IMPROVING DATA LITERACY AMONG JOURNALISTS THROUGH WORKSHOP AND CONFERENCE TO ADVANCE THE ANALYTICAL SKILLS IN REPORTING

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Abstract

In an extraordinary situation such as pandemic and disaster, journalists perform a beneficial function in presenting accurate and reliable information. Information is passed on to the public who are in dire need of guidance during an emergency situation especially when the public is overloaded with unreliable information. Therefore, journalists have an obligation to present truth and eliminate disinformation by providing fact-based storytelling to the public as stated in one of the elements of journalism. The practice of data journalism has become popular as we are becoming more familiar with the presence of data as well as the development of technology. Thus, improving data literacy among journalists has become essential. The creation of Data and Computational Journalism Conference and Workshop Indonesia (DCJ-CI) 2022 aims to enhance the data skills of journalists nationwide by presenting a series of hands-on workshops, talk shows, seminars, and networking sessions to journalists, journalism students and lecturers, as well as data enthusiasts in Indonesia. This event was attended by hundreds of participants throughout the country and joined by speakers and experts from countries like U.S., England, India, Singapore, Nepal, and Indonesia. DCJ-CI resulted in data journalism and computational products published in several media in Indonesia.

Keywords: computational journalism; data journalism; data literacy; data-driven storytelling; workshop and conference

INTRODUCTION

The presence of extraordinary situations such as pandemic and disaster have presented challenges for journalists in delivering information to the public. During these situations, people were bombarded with speedy information whereas they were in capacities of not able to proceed as fast as the information itself, leading to information overload (Mohammed et al., 2021). Mohammed et al. (2021) states that the information overload comes also in forms of 'conflicting, false, or from a genuine source'. In the midst of this situation, journalists have an important role in producing accurate and reliable information to the public. Desai et al. (2021) highlights the necessity of data-based information in which data is being collected, aggregated, analyzed, and visualized during pandemic. Therefore, the utilization of data journalism in reporting extraordinary situations has become essential. The practice of data journalism during pandemics, for example, could be seen from the media effort of collecting data, such as mortality database, case totals, hospitals occupancy rates, testing data, vaccinations, and others (Desai et al., 2021). Meanwhile, during disaster, the usage of data could minimize the problematic reporting found in reporting disaster, such as utilizing disasters as entertainment (Gotham, 2017, as cited in Ewart, J., & McLean, H., 2018) and using inappropriate sources (Murphy et al., 2004 as cited in Ewart, J., & McLean, H., 2018).

Data journalism refers to the branch of journalism which focuses on the usage of data and analysis in reporting to inform readers (Howard, 2014). In data journalism, journalists as Howard stated, "gathering, cleaning, organizing, analyzing, visualizing, and publishing data to support the creation of acts of journalism." In data journalism, Howard (2014) explained that journalists apply the element of data science in which they withdraw knowledge or insight from data. Data journalism, furthermore, consists of making data as sources to be collected and confirmed to complement other sources such as 'human witnesses, officials, and experts', applying the analytical method of statistics to question something, and visualizing the data to present the result. The practice of data journalism emerged during the presence of personal computers as tools and environment for journalists to analyze data have become more available (Howard, 2014).

In the early 1990s, the method of using computers to assist journalists, especially in investigative reporting started to gain popularity in the United States of America. Howard (2014) mentioned some journalism awards were achieved by reporters who used the computer-assisted reporting method, like Eliot Jaspin from Providence Journal and Chris Hambly from the Center for Public Integrity. Other data driven storytelling products that win journalism awards, include the 1992 investigative report of What Went Wrong published by the Miami Herald that won 1993 Pulitzer Awards in Public Service (The Pulitzer Prizes, n.d.) and an interactive story of Hell and High Water published by ProPublica and The Texas Tribune that won the Peabody Awards (The Peabody Awards, n.d.).

These two data-driven products present data in forms of map but in a different style. Miami Herald visualizes its data into static maps of locations; whereas The Texas Tribune and ProPublica create a 3D and interactive simulation map in which they show readers the possibility of what could happen if a disaster strikes Texas again in the future. The journalists from these media use their analytical skills to provide insights to the public. For example, the journalists from the Miami Herald (A. Gary H., as cited in Computerworld, 1993) analyzed several datasets including property tax assessments, damage inspection reports, building inspections, building zonation, and campaign reports (Computerworld, 1993). Meanwhile, the journalists from Texas Tribune and ProPublica collaborated with academics to make a simulation model and analysis of the hurricane and its impact.

In the States, the practice of data journalism started in the 1990s. Meanwhile, in Indonesia, journalists started to implement data in storytelling after the 2000s. Some media in Indonesia that have used this principle in their reporting include Katadata, Beritagar, Tirto.id, Jaring.id, Kompas, Tempo, The Jakarta Post, Zonautara, and Terakota (M.Adi, M. Annisa, G. Irma, personal communication, October, 2022).

These rising practices of data journalism highlight the importance of data literacy among journalists. According to Data-Pop Alliance White Paper Series (2015), data literacy refers to 'the desire and ability to engage constructively in society through and with data'. Furthermore, data literacy consists of

elements of literacy like media, statistical, scientific computational, information and digital ones. Encouraging data literacy does not relate only with teaching computational or technological skills but also providing the understanding related to the nature of data, which include challenges and principles aiming to make people able to both understand and analyze the data (Data-Pop Alliance, 2015). Mariel Garcia Montes and Dirk Slater (2019) mentioned that promoting data literacy means measuring the gap between data release and actual use. To minimize the gap of the actual use of the data available, training to journalists related to data driven storytelling could be done.

Due to the rising practice of data journalism in media in Indonesia, it is essential to provide journalists, especially those working outside the capital city of Jakarta with the skills needed to create data driven journalistic products. The skills in data reporting are important not only to equip journalists with practical knowledge but also theoretical knowledge about the ethics of creating data journalism products. Based on this need, providing proper knowledge of data journalism both skills and ethics are important along with the implementation of data journalism practice in Indonesian media. Data and Computational Journalism Conference and Workshop Indonesia (DCJ-CI) was founded in 2019 to equip journalists, students, and data enthusiasts with the knowledge and technical skills of data driven reporting especially related to disaster risk reduction and COVID-19. This paper will further discuss the implementation and implication of such activities regarding the promotion of data literacy in Indonesian mediascape to advance the analytical skills among journalists.

METHOD

To achieve the goal of improving the data literacy skills among journalists, the team of this community service (DCJ-CI) divided the event into several phases. First, the DCJ-CI team researched the conditions of data journalism practice in media in Indonesia. The research was based on literature review and observation of the media in Indonesia from the collaborator of the event Journocoders Indonesia. The research showed that not many journalists in Indonesia had participated in data journalism training or workshops. Therefore, their knowledge and understanding related to data driven storytelling are still limited. Looking at this situation, the DCJ-CI team then created a series of workshops related to data journalism to local and national journalists in nine cities in Indonesia, such as Palu (Central Sulawesi), Padang (West Sumatra), Banda Aceh (Aceh), Surabaya (East Java), Makassar (East Sulawesi), Palembang (South Sumatra), Banjarmasin (East Kalimantan), Jakarta and Ambon (Maluku).

These data-driven workshops, started in 2019 and ended in 2021, were hosted offline and online especially during the pandemic. Kirchhoff (2022) stated future journalists would need to understand several issues, such as entrepreneurial skills and knowledge, media technologies and communication processes in an environment, role of journalism in the society, innovation, and data skills and networks. The data driven journalism, therefore, helps journalists to achieve the required competencies needed in the future. According to Cheetham and Chivers (as cited in Kirchhoff, 2022), competencies are divided into several things, such as cognitive competence, personal or behavioral competence, values competence, and functional competence.

Training in a form of hands-on workshops was chosen because data journalism requires hard skills, such as knowledge of computer software, data cleaning, data analysis, data visualization, data stories, and skills to run computer programs. Hands-on training helps journalists to improve their competencies. Besides workshops, the team also created a data journalism fellowship for each workshop in each city. This fellowship is one of ways to measure the efficacy of the workshops as journalists or participants created data journalism products based on the lessons learned during the workshops. Furthermore, the DCJ CI team also produced educational materials in the forms of video learnings and texts that could be accessed only by selected participants via the website of the event. After attending the workshops, participants were encouraged to join the final event of Data and Computational Journalism Workshops and Conference (DCJ CI) 2022 in Jakarta where participants could get more comprehensive and

elevated knowledge and skills related to data and computational journalism from both experts and practitioners in Indonesia and other countries as well as expanding their networks by meeting other journalists or data enthusiasts in Indonesia. After the event was accomplished, the team did evaluations based on several things, such as data journalism products produced from the fellowships and the workshops, the number of participants attending the event (workshops and conferences) as well as their responses, and the experts who were confirmed to participate as speakers of the event.

During the workshops, the instructors taught participants to know about data, data sources, and how to find data using open source and free tools on the internet. Second, the participants learned about data cleaning and data analysis using various computer software. Third, the instructors taught participants about ethics of data visualization and how to transform data into proper graphs. The 2020 data-driven journalism workshops had additional materials such as web scraping skills and creating maps compared to the previous workshops held in 2019.

For workshops in 2019, the team assigned two instructors each day to facilitate the data-driven journalism workshop. Two instructors were needed as the class relied heavily on computer software. Errors (of applications) and inability of installing the software happened during the workshop as most of the local journalists had not been familiar with the computers software. Thus, by having two instructors, one could focus on teaching and another helped and assisted the participants when they experienced problems when installing or running the computers programs.

Meanwhile, for the online workshops in 2020, the team assigned one instructor along with two other facilitators who helped to share materials, recorded videos, and answered questions through Zoom chat and participants' WhatsApp chat group on each session. On the last day of the workshop, the instructors encouraged the participants to apply their knowledge of data journalism that they got during the workshops by developing proposals for data driven reporting. The proposal could be written by one person or by a team. The instructors would choose three best proposals for the fellowships.

These winners would get some amount of money for reporting if selected. As for the instructors for the 2019 and 2020 workshops, several names were chosen, such as: (1) Utami Diah Kusumawati, a data driven storytelling lecturer at the Journalism Department of Universitas Multimedia Nusantara (UMN), (2) Aghnia Adzkia, a senior visual and data journalist at BBC World News, (3) a senior data analyst at Tokopedia Azaria Laras Anggana, and (4) a fact-checker and researcher at Tirto.id, Irma Garnesia. The instructors for the workshops were selected with a consideration of their expertise and academic background in the related field.

Meanwhile, for the conference in 2022, the DCJ-CI team presented 8 panel discussions, 11 seminars and 6 hands-on workshops with 43 speakers, including 26 Indonesians, 6 speakers from US, and 11 from Europe and Asia, such as England, Nepal, Singapore, and Switzerland. Total registration for the conference amounted to 1200 registrar, meanwhile the participants who joined in the conference, both online and onsite, reached 700 people (DCJ-CI, 2022). This four-day workshop and conference was held in hybrid (onsite and online). Onsite venues for the conference include Universitas Multimedia Nusantara (UMN) and Hotel Ashley, Wahid Hasyim, Central Jakarta. Meanwhile, Zoom was selected as the platform for the online sessions for the workshops and conference in 2022.

RESULTS

The workshops in 2019 were held in three cities in Indonesia, such as Palu in Central Sulawesi, Padang in West Sumatra, and Banda Aceh in Aceh with disaster risk reduction as the highlighted topic. Disaster risk reduction was selected as the topic as Indonesia lies in the ring of fire, causing the country o be prone to natural disasters, especially earthquakes, volcano explosions, tsunami and liquefactions. A 2004 report by UNDP reveals that low and medium-income countries, one of which

is Indonesia, have higher risk of disaster compared to the high-income countries. Some factors contribute to this risk, including economic and social development. Related to social development, in Indonesia, for example, forest fires in 2017 were caused by the usage of fire to open farmland (UNDP, 2004). In specific conditions like natural disasters, the role of media becomes essential as it has responsibility to provide information to the public, from those impacted by the natural disasters to the society, about the events (Miles & Morse, 2006). Besides providing information, the media according to Miles & Morse (2006) also has a role in constructing the risk of the natural disasters to the public. Therefore, providing reliable and accurate narratives is important in reporting disasters. By producing fact-based reporting which relies on data, the media could become the fact-checker for fake news.

To equip journalists with the data skills needed in better reporting, data-driven journalism workshops were given to journalists. As many as 25 journalists were selected to be the participants of each workshop. The workshops' committee announced the workshops via social media as well as sending invitations to journalists' networks in those three cities to apply and send their resumes. After being selected, journalists came to attend the three-day workshop in the chosen location (hotels) with good Wi-Fi quality as the workshops relied so much with the internet connections. The first series of workshops was held from 1st to 3 rd November, 2019, in Palu, Central Sulawesi and was attended by the representative from US General Consulate at Surabaya, Annisa Mutia.

The participants selected for attending the workshop come from various media and journalists' organization, such as *Kabar Sulteng*, *Bangkit.id*, *Harian Umum Mercusuar*, *Harian Metro Sulawesi*, *Berita Palu*, *LKBN Antara*, *AJI Palu*, *Kabar Luwuk*, *Radar Palu*, *TVRI*, *Celebesta.com*, *Utara Post*, *Radar TV Palu*, *Klik24.id*, *Radar Sulteng*, *Tadulako*, *Alkhairaat*, *RRI*, *Kiblat.net*, and *Radio 68h*. Journalism students and lecturers were also participating in the workshop at Palu. Meanwhile, the second series of workshops was held from 8th to 10th November, 2019, in Padang, West Sumatra. Some of media organizations that joined the workshop are *LKBN Antara*, *Deliknews*, *Harian Pagi*, *Pos Metro Padang*, *Harian Haluan Kota Padang, Harian Singgalang*, *TVRI Sumbar*, *Minangkabau News*, *Harian Rakyat Sumbar*, *RRI Padang*, dan *Radio Classy FM*. The last series of workshops was hosted from 22nd November to 24th November, 2019, in Banda Aceh, Aceh. Sita Raiter from US Embassy Jakarta gave a speech for the workshop at Aceh province. Selected journalists came from various media, such as *KBR, Portalsatu.com*, *LKBN Antara Aceh*, *IDN Times*, *beritanasional.id*, *KOMPAS*, *Harian Serambi, Pikiran Media*, dan *RRI Sabang*.

Figure 1. E-poster for the 2019 data journalism workshop. Souce: DCJ-CI

These three workshops resulted in several data driven journalism articles published in local media, such as in Radar Palu, Medantoday.com, Metrosulawesi, kabarselebes.com, antaranews, deliknews, jurnalistravel.com dan acehtrend. Journalists applied some skills that had been taught during the workshops, including writing data stories, creating images before and after using Google Earth, producing location maps, and graphs using open source data visualization tools. Some of them can be seen as follows:

1. 9 Tahun Erupsi, Ribuan Pengungsi Sinabung Masih Menunggu Relokasi (IDN Times)
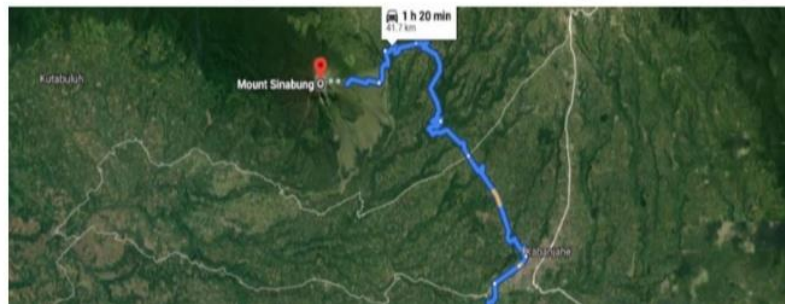

Figure 2. IDN Times uses Google Earth to show the aerial view of the Sinabung Mountain before and after the eruption. Source: IDNTimes

2. Menanti Subur di Tanah Kering Sigi. (Radar TV Palu).

3. Konsultasi Sebelum Trauma Semakin Parah dan Belajar dari Jepang Bangun Ketangguhan Mental di Daerah Bencana (Metrosulawesi).

Figure 3. The fellowship winners created an infographic related to mental health condition after the natural disaster that struck Central Sulawesi.

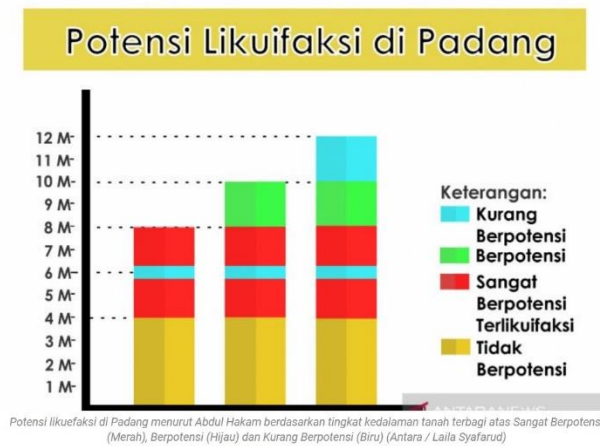4. Menilik Potensi Likuifaksi di Padang (Antara)

Figure 4. A bar chart was made by the participant. Source: Antara.

2. Five-day online data driven journalism workshops in 2020 and 2021

The 2020 data driven journalism workshop is the extension of the previous workshop in 2019. However, due to the pandemic situation, the DCJ-CI's team decided to host the workshops online (Zoom) for five days with a topic of pandemic. The 2020 data driven journalism workshop aims to teach more local journalists on the importance of reporting accurately and understand data as well as the ethics of data driven reporting especially during pandemic when fake news emerged. Tandoc et.al (2017) categorizes fake news as 'news satire, news parody, fabrication, manipulation, advertising, and propaganda.' Indonesian Anti Slander Society (Mafindo) found 201 hoaxes during January 14th to March 18, 2020. The fake news distributed during COVID, according to Mafindo, were related to several issues, such as politics, religion, ethnicities, and health. For example, Mafindo spotted fake news related to marijuana's benefit to cure COVID. To fight against the emergence of fake news, having the skills of data journalism could help journalists to provide fact-based and accurate information related COVID-19 to the public.

Figure 5. E-poster of one of the DCJ 2021 series of data journalism workshops. Source : DCJ-CI

The 2020 data driven journalism workshops were attended by 150 journalists, journalism students and journalism lecturers from several cities in Indonesia, including Banjarmasin, Maluku,

Palembang, Makassar, Surabaya, and Jakarta. These journalists came from numerous media, such as *AFP*, *The Jakarta Post*, *Mongabay Indonesia*, *Tempo, Kompas*, *Suara Surabaya*, *LKBN Antara*, *Beritasatu*, *Tribun Manado*, *Teras Maluku*, *Bontang Post*, *Banjarmasin Post*, *SuaraRiau.co*, *CNN Indonesia*, *Malut Post*, and *TVKU Semarang*. Representatives from U.S. Embassy Jakarta (Michael Quinlan) and U.S. Consulate General Surabaya (Angie Mizeur) gave closing remarks in some of the conferences.

Figure 6. The online data journalism workshop in Palembang, South Sumatra. Source: DCJ-CI

For five days, journalists learned several things like finding data, analyzing data, scraping data, finding locations, creating geospatial data, as well as making graphs and maps. At the end of the workshops, participants shared positive comments on the workshops. For example, Aseanty Pahlevi said that the five-day online workshop impressed her a lot and she would learn and practice the data skills from the online module published in the DCJ website [@dcj_ci].(2021, August 26). Meanwhile, Zainal A. Ishaq, a journalist from Cek Fakta Tempo, said that the training introduced some tools to track, transform, and visualize complicated data to become easier to understand [@dcj-ci]. (2021, May 10).

Figure 7. A testimony from one of the participants. Source: DCJ-CI (@dcj_ci) Instagram account

3. Four-day hybrid workshops and conference in 2022

The four-day hybrid workshops and conference called Data and Computational Journalism Conference Indonesia (DCJ-CI) 2022 aimed to be the first international conference in Indonesia that focuses on data and computational journalism as quoted from dcjci-2022.com. In Indonesia, several workshops related to data and computational journalism have been held by several leading journalism organizations like The Alliance of Independent Journalists (AJI), Journocoders Indonesia, and Indonesian Data Journalism Network (IDJN). However, so far there has not been any data and computational journalism conference hosted in Indonesia.

Figure 8. Wahyu Dyatmika from Tempo gave an opening speech during the first day of the DCJ-CI conference held at Universitas Multimedia Nusantara (UMN). Source: DCJ-CI

The conference was preceded by a series of online data journalism workshops to students, lecturers and journalists from six cities in Indonesia as explained above. The participants who joined the workshops could attend the conference and some of the workshop fellowships winners were also invited to present their data driven reportage products to participants. From the conference, participants have opportunities to expand their networks by meeting journalists who have interest in data and computational journalism nationwide, learn best practices from practitioners who have implemented data journalism in their newsrooms, and elevate their practical skills from experienced instructors in data and computational journalism not only from Indonesia but also from other countries.
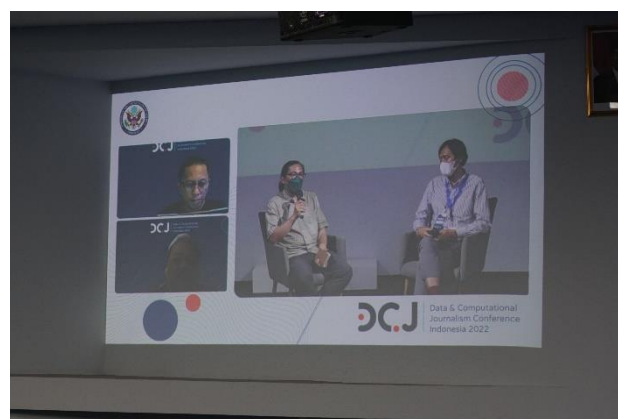

Figure 9. Speakers from Zona Utara, Teraskota, and Ekuator were sharing their data journalism experience at the local media. Source: DCJ-CI

Some of the international speakers who presented materials and shared their expertise during this conference including, Alberto Cairo (Knight Chair in Visual Journalism at the School of Communication of the University of Miami and the Director of visualization program at University of Miami's Institute for Data Science and Computing), Jonathan Soma (Professor at Columbia University

Graduate School of Journalism and Director of Lede Program), Ben Kreimer (Independent technologist and journalist from U.S.), Adolfo Arranz (journalist at Reuters), Peter Aldhous (journalist at Buzzfeed), Gabriel Gianordoli (journalist at The New York Times), Tom Walker (editor at The Gecko Project), Shadab Nazmi (Editorial Lead at BBC Visual and Data Journalism), Celine Samson (the Head of VERA Files), Ana Lucia (journalist at the BBC World Service), Helena Bengtsson (Data editor at Gota Media), and Uli Koppen (journalist at BR) Meanwhile, some of the Indonesian speakers are Yura Syahrul (Editor in Chief at Katadata), Septiaji Eko Nugroho (Chairman of Presidium at MAFINDO), Wahyu Dyatmika (Tempo), Ronny Buol (Editor in chief at Zona Utara), Eko Widianto (Editor at Terakota.id), Adi Marsiela (Editor in chief at Ekuatorial), Agus Dwi Darmawan (Data Engineer at Katadata), Ratna Ariyanti (PhD Candidate at E.W. Scripps School of Journalism, Ohio University), Adi Syafitrah (Mafindo), Elin Yunita Kristanti (journalist and fact checker at Liputan6.com), Laksono Hari Wiwoho (Managing Editor Video and Digital Distribution at Kompas.com), Agung Wijaya (Managing editor at Tempo), and Revolusi Riza (Deputy Editor in Chief CNN Indonesia).

Figure 10. Inga Ting (ABC) and Agung Wijaya (Tempo) shared the best practices of data journalism in their newsrooms. Aghnia Adzkia (BBC) moderated the session. Source: DCJ-CI

These speakers were chosen based on their specific skills and knowledge on data and computational journalism and how they utilized data and technology in producing data journalism reportage and product. For example, Cairo shared to the participants about the ethics and principles in data visualization, and Soma taught the participants on how to use machine learning (programming language) to do some data analysis.

Furthermore, Soma highlighted in his session that the usage of machine learning in the newsroom was important as it could reveal unusual data points and bias. Walker also focused his session on talking about the relevance of using data journalism for an investigative project. He shared the media's experience when investigating Indonesia's plasma palm oil. Meanwhile, Riza talked about the application of VR and AR in CNN Indonesia's newsroom and Wijaya showcased Tempo's magazine investigative products that used data and provided data in the reportage. The materials by the international speakers were presented in English but participants could also watch the sessions in Bahasa Indonesia (bilingual).

Discussion

Based on the workshops and conferences held from 2019 until 2022 and the data driven storytelling produced by participants afterward, several interesting things are found. Firstly, when teaching data journalism to different audiences, it is crucial to take into account various factors that might impact their learning process. For example, the level of technological infrastructure and access to resources might differ significantly between local and national journalists. Local journalists might face challenges due to limited resources and infrastructure, and therefore, they may require more hands-on support and guidance in acquiring basic skills such as numerical calculations and spreadsheet operation. Additionally, the level of prior knowledge and experience in journalism and data analysis might differ between participants, and this should also be taken into account when designing teaching programs. It is worth noting that addressing these issues is crucial for ensuring the quality of data journalism

reporting in the long run. By providing tailored teaching approaches that consider the unique needs of different audiences, we can foster a more inclusive and diverse data journalism community.

Secondly, data journalism training is crucial in promoting accuracy in reporting among Indonesian journalists. The use of data can help to provide evidence-based insights and enhance the credibility of journalistic content. During the training, we highlighted the importance of using data to support their stories and encouraged participants to adopt a data-driven approach in their reporting. However, one of the challenges that emerged during the training was the unavailability of relevant data. This could lead to inaccurate reporting, as journalists may not have access to the necessary data to verify their claims or support their arguments. To address this challenge, we provided guidance on where to obtain data and how to use it effectively in their reporting. Additionally, we emphasized the importance of verifying the accuracy and reliability of data sources before using them in their reporting. By providing training on data journalism, we hope to equip journalists with the necessary skills and knowledge to produce accurate and impactful stories for their audiences.

Figure 11. Fact-checking workshop at Universitas Multimedia Nusantara (UMN). Source: DCJ-CI

Thirdly, our experience with data journalism training and workshops has shown that they can serve as a valuable platform to engage individuals who are interested in modern approaches to news reporting. Despite having little exposure to data journalism prior to the training, participants demonstrated a growing interest in exploring the possibilities of data-driven storytelling throughout the sessions. By introducing them to new tools and techniques, we were able to expand their understanding of data journalism and equip them with the necessary skills to incorporate data into their future news reporting. Moreover, the training sessions provided a space for participants to network with other like-minded individuals and share ideas on how to enhance their storytelling techniques. We observed that this collaborative learning environment fostered a sense of community among participants and encouraged them to continue learning and experimenting with data-driven approaches to journalism beyond the training sessions. As such, data journalism training and workshops have the potential to attract and nurture a new generation of journalists who are committed to producing high-quality, data-driven news content.

Fourthly, data journalism gatherings offer an opportunity for the transfer of knowledge and expertise from more experienced journalists to newcomers. During our seminars, we invited dozens of experienced data journalists from around the world: the United States, United Kingdom, Sweden, Germany, Mexico, Australia, Nepal, India, Malaysia. These 'senior' data journalists are also working for prominent newsrooms, including The New York Times, Reuters, ABC Australia, and BBC World.
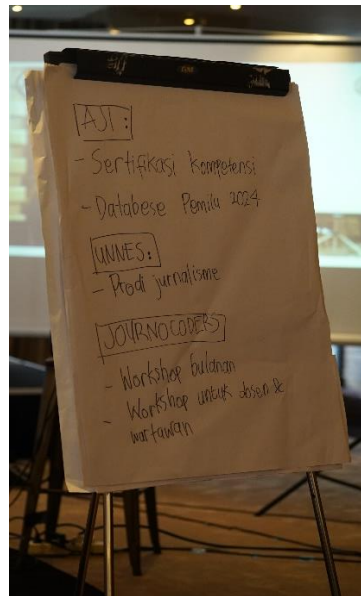
Figure 12. Results from the networking session held at the last day of the DCJ-CI event. Source: DCJ-CI

During our training sessions, we observed that journalists who had prior knowledge of data journalism were eager to share their experiences and insights with others. They shared stories about how they approached data, explored it, organized it, and visualized it for their audiences. These sharing sessions provided a platform for participants to engage in discussions and learn from one another, fostering a collaborative learning environment. This approach not only benefits the newcomers but also allows the early adopters to reflect on their own practices and improve their skills by engaging in constructive discussions with others. Moreover, by sharing their knowledge, the experienced journalists were able to contribute to the growth and development of the data journalism community in Indonesia. As such, data journalism gatherings can play a crucial role in fostering a culture of knowledge-sharing and collaboration within the journalism community, thereby driving innovation and improving the quality of news reporting.

Fifthly, newsroom collaboration is crucial in using data journalism to produce high-quality news content, as exemplified by the Indonesian case. In Indonesia, data journalism has been gaining popularity in recent years, and news organizations have recognized its potential to enhance the quality and accuracy of their reporting. However, data journalism requires a range of skills and expertise that may not be available within a single newsroom. Collaboration between journalists with different skill sets can facilitate the collection, cleaning, analysis, and visualization of data, resulting in more accurate and compelling stories. Moreover, collaboration can help to ensure that the data is interpreted correctly, thereby avoiding inaccuracies and misrepresentations. In Indonesia, we have seen examples of successful newsroom collaborations, such as the collaboration between Harian Kompas with Tirto.id, which produced a series of data-driven articles on issues during the COVID-19 pandemic, or BBC Indonesia with Gecko Project and Mongabay in their environmental news reports. By working together, newsrooms can leverage their collective skills and resources to produce data-driven stories that are not only accurate but also compelling and informative.

From the final conference, we also notice that there has been a growing interest among students and lecturers in Indonesia in the field of data journalism. With the increasing availability of data and technology, there has been a shift towards data-driven journalism in recent years. This trend has been observed not only in newsrooms but also in journalism education. Many universities and journalism schools in Indonesia have started to offer courses and workshops on data journalism, recognizing its importance in the current media landscape. Furthermore, students and lecturers are increasingly seeking

opportunities to learn and apply data journalism skills in their academic and professional work. This interest is driven by the recognition that data journalism can provide a more accurate and in-depth understanding of social, economic, and political issues. Additionally, data journalism skills are highly valued in the job market, and proficiency in this area can enhance students' career prospects. Overall, the increasing interest in data journalism among students and lecturers in Indonesia reflects the growing recognition of its importance in the contemporary media environment and the need to equip the next generation of journalists with the necessary skills and knowledge to excel in their careers.

Conclusion

In conclusion, data journalism training, workshops, and seminars organized by our Data and Computation Journalism Conference Indonesia (DCJ-CI) initiative have become an increasingly important part of the media landscape in Indonesia. With the democratization of technology and the growing availability of data, there is a growing recognition of the importance of data-driven journalism in providing accurate and insightful reporting on social, economic, and political issues. Through these training and workshop programs, journalists, lecturers, and a wider audience have been equipped with the necessary skills and knowledge to use data journalism to produce more accurate, informative, and engaging stories. These programs have also facilitated the transfer of knowledge and expertise from experienced journalists to newcomers, promoting collaboration and learning within the industry.

However, there are still challenges to be addressed in mainstreaming data journalism in Indonesia. These include the need for greater investment in data literacy education for the general public, the development of user-friendly data visualization tools, and the promotion of data-driven storytelling through various media channels. Despite these challenges, the growing interest and enthusiasm for data journalism in Indonesia offer a positive outlook for the future of journalism in the country. As data continues to play an increasingly important role in shaping our world, the need for data-driven journalism and the skills to produce it will only continue to grow. Through continued investment in data journalism training, workshops, and seminars, Indonesia can position itself at the forefront of this rapidly evolving field, providing accurate and informative reporting that meets the needs of a diverse and engaged audience.

Acknowledgements

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