



O ensino de criação de apps móveis para estudantes de jornalismo: um estudo de caso do AppInventor no Brasil

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Resumo. A demanda para que jornalistas compreendam a tecnologia e adotem-na como uma habilidade surgiu junto com a evolução da mídia digital (Cairo, 2012; Knafllic, 2015). Assim, as escolas de jornalismo têm adaptado seus currículos para incluir essas habilidades em sala de aula (Broussard, 2015). Neste artigo, oferecemos um estudo de caso de uma dessas abordagens na Universidade PUCRS, no Brasil, onde, desde 2011, os alunos são desafiados a fazer um aplicativo jornalístico com a plataforma AppInventor em sala de aula. Este artigo aborda essa experiência e a percepção de jornalistas e estudantes de mídia da PUCRS. Percebe-se que aliar computação e jornalismo faz com que os profissionais pensem não só sobre o próprio desenvolvimento, mas sobre como empacotar informações e distribuir conteúdo, duas lógicas fundamentais hoje. No entanto, os resultados também mostram que a tensão entre jornalismo e programação parece ser uma discussão ainda bem forte. Isso acontece em um contexto em que o mercado de mídia talvez ainda não tenha descoberto como incorporar jornalistas com a compreensão de código e programação de modo a melhor aproveitá-los.

Palavras-chave: comunicação; ensino de Jornalismo; jornalismo móvel; mobilidade; pesquisa; programação.

[en] Teaching mobile app creation for journalism students: a case study of android AppInventor in Brazil

Abstract. The demand for journalists to understand technology and embrace it as a skill emerged along with the evolution of digital media (Cairo, 2012; Knafllic, 2015). Hence journalism schools have been adapting their curriculum to include those abilities in their classrooms (Broussard, 2015). In this paper, we offer a case study of one such approach at PUCRS University in Brazil, where, since 2011, students have been challenged to make a journalistic app with the Android AppInventor platform in class. This paper addresses this experience and the perception of journalism and media students of PUCRS in Brazil. It is perceived that allying computation and journalism makes professionals think not only about the development itself, but on the packaging of information and distribution of content, two fundamental logics today. However, results also show that the tension between journalism and coding appears to be an ongoing discussion. That happens in a context where the media marketplace perhaps hasn't figured out how to embrace journalists with coding comprehension to take advantage of it.

Keywords: computation; communication; journalism teaching; mobile journalism; mobility; research.

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1. Introduction

As mentioned by Broussard (2015), the movement to introduce coding skills in journalism schools wasn't followed with a single concept of what learn/teach coding in journalism schools means. The discussion about this topic rose first while HTML and other basic languages were introduced, later evolving for topics such as data driven journalism and visual journalism (Cairo, 2012; Knafllic, 2015), along with debates in events such as Computation + Journalism Symposium in North America and the Brazilian Association of Journalism Research (SBPJor). With this in mind, this paper addresses the experience of using AppInventor with journalism and media students at PUCRS University and the qualitative perception of the students who have taken part of these classes.

In the experience here addressed, the coding skillset taught were the ones related to mobile app creation, attached to the logics of AppInventor, a Scratch mobile based platform developed by the Massachusetts Institute of Technology (MIT). The challenge of creating an app related with journalism or media was given as a group in-classroom project for senior undergraduate students at PUCRS and in a professional Master course of digital media, with the purpose of connect the challenges of mobility and digital distribution of news and information in a highly attention-competitive world.

Our research objective was to understand how students perceive the incorporation of this kind of activity in a Journalism/Communications course. It is increasingly central to study mobility and coding, but how does that actually apply to students, surrounded by different perspectives, and the context of analog media? Do they enjoy that and perceive as an opportunity, or do they have trouble applying those skills professionally?

Even though this topic is fundamental, it is still rare to find media professionals that have basic coding experience, understand basic logic, or at least sport a basic IT comprehension of mobile projects: for example, knowing the general complexity of an idea, or having the general notion of what a mobile news project or app demands. Looking to the context of these research and its authors, few universities offer courses or classes dedicated to this topic, concentrating efforts studying topics such as digital video edition, social networks and online publication using content-management systems (CMS). Books that discuss this rarely rely on a specific language or, due to the ever evolving publications guidelines that regulate mobile markets, cannot point solutions to understand how to not only code, but understand the policies and politics that shape the mobile universe (Pavlik y McIntosh, 2016; Briggs, 2015; Jones y Salter, 2011).

These skills, even basic, are far away to be a consensus. Even with the mobile scenario becoming more important with the technological evolution witnessed on our present days, this context is often discussed, but not practiced from its basic design to publication and then usage. Unfortunately, this reinforces among students and professionals the idea of the journalist as a “The New Yorker” reporter, and nothing else.

2. Brief context of the instruction of journalism in Brazil

Brazilian, as other developing countries, entered “all in” in mobility, having today an amount of smartphones —168 million in April 2016, according to one study (Meirelles, 2016)— close to the actual number of the population. More often than not, especially for lower-income classes, the only connected device Brazilians have, besides their work-places’, or even at all, is the mobile phone. In this landscape, mobility has been a highly discussed topic for Brazilian media strategy. It can also be connected to profit and market issues, since mobile monetization is an even bigger challenge than in other platforms. This is especially true because Brazil is an Android dominant market. The market share in the country between Android and iOS, respectively, is 92,4% and 3,3%, according to data from Kantar WorldPanel relative to January 2016 (Worldpanel, 2015).

The teaching of journalism in Brazil has some peculiarities, which should be approached in order to give a base to the context in which the present study was developed. Generally, with some exceptions, journalism teaching in Brazil is done regarding media languages: text, audio, video and digital. As Strelow et al (2010) point out, in a thorough study of the aspects digital journalism teaching in Brazil, subjects of digital journalism tend to be placed on the more advanced semesters of the curriculum. Also, they tend to be applied, and have to compete attention with subjects from the other media, since undergrad courses are not focused, but contain a broad spectrum of areas.

The main production on these courses are blogs, and in those blogs, the prevalent ways of publishing content is producing posts integrating text, photos and video. There are no registers of a larger involvement with mobile journalism. That can be partially explained by the publication date of the study from Strelow et al (2010), since the area was not as developed as it is today. Still, it demonstrates an important gap the area has, regarding the marketplace.

Canavilhas (2009) stresses that there are great opportunities in the digital realm for teaching journalism, connecting necessary skills and mindsets to issues that are maybe not so much approached on the marketplace, or, if they are, are not reflected upon. Although his study was written some years ago and the technology has evolved, his vision for the teaching of journalism still has a great value. He devises four opportunities, from which two can be linked to the AppInventor methodology described here: content distribution; and evolution of technologies and markets.

Although referring more about the European context, Canavilhas makes clear the necessities of developing studies on multiple platforms, a notion that became a basis in this study:

on a more practical level, journalism education should seek to be always one step ahead of the market. It is not enough to train students to the current business needs, it is necessary to anticipate the future and develop research projects that incorporate these same students (...). Only then we can train multitasking and multiplatform professionals, two essential features for businesses. (Canavilhas, 2009, p. 55, our translation)

3. Case study description

Data has always been on the core part of journalism. On writing a story’s lead paragraph, a professional “coded” questions of who, what, why, when, where, and how a particularly event happened. This methodology lets both reader and journalist organ-

ize data in a pattern that is the key to clearly understand facts. As digital journalism evolves gradually on both the production and consumption sides of stories in different formats and situations, these methodologies start to become even more complex. The evolution of code in the form of software (Manovich, 2013) was the logical progress of the digital content.

As mobile evolves to always-on devices that become the main screen for accessing personal and public information, software also becomes popular. Today, apps are almost a cultural good.

This scenario led us to the importance of software development literacy on journalism schools. While we realize this, we face a culture, mainly emerging from the humanities, that usually repeals any kind of mathematics evolved. With these factors in mind, we found on App Inventor an efficient tool to teach journalists the logic behind software programming, without having to dwell on the complexity of writing actual code sentences and learning the syntactic and semantics of coding.

Today, developing an app on AppInventor is the main assignment of the subject Convergent Journalism, taught in Portuguese and English, at PUCRS. This teaching effort was started by professors Eduardo Pellanda and André Pase in 2011. It is also used on some graduate courses with the same focus. From 2011 to 2016, 699 Brazilian students have enrolled in this class, with 20 more being one the graduate level. Before this, the class developed interactive videos for the Brazilian Digital TV Protocol (from 2007 to 2009) and Digital Newspapers for eReaders and tablets (2010).

Students have to think about an opportunity/problem and how they could tackle that through an app. Normally, the apps produced are content-based, that is, their main feature is content tailored specifically for mobile and for the situation they identified. Students are encouraged to interview sources in order to have relevant and accurate information. Examples would be an app for planning your wedding, another for first aid instructions, an app for finding dog shelters around town and an app for university exchange programs.

The average time for producing the project is around 10 classes. First, they make an exercise on the platform code.org, just to have a basic notion of the programming logic. This usually is their first foray in formal logic/math since high school. Then, they have classes specifically for planning the app's UX (user flow, architecture of information), followed by visual identity, content producing and actual creation on AppInventor (programming), which takes the most time.

On the first times the assignment was proposed in class, nearly five years ago, there was some resistance from the students. However, the evolution of the mobile scenario might have led them to realize the goal behind the exercise.

All classes taught for undergraduate students and Master Communication students followed the same pedagogical methodology, differentiating in deepness and complexity required for the projects. The instruction design relied on the following strategies:

- Expositive lectures and debates about mobility and journalism for the understanding of the relevance of the activity;
- Practical workshop where students could get more familiar with AppInventor through small tasks, as creating a functional button bar menu, for example;

- Division of the project through idea development and identification/justification of market/customer needs, benchmarking, wireframing and UX draft, screen designing and finally coding and development. All made during class hours with Professors helping when needed.

- All the process was also guided by a Tumblr weblog, with tailor-made tutorials for the class;

Besides the pedagogical strategies chosen, this paper relies complementarily on the qualitative/quantitative perceptions of the students and former students who experienced the classes. It was made through an anonymous online form, with four sections/approaches:

- **First section:** served to filter only the target students/public. It was made through the multiple-choice question “Did you use AppInventor platform in classroom as a student?” where media and journalists students related to PUCRS went on to the other questions.

- **Second section:** six sentences (described below) about the relation between AppInventor and Journalism/Communication studies with a 10-point-scale of agreement and disagreement, where 1 represented “totally disagree” and 10 “totally agree”.

- **Third section:** one multiple-choice question regarding if the experience was hard or easy and whether it made or not sense for them as journalists; one 10-point scale statement that “I feel better prepared/I feel that the university has contributed to me as professional with the use of AppInventor in the classroom”; three open questions asking “what was easier and harder to learn”, “Did you use AppInventor’s knowledge in other occasions”, and “General comments on the experience of using AppInventor in class”.

- **Fourth section:** a multiple-choice question regarding the age of the participants.

All questions were built in an attempt to be as neutral as possible, in order to identify patterns in the relation between the students and the methods used. The sentences of the second section were:

- “The relationship between journalism/social communication and teaching AppInventor is not clear to me or doesn’t exist”
- “Although less widespread than other daily tools, the use of programming platforms are important for today’s journalist/media professional”
- “Although less widespread than other daily tools, the use of programming platforms will be important in the future for journalists/media professionals”
- “The journalist/social communication professional should also think about content distribution, and that’s why AppInventor is important”
- “Having in mind the rise of consumption in mobile devices (e.g. smartphones, tablets, smartwatches etc.), learning AppInventor for distributing content makes sense to me as journalist/social communications professional”
- “Whether I like or not digital journalism, AppInventor and the programming knowledge deriving from it seem to be important to have knowledge in the current scenario of journalism and communication”

All items on all sections were mandatory, with the exception of the paragraph questions. The survey was open for answers for a week in 2016 from July 12 to July 19

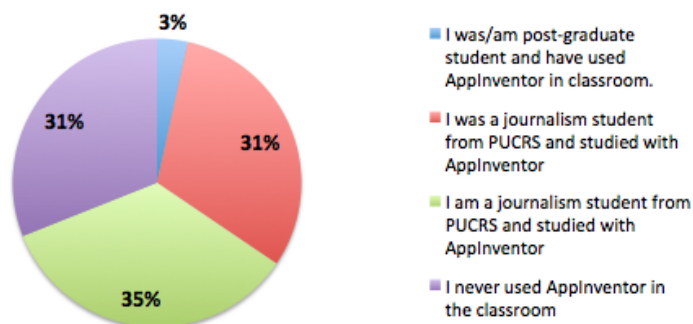
and was promoted through social media channels in order to reach both students and former students. It was primarily shared through the personal Facebook's profile of the professors engaged in this research and also posted in five specific groups of students and former students of PUCRS on Facebook: three groups of the faculty of Social Communications and Journalism of PUCRS, called Famecos (namely "Famecos", with 1084 members; "Somos Famecos", with 1.069 members; "Famecos Noite", with 983 members), one of the professional master course class of 2015 ("Comunicação Digital —UCS/PUCRS" with 30 members) and one group from the graduate department of PUCRS ("PPGCOM - PUCRS", with 196 members). Even though the profile of the target students had differences (some were graduate students, while the majority was of undergraduate), we considered important to have all their opinions, since they have some fundamental similarities: they studied communication, but didn't have any background coding, and learned AppInventor in the same overall context and methodology.

In total, 59 people answers were collected. One student answered the survey and had to be cut from the overall result, since the subject stated he/she was a media professional, but had learned AppInventor somewhere else. His responses could result in a different pattern from the others, so the researchers decided to leave it aside.

4. Results

As one can see in Chart 1, the proportion of current and former students that have answered is very close, making the research well distributed. Even those that graduated haven't done so more than 4 years ago. Also, 31% answered stating that they haven't used AppInventor in the classroom, whether or not they have been students at PUCRS. Therefore, those answers (18 out of 58) were left aside. Thus, our sample for analysis is composed by 40 responses: 38 from PUCRS undergrad students (former and current), 2 from post-grad students that made the exercise in similar fashion with the same professor being responsible for it. All undergrad subjects analyzed are on the last semesters of college, since this exercise takes place on the seventh level (from eight).

Chart 1. Profile of the surveyed. Source: own production



The sample contained mainly people in their early to mid-twenties: 77% were between 21 and 26 years old.

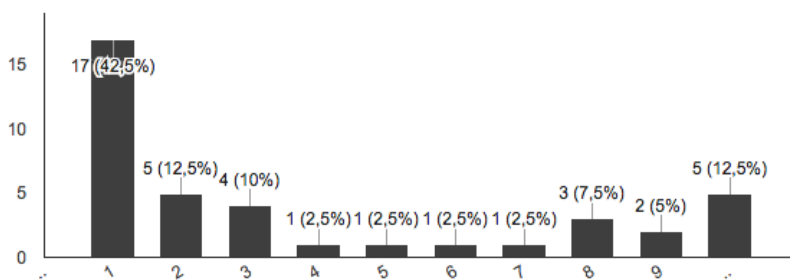
The impressions we collected from the students show an underlying pattern of approval of the experience. Being an exercise that proposes a very different type of literacy, regarding the usual design of digital journalism classes, as seen before, we were curious to find if students could connect the idea of programming their first app with the skills needed to navigate digital journalism today.

Overall, the results of the 10-point-scale questions had around half —between 42,5% and 60%— of the answers showing a very positive regard towards AppInventor, its necessity in this day and age according to the marketplace, and its global relation to journalism. Those are only the answers on the extreme spot (10 or 1). That is true for seven questions, with an additional one having more mixed results, as we will highlight further ahead.

The relationship between AppInventor and journalism was totally acknowledged by 42,5% of the surveyed, with more 12,5% marking two (the question asked if the subject agreed that there was no relation between teaching AppInventor and journalism, that is, it was a negative question).

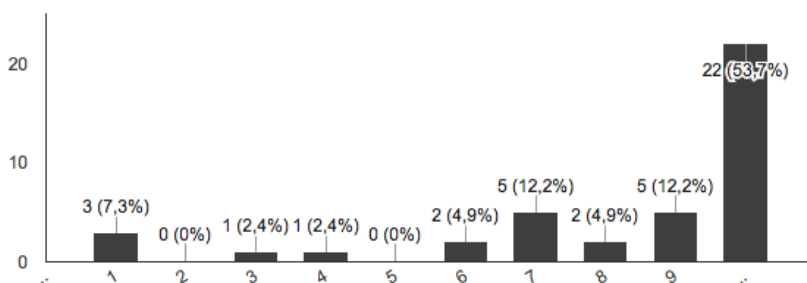
Chart 2. Accordance with the statement “The relationship between journalism/social communication and teaching AppInventor is not clear to me or doesn’t exist”.

Source: own production



This same pattern holds true when they were asked if programming platforms were important for media.

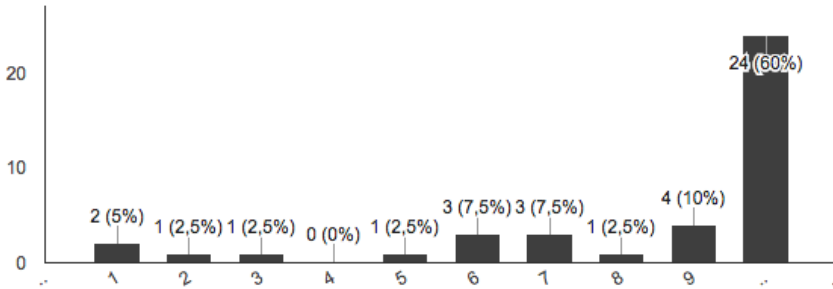
Chart 3. Accordance with the statement “Although less widespread than other daily tools, the use of programming platforms are important for today’s journalist/media professional”. Source: own production



This demonstrates that the use of AppInventor in class was successful not only in itself, but in carrying the notion that programming was an important skillset for the current professional. This is interesting, since the Brazilian journalism curriculum doesn't have any emphasis on coding skillsets. Or maybe this occurs especially because of it. One possible explanation is that students (and recent grads) are facing those challenges on the marketplace, and seeing the need for a new type of professional. But there are nuances on that, as we will see.

The same trend is kept when asked about the importance of this skillset on the future (Chart 4). This graph shows a discrete growth on the extreme positive spot (10), but the difference between this and the previous (Chart 3) — is very little, almost irrelevant. It might demonstrate that the ones who believe that AppInventor skills are not important for journalists today, might also think it will not be important in the future.

Chart 4. Accordance with the statement “Although less widespread than other daily tools, the use of programming platforms will be important in the future for journalists/media professionals”. Source: own production



The other realm explored by these questions was about the connection between doing this kind of assignment and the distribution of content. Charts 5 and 6 cover this topic and show similar results.

Chart 5. Accordance with the statement “The journalist/social communication professional should also think about content distribution, and that’s why AppInventor is important”. Source: own production

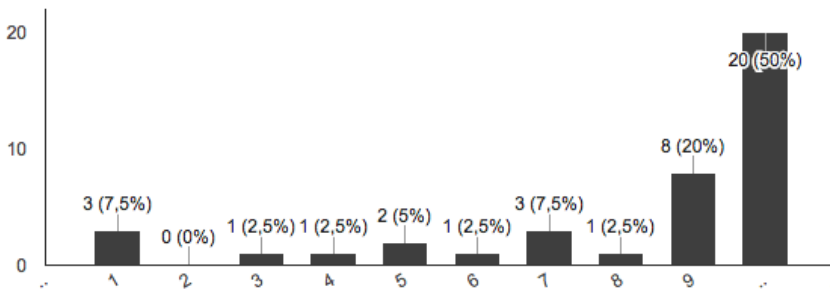
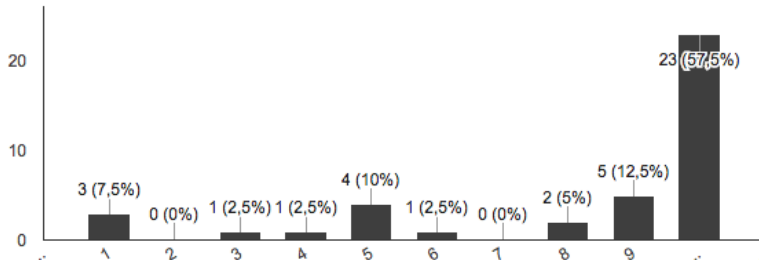


Chart 6. Accordance with the statement “Having in mind the rise of consumption in mobile devices (e.g. smartphones, tablets, smartwatches etc.), learning AppInventor for distributing content makes sense to me as journalist/social communications professional”.

Source: own production

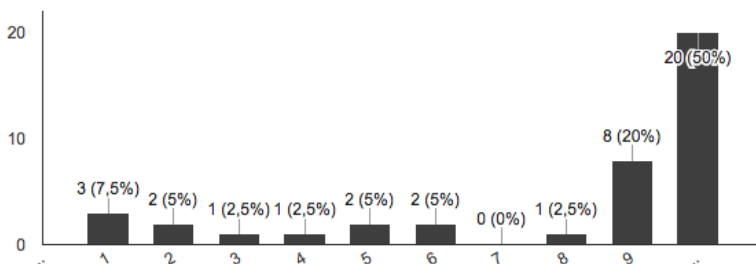


This is an important topic to be addressed, since the distribution of content itself isn't a subject covered thoroughly during the journalism course. Students, and classes, tend to focus on how to report and produce content, but usually don't think about the channels where this content will be distributed, as seen from observations of the researchers. Indeed, in the current ecosystem of journalism the question of how/where the content is distributed has become as central as the nature of the content itself. Of all the parts involved in this puzzle, mobile devices are crucial, a field where media outlets have had trouble to think of native solutions for the current consumption trends. By having assignments focused on the challenges that the mobile world poses since early in their career, journalism students can start thinking about how to advance this. The apps developed may be incipient, but the basis of thinking directly about apps (not even mention programming) is being built.

Other two questions asked about the overall importance of having dealt with the programming knowledge surrounding AppInventor, having in mind the current journalism marketplace. Again, both have a similar pattern (Chart 7) of agreement to the assignment.

Chart 7. Accordance with the statement “Whether I like or not digital journalism, AppInventor and the programming knowledge deriving from it seem to be important to have knowledge in the current scenario of journalism and communication”.

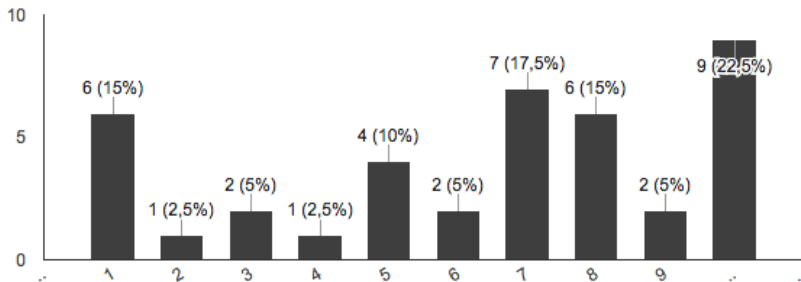
Source: own production



In these charts, as mentioned, the overall trend of around 50% of agreement with the meaning and goal of the AppInventor assignment holds true. However, one of the 10-point-scale questions shows a different pattern, the one that asked about feeling prepared by the university to face the challenges of the profession.

Chart 8. Agreement with the statement “I feel better prepared/I feel that the university has contributed to me as professional with the use of AppInventor in the classroom”.

Source: own production



As we can see in Chart 8, this is the question with the lowest score of 10 — Totally Agree answers, from the positive questions. Also from the positive questions, it is the one with the highest score of 1-Totally Disagree. The overall trend however, is agreement (14 from 1 to 5 against 26 from 6 to 10).

This ambivalence from the students might make this question the most interesting pattern of the research. We can relate possible influence factors from that —and we are going to do it later— but just the fact that it shows a lesser agreement highlights the incipency of the relation between coding skills (represented here by the AppInventor activity) and journalism. If one thinks that good writing should rationally make journalists more prepared for the marketplace, should not some coding literacy (even if basic) be a valued skill as well? Even with a majorly positive view of the AppInventor skillset from students, they probably cannot find a direct feedback on the marketplace stating its importance. Additionally, maybe on the busy daily routine of a media company, coding skills are still a bonus and not a must or a differential (in the Brazilian context).

This perspective can be combined with the results of one of the paragraph questions. When students were asked if they have used AppInventor knowledge outside the classroom, from the 26 answers, only seven (27%) said yes. From the negative answers, one used the word “unfortunately” and another mentioned that he/she had no opportunity to use it, which can be connected with the arguments mentioned before. On the other hand, from the ones who did use AppInventor’s competencies, three stated to have built and commercialized an app — one was a radio streaming app, and other made a clear connection with journalism daily skills and the logic of organizing content that the exercise demands. So it can be

useful, but maybe it still has not a clear connection with the daily routine of most students. That can happen due to a gap from the media marketplace in valuing these professionals, since the one who sold the apps probably had done it on its own, as an entrepreneur or freelancer.

This difference on the chart may also be connected to other factors, e.g. to limitations on the AppInventor platform. Although it is very powerful, allowing people without previous knowledge of coding to create an app that can even connect to a database and have some advanced features, the service's interface couldn't be called friendly. The organization of elements on the screen follows a distinct logic that can take some time to get used to. Also, the screen elements are more basic, with three options for buttons and only basic colors for boxes and background. That can be bypassed by using taylor-made images from any photo-editing software, but the native options for designing the interface don't seem to be friendly for the students. We can see some of this vision on the written answers they gave.

Another limitation can lie on the fact that apps done on AppInventor on the researched journalism classes are very basic. They don't use complex data mechanisms or structures, even though the platform provides those. That happens especially because the amount of time is reduced, having only some dedicated classes for programming the app during the semester, and because for building some of those structures the learning curve could be too steep. This may generate some frustration from the part of students when they are faced with the challenge "devise a mobile journalistic app and build it". They may tend to think of complex apps, using social networks connections, logins, profiles, smart recommendations and so forth, but, after thinking about the time and skill constraints, may have to settle for more basic apps, since it's an introductory exercise.

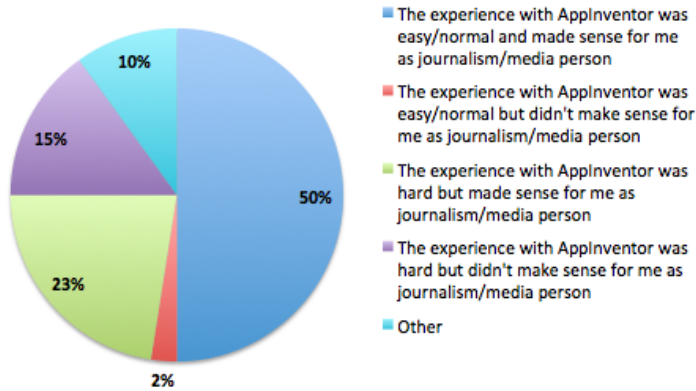
In fact, the idea of not feeling so much prepared may be linked to the circumstance that the AppInventor assignment is the first and only time where students have this kind of exercise available. In a different arrangement of the journalism curriculum, more complex ones could follow or have preceded it, involving mobile journalism and content distribution, thus better developing these skillsets. It is a possibility that students do enjoy the activity, but don't feel as much guidance on how to apply these skills or continue to develop it.

As a result of the combination from these three factors, students may end up with the impression that they weren't as prepared as they should with the assignment, even though they recognize its importance and relevance to journalism.

Again, we can remember the paragraph questions, one of which addressed the "most and less difficult skill to learn in the AppInventor exercise". From 16 statements who addressed the hardest issue to learn, 8 (50%) mentioned coding as the hardest, 5 (31%) mentioned the screen design and/or UX flow and 3 (19%) cited limitations of AppInventor or the context. As the easiest, programming logics appeared with 6 (50%) mentions and layout/UX had 3 (25%), from 12 answers. We can see there is a divide among the student's knowledge and skills.

Finally, regarding the overall difficulty of the experience, most students rate it as easy/normal, despite the limitations of the platform, with half of them (20) characterizing it also as making sense for a journalist, as shows Chart 9.

Chart 9. About your experience with AppInventor, which alternative fits you best?
Source: own production



Still, 38% of the respondents classify the AppInventor assignment as hard (whether or not it made sense for them), which is a relevant figure. This result can imply that coding exercises for journalism students need special attention since they use skillsets that have not been developed throughout their college life.

5. Conclusions

AppInventor in journalism is a totally different paradigm. But even using it as a means to an end, not the target itself, platforms limitations are still important to keep in mind. When thinking about this kind of exercise, journalism school faculties should pay attention to the platform chosen and its characteristics. The simplicity of coding should be considered, but limitation of features can frustrate students.

This type of exercise shouldn't come alone, but as one on a series of insertions of coding/computational skills in journalism. One good measure would be that maybe they shouldn't come so further up on the curriculum, but earlier. Also, allying computation and journalism makes professionals think not only about the development itself, but on the packaging of information and distribution of content, two fundamental logics today.

The tension between journalism and coding appears to be an ongoing discussion, which is reflected on the results and in the general comments sections. The AppInventor experience illustrates how enlightening a discussion by programming can open horizons for young professionals. When they conclude the assignment, most of the times showcasing their creation to professionals, they state that their notions changed and now they can understand and not just use an app.

In the past days, classes about audio or video media had the help of a technical expert to edit stories. Print press groups sent pages for the print shop. Thus, part of the "fabricational processes of the media" were outsourced. This mindset collapsed not only with digital tools, but with the converging jobs and functions that happened during the last years (Salaverría & Negro, 2009). Activities like this bring the pro-

cess back to the hands of students, even with their work under the control of Google Play and AppInventor Gallery stores.

This turning point is interesting also to think about the role of the instructor these days. With ready-made solutions and tutorials online, weekly encounters with technical and journalistic discussion offer a perspective that is not often available. At the same time, it highlights the importance of the educator as someone who starts discussions about important issues and content, trains students to face new horizons and solve problems that will be important for them in the near future.

Results of the survey show evidence that the media marketplace in Brazil perhaps hasn't figured out how to embrace journalists with coding comprehension and take advantage of it. However, freelancing and entrepreneurship could be ways of taking advantage of this computational thinking on the current competitive scenario in Brazil, with increasing unemployment rate.

6. References

- Briggs, M. (2015). *Journalism Next: A Practical Guide to Digital Reporting and Publishing*. Washington: CQ Press. 3rd edition.
- Broussard, M. (2015). Teaching Coding in Journalism Schools: Considerations for a Secure Technological Infrastructure. *Computation + Journalism 2015 Conference*, [online]. Available in <http://cj2015.brown.columbia.edu/papers/teaching-coding.pdf>
- Cairo, A. (2012). *The Functional Art: An introduction to information graphics and visualization*. New York: Voices That Matter.
- Canavilhas, J. (2009). Ensino do jornalismo: o digital como oportunidade [Teaching journalism: digital as an opportunity]. *Actas do Seminário JORNALISMO: Mudanças na Profissão, Mudanças na Formação*. 49-56. Available in http://ubibliorum.ubi.pt/bitstream/10400.6/717/1/ensino%20do%20jornalismo_2009.pdf
- Jones, J. & Salter, L. (2011). *Digital Journalism*. London: Sage Publications.
- Knaffic, C. N. (2015). *Storytelling with Data: A Data Visualization Guide for Business Professionals*. New York: Wiley.
- Manovich, L. (2013). *Software takes command* (Vol. 5). A&C Black. New York, USA: Bloomsbury publisher.
- Meirelles, F. D. S. (2016). 27ª Pesquisa Anual do Uso de TI, 2016. *Fundação Getúlio Vargas*. Available in <http://eaesp.fgvsp.br/sites/eaesp.fgvsp.br/files/pesti2016gvciappt.pdf>
- Pavlik, J. V. & McIntosh, S. (2016). *Converging Media: A New Introduction to Mass Communication*. Oxford: Oxford University Press. 5th edition.
- Salaverría, R. & Negrodo, S. (2009). *Integrated Journalism. Media Convergence and Newsroom Organization*. Madrid: Editorial Sol90.
- Strelow, A., Gruszynski, A., Toneto, B., Cunha, L., Machado, M., Venegas, S., Soares, T. & Necchi, V. (2010). O Ensino do Jornalismo Digital no Brasil: Página Em Construção [Teaching Digital Journalism in Brazil: Page in Construction]. In A. Primo, A. Strelow, A. Gruszynski, B. Toneto, L. Cunha, M. Machado, S. Venegas, T. Soares & V. Necchi, *Mapeamento 2 do ensino de jornalismo digital no Brasil em 2010* (pp. 30-57). São Paulo: Instituto Itaú Cultural.
- Worldpanel, K. (2015). *Smartphone OS market share*. 2014-11-1]. Retrieved from <http://www.kantarworldpanel.com/global/smartphone-os-market-share>