"Making" the contemporary and next-generation journalist, through data journalism: The need for emerging curriculum in journalism education in India - A primary proposal

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Abstract

Like any other profession, the media and communication domains are also majorly robust with the advent of computers and information communication technologies. In the recent past, the concept of data journalism struck the chords of major news media houses across the globe. Data journalism is an evolving form of storytelling, where journalist works with data, data analytics software, and visualize data to narrate their news stories. In India, over the years, many academic institutions started offering certificate, diploma, undergraduate, postgraduate, and research programmes in journalism and communication-related fields. Currently, academic curricula and journalism education are strengthened with conventional journalism theories and practices. Due to the arrival of data journalism, modern tools, and techniques, journalism pedagogy faces a relatively large knowledge gap. This research article is an outcome of exploratory research that examined 155 academic institutions by scrutinizing the communication curriculum offered across India and suggests the need-based syllabi in consultation with academic and industrial experts, which entails data journalism as an empowering element for the current and next-generation journalists.

Keywords: Data journalism, data journalism course, journalism education, curriculum, syllabus, India

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Introduction

Journalists disseminate information through news stories representing knowledge and opinions to the general public (Labiste, 2016). During the COVID-19 pandemic, it was once again proved that it is one of the essential public services (Kumar & Jena, 2020). The journalist tried presenting medical and scientific data that addressed the criticality of COVID-19, they were expected to develop stories which link the science, medicines, health, and social life in an authentic, ingenious, and simplistic manner (Bunquin, 2020). In the long journey of the journalism profession, the practice and production of news content have undergone a sea change. Technological advancement, innovation and smart inventions shaped the newsrooms (Tandoc, 2014). The popularity of digital media has dramatically altered the consumption of news too. Currently, the practice of the journalism profession works with scientific independence (Meyer, 1995). The professions in the arts have also become more scientific. So, an academically qualified journalist may be able to approach the process more scientifically with the latest tools and techniques; furthermore, a journalist is expected to complete a given task in a reasonably appealing manner, which captivates the news consumers' attention (Liwag-Lomibao, 2021). To make news reliable, realistic, scientific, and more credible, the news industry has started adopting digital data as a key resource for developing news stories. "Data journalism" is fairly a new term where a journalist finds stories in data that may be interesting to the public and present these stories most appropriately for public use and reuse (Heravi, 2017; 2018).

Journalism education and production of news content

The journalists are the backbone of any successful news media house which produces quality content. Nowadays, journalists are better educated than before; wide-awake than predecessors with a better grounding in computer-based technologies. So, journalism education is the key to nurturing the skills and enhancing contemporary need-based knowledge. Today, the need for journalism training has been accepted all over the world. Even news media organizations have accepted the fact that journalists should be appropriately trained and expected to learn before they pursue a professional career (Singer, 2004). The history of journalism education in India shows checkered growth starting with the Journalism programme at Adyar near Madras (now Chennai, South India) by Annie Besant (theosophist, women's rights activist, writer, and orator) in the mid-1920s, followed by the University of the Philippines to start a journalism course in 1919 (Gapasin et al., 2008), then Aligarh University introduced an instruction course in Journalism in 1938, the University of Punjab (now in Pakistan)

in 1941, Kabul University of Afghanistan in 1981, the University of Dhaka (Bangladesh) in 1962 and subsequently in other universities and institutes across South Asia (Muppidi, 2008; Ullah, 2012).

Nowadays, technology has dramatically changed the way people access information. As much as consumers have changed the tools, they use to get information, newsrooms also have changed the tools they use to prepare and present the news. Due to this, the structure, pattern, and pictorial depiction of news content have also changed indeed. Data journalism has emerged as an occupational subgroup that gives public interest journalism with a newer approach (Hermida & Young, 2019). With different social and nonhuman networks, it created pathways for social and material relations that construct legitimate ways for being a journalist and doing journalism. Today news stories flow in as they happen, from multiple digital sources, through content curators, from blogs, through a vast network of social connections; at the same time, they are being liked, ranked, and commented upon by the common public. Gathering, filtering, and visualizing are happening beyond what the eye can see has a growing value. Thus, the need for data journalism has increased immensely. The data journalist demonstrates how to tell stories with data and how to combine the results of data analysis with traditional reporting (Showkat & Baumer, 2021). Data journalism is the new plethora of possibilities that open up when the traditional "nose for news" and the ability to tell a convincing story combined with the sheer scale and range of digital information that is available. Jonathan Hewett (2016), in his work *Learning to teach data journalism: Innovation, influence and constraints,* analyzed and reflected on the data journalism module, which was a part of a master's degree programme at City University, London, United Kingdom. He proposed that a comprehensive inquiry and knowledge need to be developed in connection with studying the curriculum and the course content through comparative study offered at various institutions across the globe. Further, the approaches deployed for teaching and learning data journalism, pedagogy innovations and more importantly going beyond the split between "vocational" and "academic" journalism education need to be looked upon.

Many scholars strongly advocated the need for a new generation means of news delivery, example: personalized news feed in/through sunglasses/eye wear; few scholars dived deep into the theme of data-driven journalism/data journalism and its novelty to make news consumption simple and valuable, because of its visualization it saves the time of the consumers; some scholars studied the need for data journalism through the industry by selecting sample respondence from journalist / media house and newspersons, example: Global Data Journalism Survey by Bahareh R.

Heravi (2017), those studies listed the skills sets that are required for the industry practice. But hardly any study addresses the need for curriculum development by auditing the courses offered by academic institutions, their course content, the syllabi, practitioners', and media educators' inputs that add pedagogical significance to the learners or soon-to-be practicing journalist. This work tries to address those gaps by providing insights and pointers for model curricula to offer a need-based data journalism course for aspirants.

With the given premise, the following are the objectives of the research study.

RO1 - To comprehend the need for data journalism pedagogy.
RO2 - To identify the data journalism course offered in Indian educational institutions.
RO3 - To provide a prototypical curriculum pointers for the data journalism course.

Data journalism and its fundamentals

Data journalism, or "data-driven journalism," is a type of journalism that incorporates a vast amount of information that is available in the form of large data sets, otherwise known as big data (Bounegru et al., 2012; Rogers 2011), consisting of statistics about public or data collected with the aid of the public. Data journalism is a culmination of journalism and technology; it comprises journalism, computer science - data analysis and programming, statistics, and visual design (Appelgren & Nygren, 2014; Zhu & Du, 2018). Data-based visualization techniques are widely acknowledged because it is easy for the recipient to crunch large and complex data into a news story (Gupta et al., 2016). Charles Berret and Cheryl Phillips (2016) defined data journalism as a "field that encompasses a suite of practices for collecting, analyzing, visualizing, and publishing data for journalistic purposes" (p 15). Data journalism scholar Bahareh R. Heravi (2019) stated that, "It is an emerging area of practice and study, which draws on knowledge from several disciplines, including journalism, information science, social sciences, data and computer sciences, data analytics, information design, and storytelling" (pg 2). The available data need to be interpreted, synthesized, analyzed, and appreciated (Burns & Matthews, 2018) formally and creatively to suit the journalistic needs, which helps the readers to put less effort or viewing attention to understanding a news item (Rajasekar, 2014). Data journalism is an emerging form of storytelling that requires an expert level of multi-talented professionals who embrace the traditional journalistic skills and smartness in accessing the information that happens to be in the form of

data. Turo Uskali and Heikki Kuutti (2015) stated that the information can be obtained, categorized, compared, and cross-verified instantly and precisely. Contemporary data journalism specialists need to have a good understanding of computer fundamentals, data analytics, and data visualization skills. News organizations need skill-based smart journalists to handle data to develop data-driven journalism. News stories developed out of these efforts give journalists new prospects. Few organizations face challenges that include skill shortages for creating data visualizations with their staff journalist. (Kashyap et al., 2020).

Philip Meyer (2002) mentioned that data journalism is accomplished with computers assisted reporting to analyze data as precision journalism. According to Paul Bradshaw (2010) and Jonathan Gray et al. (2012), data journalism undergoes the following steps: (1) finding data—it involves the ability to access data through computer-assisted reporting skills or, for some, specific technical skills such as MySQL or Python to gather the data; (2) data mashing—is the process of integrating heterogeneous data from numerous sources to give a more holistic view to make a big picture; (3) interrogating data—it is all about working on data in a spreadsheet to derive on some specific results; (4) visualizing data—is the stage where the complex data takes a form of simple designs (there are many free online tools such as Fusion Charts, Google Charts, ManyEyes, Carto, Mapbox, Datawrapper and Tableau which help in the visualizing process and make things easy and possible for journalists); and (5) publication of the story—this is the end-product of the combination of data and journalism (Howard, 2014). In their study, Mathias-Felipe de-Lima-Santos et al. (2021) found that Carto, Tableau, Datawrapper, and Mapbox are the most used solutions in Australia.

Uskali and Kuutti (2015) posited that the data journalism movement took a big leap in the year 2010. This was hastened with the contribution from the major news media conglomerates like *The Guardian, The New York Times*, and *Chicago Tribune* (Kashyap & Rabindranath, 2016), followed by FiveThirtyEight owned by ESPN, *Texas Tribune,* ProPublica, BuzzFeed, and Vox (Gupta et al., 2016). The English language Indian print news organizations like *The Hindu, Hindustan Times,* and *The Indian Express*, along with digital news organizations such as IndiaSpend, How India Lives, Livemint, Health Analytics India, and a few others-initiated data-driven journalism in their newsrooms (Kashyap et al., 2020). Priya Rajasekar (2014) stated that in India the data from the citizens are collected both at central and state (province) levels, and it is considered to be a huge asset of the nation. Various national-level data divisions are operational, including the Data Wing of the Ministry of Statistics, and Programme Implementation

(MoS&PI) made up of the Central Statistical Organization (CSO), National Sample Survey Organization (NSSO), and Computer Centers. Furthermore, India has an open government portal known as data.gov.in, which features nearly 3,86,341 resources in 8,284 categories with 1,999 data visualization sets for public access (as of April 2020). There are also several international service organizations, NGOs, and private organizations that work to develop data, mainly serving the well-being of the people.

Methodology

This research was carried out at two levels. First, the top hundred institutions listed in the Indian National Institutional Ranking Framework (NIRF) 2020, all the central universities of India (funded by the government of India) and a few eminent well established private institutions, institutions backed by media houses/government, totaling 155 institutions were examined to understand whether they offer courses on data journalism and if they have data journalism courses, content analysis was done to understand the coverage of the syllabus. The procedure followed to achieve the first level of the methodology is 1. Retrieved the datasets from the NIRF website <www.nirfindia.org> and other portals, 2. Cleaning, sorting, and identifying the required data were done. 3. Access all the one hundred and fifty-five institutions' profiles, programmes offered and course details through their websites, curriculum booklet, course outlines, requested and received through email, got the data through personal visit, through professional contacts, from passed out students of those institutions/programmes, and through few new joiners, interns and working professionals and 4. The parameters of content analysis were framed using Bloom's taxonomy verbs - I. Remembering, II. Understanding, III. Applying, IV. Analyzing, V. Evaluating, VI. Creating (Forehand, 2010).

Second, in-depth interviews with selected eminent media educators and working journalists were conducted, because these provide significant details and a significantly higher level of disclosure, dialogue, and discourse compared to other methods (Paragas, 2016). Interviews followed a semi-structured interview guide. The subsequent processes were followed to arrive at the sample respondence (experts): 1. India was divided into five zones, namely North India, South India, Eastern India, Western India, and Central India zones. 2. Two media educators and a working journalist were included in the study from each zone, totaling ten media educators and five journalists. (Many experts were reached, and few may not be able to be part of this study because of lack of time, work commitments, etc.). 3. To identify the sample respondence, snowball sampling was done. 4. Semi-structured interview method was adopted for the study to get the best resources from

the experts. 5. Data collection (interviews) were done through conventional and digitals method and tools like telephonic, in-person face-to-face discussion, email, instant messing App like WhatsApp, voice notes, and many more. Since, human subjects were part of the data collection process, the authors acknowledge that we comply with ACA code of ethics. Keeping in view of ethical considerations the interviewees were briefed about the nature, need and the proposed benefits of the outcomes. To make the study more focused, undergraduate, and postgraduate degree programmes have been considered; certificate, diploma, MPhil, and PhD programmes have not been included; however, in some cases, the postgraduate diploma is taken into consideration venerating the reputation of the institution.

Data journalism pedagogy and its essentials

The RO1 - to comprehend the need for data journalism pedagogy is focused in this section. In her research conducted with the working journalist, Heravi (2019) identified that 98% of the respondents are eager to acquire data journalism skills; 64% of the respondents prefer to learn how to analyse data; 51% like to learn how data is visualized and 40% of them are interested in understanding how to develop a story out of raw data. The pedagogical significance of data journalism arises because of the fake news culture currently prevailing in the digital space. The infodemic nature leads to extreme concern among various stakeholders, so the working journalists would like to get trained in accessing data from the right source, validating it, interpreting it, and representing it in a simple visual form and these falls outside of the traditional method of journalism practices. Rajasekar (2014) argued that aspirants or digital natives may adapt the data journalism and digital visualization skills easily because their grasping power will be much higher than the practitioners. This is supported by Amy Schmitz Weiss and Jessica Retis-Rivas's (2018) study, which identified that journalism students show positive interest in learning data journalism, and they endorsed that it is significant to have a "big" footprint in the early days of their professional career. Data journalism can provide an opportunity for students to build their portfolios before they graduate. The need for the hours of journalism education is to emphasize portfolio-building, which leads to real-world experience and internship, and that provides value-based networking.

Bahareh R. Heravi (2017), in her research article "Teaching data journalism," mentioned that the "to-be journalist," alias the aspirants, fall into three categories. The first is the people perusing a bachelor's in the journalism programme—they are young aspirants who enter higher education systems after completing their schooling. They will be eager to learn everything about journalism. They are the best part of the group who

need data journalism learning, and hands-on training either has major or has elective or minor. The second category people are those who completed a degree programme, but not a journalism major, on the other hand in a related area—this group of people hold a degree in humanities and social sciences domain that ranges from literature to linguistics, political science to economics, social psychology to gender studies. Individuals in this group can be trained the traditional journalism skills along with data journalism and its tools. The third category of people are those who are educated in computer science, information science, or data science domain—these individuals come from a technical background. They know the methods and techniques to work on data; they may need primary education in journalism and the application of data into a journalist style of storytelling.

Today, there is an increasing number of universities across the globe offering data journalism courses in their undergraduate and master's degree programmes. Columbia University has even developed an MS programme in Data Journalism for students looking for advanced journalism and information science skills (Terry, 2019). Cardiff University is offering a master's programme in Computational and Data Journalism (Mutsvairo, 2019). Northwestern University focusing on data journalism by using free charting tools; sourcing and mapping data ("Data Analysis and Visualization for Journalism," n.d.); Stanford University emphasis on negotiating for and obtaining data; building a data scraper, mapping for analysis to make a data driven story ("You have questions," n.d.). Some of the notable academic offerings are a full-time master's programme in Data Journalism at University of Missouri; DePaul University; Columbia University, USA; Birmingham City University, UK; University of King's College, Canada; Universidad Villanueva, University Rey Juan Carlos of Madrid, Spain; University of Zurich, Switzerland; TU Dortmund University, Germany and Aristotle University, Greece ("Data-journalism-courses," n.d.)

Currently, more than 200 institutions across the globe offer data journalism courses, among that 146 were from USA and 12 from the UK (Heravi, 2019). Forty-eight percent of data journalism course modules or content are offered to postgraduate journalism students, and 35% are offered to undergraduate level students (Heravi, 2019). The primary objectives of the curriculum are to teach the students to find, collect, and clean the data; to analyze and visualize data, and to make a data-driven news story. The course outcomes complement data-driven minor projects done individually or in small groups, that may attract and provide confidence and interest for more advanced learning and practice. Heravi (2019) insisted that instead of having a full-fledged data journalism programme short, three to five credit courses comprising thirty to fifty hours of engagement may add interest to

the students. It may be the most attractive offering that exposes the students to a new data environment, software, and tools and provides a new skill development.

One of the notable endeavors of Google LLC is the Google News Initiative's offering of free data journalism course online, that provides a fundamental understanding of finding, analyzing, and visualizing data using Google software like Trends, Public Data Explorer, and Fusion Tables ("Data Journalism," n.d.). The digital space and availability of data in the public domain have created the need and importance for data journalism education, both in the newsrooms and in academic institutions (Burns & Matthews 2018). The news organization works around the clock delivering news content, so they may not be able to have extensive and comprehensive training on the new form of journalism. Instead, they may conduct niche training sessions for a short period. One of the pioneering efforts in India, to be mentioned as part of the comprehensive industrial mentorship programme, is offered by a joint initiative of *The Hindustan Times* (Indian English-language daily newspaper), *Mint* (Indian financial daily newspaper), and How India Lives (Indian public data repository portal) in 2018, by creating a six-month paid Data Journalism Fellowship for graduates and early-career professionals ("Data Journalism Fellowship," n.d.) providing opportunities to do research and produce stories for publication while getting real-world experience in journalism. These include: (1) gathering data from scraping from the web, collecting information through Right to Information (RTI) act requests, and finding data from public sources; (2) analyzing data using spreadsheets and programming languages like R, Python, and JavaScript to extract interesting and meaningful stories; and (3) visualizing and developing the online interactive form of news content for the reader's engagement. Many times, due to the professional commitments of the news industry, the training gap arises. Hence, journalism schools are under pressure to give adequate knowledge and hands-on exposure to the aspirants.

Data journalism education in India

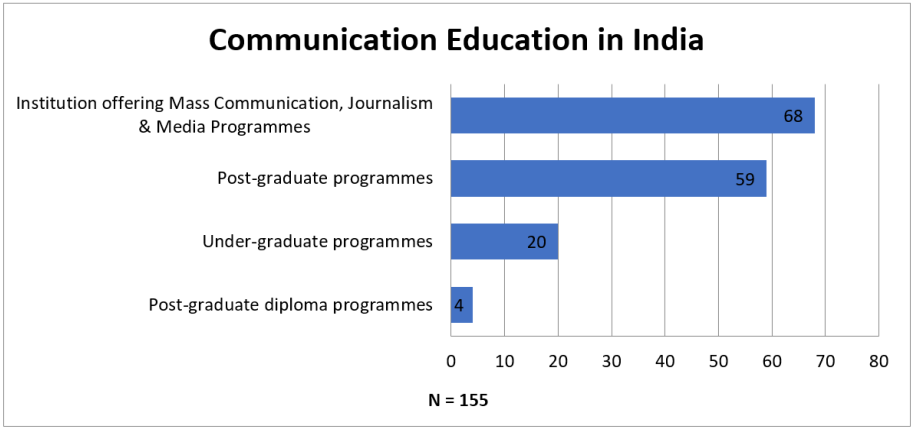
This section of the paper presents the RO2 – to identify the data journalism course offered in Indian educational institutions. Mass Communication, Journalism, and Media Studies are offered in India in various forms in more than 495 institutions (Kashyap & Bhaskaran, 2020). They are provided at (1) University (Central, State, Private, Deemed-to-be) and their affiliates or autonomous colleges; (2) media organization or professional body-backed institutions like Asian College of Journalism (from the house of English language national daily *The Hindu*), Bennett University (from the house of

English language national daily *Times of India*), etc. (Sanjay, 2012); and (3) private or government-promoted stand-alone institutions like the Indian Institute of Mass Communication, Arena Animation, and Maya Academy of Advanced Cinematics. Through all these means, millions of students get access to communication education in the country. From her research, Heravi (2019) identified the institutions that offer data journalism courses are addressing the fundamental of what is data? Where is the data? How to access the data? And how to process the data. She further emphasized that "how to analyze data" is the most important skill to acquire. Kayt Davies and Trevor Cullen (2016) identified four thrust areas in data journalism training; they are (1) accessing data in the deep net; (2) coding and extraction of meaningful information from big data; (3) sampling techniques and concepts such as descriptive and predictive statistics, which is a part of quantitative literacy; and (4) data visualization and storytelling using Google maps, timelines. Jan Meyer and Ray Land (2003) suggested that education should provide a dynamic experience. So, practice-based learning, which entails the acquisition of tools and techniques, provides students with the capacity to handle data journalism assignments and offers confidence to develop their own expertise.

Sundeep Muppidi (2008) identified one of the prime lacunae in journalism education in India as the inconsistency of course curriculum across institutions. Unlike engineering or management programmes Mass Communication, Journalism and Media programme curricula vary across the country. We did a comprehensive web-based survey, leading to content analysis of data journalism curriculum accessing 50 central universities, top hundred institutions listed in the National Institutional Ranking Framework (NIRF) 2020 ranking released by the Ministry of Human Resource Development (MHRD), Government of India, to rank institutions of higher education in India (that includes all type of institutions) and some reputed media organization, government-backed and private institutions which offer Mass Communication, Journalism, Media-related programmes. Figure 1 displays the institutions offering full-fledged Mass Communication, Journalism, and Media programmes at undergraduation, postgraduation, and postgraduate diploma levels.

Indeed, it was interesting to identify that the Jamia Millia Islamia (a central university) is offering a master's programme in Convergence Journalism with a full-fledged course on Immersive Media and Big Data for Journalism having a major focus on technology and its experiences with minor emphasis on data Journalism, but they also have sub-units like forms and format of data journalism, data mining and using big data in journalism and data visualization using various software. One of the subject

Fig. 1. Communication education in India



matter experts for the question of the value addition the data journalism brings to the current era was that "data journalism requires import skills of data science … to analyze them with different tools and to finally present them to the audience in an interesting and meaningful form." Similarly, another expert mentioned, "With the credibility of the media touching a new low, with fake content and narratives, speculative and agenda-driven stories, data alone can lend authenticity and accuracy to media reportage." Secondly, with media consumers increasingly becoming more educated and aware, they look for essence in the story (i.e., facts and statistics as against generalized content). Thirdly, in a cut-throat competitive era, data and its presentation including visuals, graphics, and charts can make the stories much more attractive to the readers and viewers. The same has been endorsed by many other experts and practitioners. They feel that more precise and data-based reporting will provide solutions to unpredicted problems, concerns, and issues, like COVID-19, well-being, vaccination, and many more. Furthermore, the huge amount of data presented is verifiable, it makes the information environment more interactive and multidimensional, and it helps in understanding the important issues that are trending that are not only statistically noteworthy but also very relevant, because of their authenticity and have the convincing capacity with the use of absolute numbers. Common man understands the numbers when it is logically put to him/her.

Keeping the above in mind, the Central University of Kashmir is offering a master's level programme in Convergence Journalism, in that a few portions address data journalism. The University of Hyderabad (a central university) is located in Hyderabad (India) offering data visualization in their Convergent Journalism course. Bharathiar University, Coimbatore (a

state university) is offering data journalism as an element under the course Reporting and Editing in their master's programme.

To the question "Why should journalism, media, or communication students should learn data journalism?," one of the experts mentioned the following: "As journalism is closely related to society there is a strong need for technical education related to data journalism. The learnings at the higher education level help in training, teaching, and intensifying the course for developing and preparing a complete professional to the industry." Few experts emphasized the need for skill enhancement and competences, more precisely those who learn data journalism will have an edge over those who are not aware of it. One expert's expression stated that, "With journalism, media and communication schools burgeoning all over and campus interviews / placements increasingly becoming difficult, candidates with specialized skill sets such as understanding of data journalism stand a better chance in the job market."

By understanding the need of the scenario, the Delhi School of Journalism (part of the University of Delhi, a central university) is offering a five-year integrated programme in Journalism, and in its eight semesters, they provide a full-fledged course on data journalism. The course introduces the students to data journalism, the recent trend in journalism, and its tools and methods. Furthermore, they also offer data visualization portions in a course called Web Journalism. Similarly, Anna University (a state university), Chennai, in their five- year integrated master's in Electronic Media programme, offers a three-credit elective course titled Data Journalism. The School of Communications at XIM University (a state private university), located in Bhubaneswar, offers something similar as Data Analytics, Development, and Data Reporting course at the master's level for journalism specialization students. The course content focuses on various tools, techniques, and practical approaches toward it. Amity University (a private university), Gwalior, has an exclusive course titled Introduction to Data Journalism for undergraduate students in their fifth semester. Savitribai Phule University, Pune, is offering a Data Journalism course as an elective course for the master's in journalism and Mass Communication programme in the third semester. Kalinga Institute of Industrial Technology (a private university), also located in Bhubaneswar, also offers a course on Data Journalism in the fourth year of the five-year integrated programme in Mass Communication and Journalism.

To put forth a question, what value the data-based journalism does add to society in the future? Many interesting insights were received. The interviewees felt that "transparency, empowerment of citizens, comprehensive use of Right to Information, awareness about rights,

accountability of those in power and enhanced credibility of media and thereby together strengthening of democracy." Furthermore, "it (data journalism) provides a very convincing way of analyzing and predicting trends, of finding out the outliers and also to verify the claims made by sources." Similarly, experts mentioned that "it will increase more hard-hitting and in-depth stories revealing the broader pictures of different aspects of the social, political and economic systems resulting into various uncovered pictures of the process."

On the other hand, a verbatim of an expert throws light on many uncovered matters and it goes like this: "In the present-day system, our lives are nothing but the assessment of numbers; from our identity to financial capacity to social security, everything is measured in terms of numbers. We are living in a society run by binary numbers, algorithms and so on. The coming generations can easily associate themselves with numbers and data. If a situation or event will be explained to them as data rather than in words, it will make more sense to them. People like the logical reasoning hidden in data. It makes the story more credible and reliable. Thus, leaving a deep impact on society." Many academic pieces of literature also support these claims; surely data-based journalism will add great value to society in terms of understanding the facts from a better perspective. It will lead to the development of quality governance, corporate business and cultural existence.

Supporting the expert's view, the Indian Institute of Mass Communication (an autonomous and stand-alone institution promoted by the Government of India located in New Delhi) empowers the aspiring journalist to take a deep understanding of numbers-led data for quality governance, better sociopolitical and economic conditions of people in their postgraduate diploma in the English Journalism programme, having a portion to discuss data journalism in various courses like (1) History of Journalism; (2) Media Laws, Ethics, and Regulations; (3) Reporting: Concepts, Processes, and Techniques; and (4) New Media and Digital Journalism. This is similar to the media organization-backed institution, the Asian College of Journalism, has few discussions on data journalism and data visualization in their postgraduate diploma programmes. Bennett University (a private interdisciplinary university) located in Greater Noida, Uttar Pradesh, in the National Capital Region (NCR), through their Times School of Media offers a four- credit course on Data Journalism for undergraduate Journalism & Mass Communication students.

The Indian Institute of Journalism & New Media (a private journalism school located in Bengaluru) offers a postgraduate diploma in print / broadcast / multimedia and online journalism, having an elective course

titled Telling Data Stories Using Graphic Tools. This course teaches students how to find relevant data using web-scraping tools, analyse data with Excel and Python, and visualize data with a variety of software. Indira Gandhi National Open University (a central university) located in New Delhi, offers a master's programme in Journalism & Mass Communication, having a section on understanding data journalism in their course Reporting Techniques. English and Foreign Languages University (a central university), located in Hyderabad, offers a master's programme in Journalism & Mass Communication, having a course on New Media and Data Journalism in the third semester. Symbiosis International (Deemed-to-be University), Pune, is offering MBA in Communication and Management; they have Data Visualization as a specialization course.

The following are the verbatim quotations of a sample respondents in connection with the question related to the neglect of data journalism education at present. One of the experts mentioned that, "Most journalism schools in the world have introduced concepts of computer coding in their classes. Students will be severely handicapped if they are not equipped with these tools." Furthermore, "The stories prepared by the journalist may be a failure or unprofessional. Stories will not be of high common sense; the conclusion may be confusing and may lead to misinterpreting of the whole issue." Another expert said that journalism, media, and communication education is industry-oriented: "A curriculum devoid of data journalism training would be out of sync with the industry." Data journalism at current times is an essential skill if the student is looking for international exposure, expertise, and experience, "the negligence of learning these skills will automatically slay chances of being recruited at a good position in a reputed media organization." Furthermore, it also caters immensely to the research requirements of the journalism, media, and communication industry." In simple words, if data journalism training is deserted, then it would surely create a gap in the understanding of modern progressions of journalism and the industry itself. A growing economy-based country like India will be left behind if data journalism is not made as a curriculum in Indian journalism, media, and communication institutions and it will become very difficult to adjust to the competition in future.

The United Nations Educational, Scientific and Cultural Organization - UNESCO (Verweij, 2013), in their "Model Curricula for Journalism Education: A Compendium of New Syllabi," suggested that data journalism is an essential component. It is recommended to introduce the data journalism course to second- or third-year students undertaking a four-year bachelor's programme with fifty hours' worth of credit; it addresses the underlying theory, methods, and tools of data journalism; 70 percent of the grading scores for this course

are derived from the assignments and test, and the remaining 30 percent of the scores are derived from projects that students demonstrate mastery of data journalism. The suggested course uses pedagogy combinations of various approaches with a defined learning plan of 10 sessions, one hour each that includes the basics of data journalism, principles of research and statistics, introduction and working with spreadsheets and data analyses: scraping, refining, testing, and making graphics with web tools. The important element is developing a story as a project—individually and in groups working with Tableau and Google Fusion tables for more advanced graphics and maps.

Similarly, the following is the data journalism course ("Data Journalism," n.d.) offered online with 18 lessons that help the learners to tell in-depth, insightful stories by getting, analyzing, interpreting, and visualizing data in compelling new ways. The course suggests using Google tools and products, that include sourcing Google data with public data explorer, Google Sheets for scraping from the internet and cleaning data, Google surveys, Google Crisis Map, identifying data through a source like Global Forest Watch, Election DataBot, using Google trends for searching latest stories and insights, techniques to do improve search results, data visualization through Tilegrams (open source data visualization tool), advance techniques of Tilegrams, Google Data GIF Maker (a tool for showing data comparisons), Flourish - data visualization templates (open source data visualization templates for newsrooms), Google Fusion Tables for creating intensity maps, visualizing data through Google Sheets, and learning Data Studio for making interactive data visualizations.

Recommendations and the way forward

Sanjay (2012) and Tere (2012) suggested that journalism education in India should focus on contemporary need-based training considering the changing contours of modern technologies. Bearing in mind their suggestions, the data journalism course should be seriously considered to be accommodated in journalism education in India. We asked the subject matter experts, to mention the worst effects the media educators do the future society if they don't teach data journalism to the current students and the journalism aspirants. The responses were eye-opener, and they primarily support the premise of this paper. The experts felt that the major vilest effects would be, "The aspiring journalists will be unable to verify claims made by sources/officials, and they will be severely restricted in acquiring data from the digital ecosystem." One of the experts said, "The future of media is all about storytelling and today no political, economic, diplomatic, sports, and developmental story can be told without data and if media educators are doing so, they not only hindering the growth of his or

her student but also being totally out of harmonizing with the new reality. These statements emphasize that aspirants/students will grow with a lack of skills about quite important and relevant techniques which will eventually decrease the possibilities of the betterment of society in the digital age. One of the experts also mentioned that, "They (journalism, media, and communication educators) will simply keep the students deprived of a brimming opportunity thus doing a disservice to the society by not allowing it to explore its full potential as well as by not able to cater to its information need in an updated manner. The peak worst effect would be that the ever-growing digital era and the professional need of journalism may reject the students/aspirants who cannot cope-up with the industry need and the modern ways of data-based news delivery and storytelling. Those who don't update themselves with modern tools and techniques will become obsolete in their knowledge base and the industry will reject them. So, Rajasekar (2014) suggested that the students of the data journalism course should be introduced to news, numbers, and the latest free tools that help to create data visualization. Understanding the complexity of data journalism, it can be offered as a three-credit course in the postgraduate communication programme as a major for journalism students and electives for other media domain students, or it can be offered in a five-year postgraduate integrated programme in their fourth year of study. The following are the pointer sets suggested for a prototypical curriculum schema (RO3) for a three-credit course having thirty hours of classroom engagement and fifteen hours of hands-on experience:

1. Learning the concept and nature of data journalism, the need for data in the newsroom, the importance of Computer-Assisted Reporting (CAS), dealings with data deluge that includes relevance, future, and critique, leads to ethics and concerns.
2. Essentials of statistics, that include resources and mining the data for stories through Google Data and Public Data Explorer, analyzing data with the help of Google tools like Google Surveys, Google Crisis Map, Global Forest Watch, and Election DataBot.
3. Reliability and sorting the data by working with Google Trends, Google Fusion Tables and Tableau Public, further working with Google Sheet by scraping data from the internet and refining it, cleaning and visualizing data through Carto DB, Datawrapper, Flourish, Gephi, Google Data Studio.
4. Developing visual-based stories with the help of infographics, bubble plots, Infogram, Mapbox, Plot.ly, Tableau, Google Tilegrams, Google

Data GIF Maker, and Google Data Studio for making interactive data visualizations.

5. Case studies and a capstone project that includes classic data journalism cases and examples like Wikileaks (Afghan war logs) and Panama papers, further collaborations with media organizations and individuals—small-scale, community-based, crowd-sourced projects for writing a data-driven news story that leads to publishing it online and follow-up.

The above are the outcomes of content analysis based on Bloom's taxonomy applied to journalism curriculum, expert interview/inputs/opinions and secondary data resources.

Conclusion

News organizations around the world have started their data journalism activities gradually (Uskali & Kuutti, 2015). Data journalism is coming of age in India. Simple visual but in-depth data-driven stories are piquing readers' interest. COVID-19 data-based stories provided sensitive facts to the common public and transmitted the seriousness of the epidemic. A journalist who works on a political story may also report on health and science-based issues. Generalists may not always survive in the future. So, journalists may need to put multidimensional, multitasking efforts and may expect to expand their horizons. Undoubtedly, technology-enabled data journalism is going to shape the future of journalism, so the journalistic aspirants must be technology-focused and industrial-ready.

Tere (2012) suggested that to upgrade the status of communication education, three types of stakeholder efforts are necessary. The media educators, media professionals, and most importantly those who are at the helm of higher education like heads of the Mass Communication, Journalism, and Media departments, deans, the board of studies experts-members, academic councils of the institutions and all the members of the academic bodies who are holding academic administration responsibilities.

Through this research, we have offered a humble primary proposal to consider the data journalism course in Mass Communication, Journalism, and Media programmes offered at Indian universities and institutions, that they ought to give need-based professional quality education and impart value-based training to future media personnel, who may destroy misinformation and disinformation with accurate data-based stories that do good to the general public.

In the long run, we recommend the institutions to consider data-oriented courses including Advanced Data Journalism, Introduction to

Programming, Advanced Programming and Coding, Data Visualization, Information Design, and Statistics. Heravi (2019) also suggested data journalism in the future should be complemented with data analytics skills followed by computer coding skills with R, Python/JavaScript and database management through Ruby on Rails—MySQL/PostgreSQL, etc. (Kashyap & Bhaskaran, 2020). But the academic fraternity should keep in mind that the curriculum and syllabus have to be practical rather than theoretical. Furthermore, in their recent study, Kashyap and Bhaskaran (2020) suggested that journalism students should learn to have critical data literacy which enhances ethical practices. As one of the subject matter experts said in his interview, "In every news story there is a bit of data. A journalist needs to understand the data and analyze it properly before concluding any decision. After all, the journalist always has a commitment towards the society."

Ultimately, a student who learned data journalism should be able to get a job as a journalist who attempts to do fairly good work with data and ethics. Even if a learned data journalist practices general journalism, it should be noted that they are equipped and will take up the challenge when an opportunity knocks on their door, because as asserted by Knight (2015) data journalism is going to be the "future of journalism."

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