basically check the information as they wish. You should have both sides in an interactive graphic.

**Connie:** In terms of using interactive graphics to improve an explanation or an analysis, what are some key principles to follow? Can you talk a little bit about things like affordance and a little bit of the other…

**Alberto:** Sure. First of all, these step=by-step approach I explain before I believe is crucial. Then there are several rules of interaction design; a very, very basic rule of thumb of interactive design that can greatly benefit any presentation. There is a very famous book about interaction; not digital interaction, per say, but interaction in general an industrial design which is an extension of that. Which is the design of everyday things of Donald Norman, which should be required reading in my opinion for anybody who wants to create interaction. It's The design of everyday things. One of the rules of interaction that he proposes is used affordances. An affordance is, basically, a very technical sounding word when you read it in the book. Actually, I read the book, I didn't understand very well what he was talking about at first but

then I basically I had the insight that, basically, an affordance means that an object that readers can interact with should, basically, give you a clue of how that object operates.

That very abstract rule can be translated into interaction design if you say well if you are going to have a button in your presentation, make it look like a button. Create a relief affect around the button; highlight the button somehow so it looks like something you can press on, etcetera, etcetera.  Another consequence of that rule for instance, let's say, that you're going to have a slider in your presentation that will allow you to access time based data. How unemployment rates have changed throughout the years and you have a slider there that lets readers move back and forth between the fifties and today. You are going to have a slider there, make it look like a slider. Make it look an arrow that has a little shadow behind, something really subtle though; it should not be very, very visible because you don't want to attract readers attention to the special affect; to the shadow affect. It should be extremely subtle but visible enough to make readers understand that that's something that they can grab and move.

**Connie:** Right.

**Alberto:** Those are the main rules; it's not…after that, if you want to talk about other deeper rules of interaction design, it's fine. If you understand just those very basic principles, your presentations will improve a lot.

**Connie:** Since we have to wrap up in a few minutes, I wanted to ask you, for people who don't have Illustrator, did you have some recommend tools for creating info graphics?

**Alberto:** Yeah, it all depends on how I believe how a geek you are or a technical or reinted you are, there are several options there. If you don't know anything about programming and want to learn anything about programming, although I recommend everyone learn a little bit about basic scripting. There are several tools out there. There's a tool called iCharts, which lets you creat interactive, simple interactive graphs pretty quickly. You also have a data rocker which does basically the same. You have a Google Fusion Table, which also lets you create very simple data maps and graphs, etc. You also have Tableau, a Tableau is a commercial software, you have to pay for a license but they also have a public version. If you search for Tableau public in Google, a Tableau is a data analysis; an analytics tool which creates pretty beautiful, pretty effective graphs and even maps. It's another good option if you don't want to learn any program.

If you want to learn a little bit about scripting and programming and have more freedom to create whatever graphic you want. The problem with working with software is that you tend to stick to the defaults. You tend to be menu driven. These are the options that the software offers; I'm going to stick to those options. Bar graphs, line graphs, whatever. If you learn a little bit of programming, you will have more freedom to create the graphic shapes that you want or that you need for your

particular graphic. There are…Illustrator for instance doesn't require any programming but basically lets you create whatever you want.

If you want to create interactive graphics, Adobe Illustrator obviously cannot do that because it's a tool that was designed to make pre-graphics or static graphics. If you're going to create interactive illustrations using the scripting, there's a program in language called Processing. Processing, which is relatively easy to learn and lets you create interactive illustrations. It was created by a data visualizer called Ben Frye a number of years ago and its on it's second version right now; 2.0. It's quite easy to understand and quite easy to learn in my opinion. It lets you create graphics almost right away because it has a very natural syntax; a very natural grammar in the sense that in traditional programming language is you had to create…you had to write very obscure lines of code to do something trivial. If you wanted to create a circle you had to write very strange commands with numbers and stuff. In Processing, basically, you say, you write, I want a circle and the program or the language creates a circle. It's very easy to understand, it's very natural. Today, many designers are using Processing, obviously, but there is a second option in there which is to use a D-3, the letter D and then 3, the number. D-3. D-3 is the…it's a library of a programming language called Java Script and the learning curve of D-3 is a much steeper than Processing in my opinion.

It is also very, very interesting. It gives you a lot of freedom to create whatever you want. It's the programming language that is being used by, for instance, the New York Times to create all those beautiful interactive visualization that they produce so often. D-3. Another option is R, the letter R, R is a programming language that was designed specifically to deal with statistics; with a quantitative data. It's the language that is being used by statisticians and scientists that deal with the statistics all over the world. It's open source for…all these three languages are open source, they are free also, you can download them for free. R is also very interesting.

I try…I learn how to use it on a very basic level. Last year and the basics are easy to understand as well. Always if you want to learn a language, you will have to study a lot but just to get the basics, it doesn't take that long.

**Connie:** Those are great recommendations. What are some new sources that you would recommend for people who want to study very good examples of professional info graphics?

**Alberto:** I believe that there are two sides of the answer to that question. First of all, I believe, that you don't need to just study good examples You also need to study a little bit of theory. Theory, I mean theory applicable to the real world. In that sense, I believe that people who are interested in info graphics should read at least the main books in our area. Obviously, you have my book if you want to read it but then you can read the *Functional Art,* obviously. I will be very happy if you do that. You also have to, I believe that people should read your own book; the visual language for designers is a great resource. Then go and read Stephen Few's books, for instance, *Information Dashboard Design*, etc. *Introduction Action to Graphics. Show Me the Numbers* is another very good book to do with the statistical graphics. Then there

are other people who are very interesting, William Cleveland, for example, has written extensively about statistical graphs. Naomi Robbins has a very good book about graphs, *Creating More Effective Graphs*. There are a number of sources out there.

Then there are, obviously, online resources. There is my blog in which I post articles all the time, the functionalart.com but then you also have flowingdata.com, Nathan Yau's website, in which you can see plenty of examples of info graphics, some of them are not good but many of them are great so it's a great resource to keep an eye on to get examples. You also have an information aesthetics and the website is infosthetics.com; it's a great resource. There are plenty of people out there writing about these. You should have obviously Robert Kosara; Robert's website is called Eager Eyes, eagereyes.com. It's a great website and Andy Kirk's website, visualisingdata.com. Visualising written in British, so it's with an 'S' in this case. visualisingdata.com is a great resource to learn about all this. There are plenty of resources and when the conversation is over there…actually, if you go to my website…I was going to send you this resource but if your listeners want to do that, they can do that already.

If they go to my website the functionalart.com, on the right column there are several items on the right column. If they scroll down a little bit, they will see a link that says "recommended readings that I use in my classes." If they click on that…that post, that article they see in there is the list of readings, videos, books, etc. Resources related to info graphics and visualization that I recommend to all my students. It will take many hours to go through all those resources but those I believe are the best resources out there to get a glimpse, to get an idea, of what info graphics and visualizations are about.

**Connie:** That's great information. I agree with you that you don't only have to look and study the best examples; that the theory is important, that also that giving examples and seeing what works for you and what doesn't work.

**Alberto:** That is actually, now that you mention it, that is part of my classes as well. One of the things that we do in our classes is a criticism and reviews of info graphics that have been published. Basically, I bring an example to class, I show it to students, and I tell them what do you think about this. I give them some orientation on how they should do that. First of all, one of the things that I tell them is, what is this graphic trying to show? They have to figure it out what it is the graphics is trying to show then they have to think about if the graphic is effective at showing those data or those facts or those ideas. Is this graphic functional? For instance, is this graphic good to let you accurately compare things? Was that the intention of the graphic, the goal of the designer? If so, is the graphic effective? What do you think about the structure, what od you think about the narrative. Does the graphic show all the different angles…offer the different angles of the story? Those are the things you should think about.

That's why I usually, and I want to stress that idea gain, I usually say that an info graphic is not something to be seen or to just being seen. It's something to be read.

It's something to be explored. Info graphics are not illustrations, info graphics are tools; tools for understanding. They obviously have an aesthetic, a beauty component and that component is extremely important. It's not the only component we should care about, we should care about the structure, we should care about functionality; we should care about insight. What kind of insights does the graphic provide? That's the key think.

**Connie:** Yeah, I totally agree and I think that that might be missed with all these info graphic posters that are out there. They might not realize…

**Alberto:** Yeah they don't provide any insight just because they don't show anything of the complexity that lies behind the data that they present.

**Connie:** Right. Alberto, I want to thank you for all of your insights into creating info graphics and what they're all about. It was great talking to you and thanks for giving us so much of your time.

**Alberto:** Likewise. Thank you so much. Thanks so much for having me.

**Connie:** I hope you got a lot out of this interview. I think Alberto has a gift for teaching and if you have any interest in creating information graphics or data visualizations, you'll really like his book *Functional Art*. By the way, did you know that you can subscribe to this podcast in iTunes? Thanks so much for listening and I'll be back in a few weeks with another episode. Here's to exceptional learning.