Dear readers,

Welcome to our first edition of 2015, proclaimed by UNESCO as the year of Light and Light-Based Technologies!

This month we would like to explore the ever-expanding notion of big data, and investigate its potentials in the field of education. As it is claimed, big data can provide the data-informed foundation for unique and personalized learning experiences for every student based on their abilities, paces and interests; it can consequently provide support and assistance to the students in areas that they struggle with, based on the multidimensional data collected from numerous sources. However, with all of the positive aspects, there have been a few concerns over privacy of the users (students), inequality in data production and participation, gap in what we know from data and when we find out what it means, as well as more global challenges over effective and useful data collection that would contribute to education and development for it to become smart data.

We hope that you enjoy reading this edition!

Please let us know if you have any comments or suggestions.

Highlights:

Big Data in Educational Assessment (by David Gibson)
Written by David Gibson, Curtin University’s Director of Learning Engagement, this article introduces the reader to the emergence of big data and its role in educational assessment, the related challenges, as well as the opportunities that are possible in the years ahead.

Associate Professor David Gibson, Curtin University’s Director Learning Engagement, is an educational researcher, professor, learning scientist and technology innovator. His research focuses on learning analytics, complex systems, web applications and the future of learning, and the use of technology to personalize education via cognitive modeling, design and implementation.

The emergence of ‘big data’ in educational practice - defined as data that has large numbers of records, of widely differing data types, and is rapidly collected for immediate action – underscores the need to develop new knowledge and skills in educators, researchers and policymakers. For example, assessment literacy (Stiggins, 1995) in the era of big data has become more important than ever for understanding how technology influences and impacts assessment types and processes and especially for developing confidence in creating and analysing arguments from evidence.

One caveat concerns the matter of how big is ‘big’ in educational contexts. In other scientific fields, big data is truly massive, on the order of petabytes (one million gigabytes or 10^15 bytes) of information. Educational data is not this big – yet – although with the advent of digital learning environments and virtual performance assessments, it is quickly becoming much bigger than it has ever been. Education, however is rife with vastly differing types of data, since learning involves physical, emotional and
cognitive components and these are not all measured in the same way or with the same degree of accuracy. Additionally, educational data needs to be analysed and used relatively quickly, if the purpose is to help a learner make a better decision in the next instant of time. Overall, data in today’s digital world of learning is rapidly becoming ‘big data’ when compared to information available in traditional educational settings before the Internet, social media, and highly interactive digital applications. Thus there is a need to better equip teachers, researchers and policymakers to understand and deal with big data issues.

Developing theory for the application of data science methods in educational assessment is important for two primary reasons. First, the assessment of virtual performance presents new challenges for making inferences about what someone knows and can do (Clarke & Dede, 2010; Ifenthaler, Eseryel, & Ge, 2012; Quellmalz et al., 2012). Second, new tools of analysis are needed for discovery of the patterns and drivers in complex systems such as teaching and learning, classrooms and schools as systems (Gibson, 2012; Patton, 2011). As higher education teacher preparation institutions meet these needs, we expect to see an increase in articles explaining the use of data science methods for example, in learning analytics aimed at improving learning and the achievement of graduate capabilities. We can also expect to see an expansion beyond traditional statistics in educational research, to include data mining, machine learning, and other methods of data science.

The main challenges big data in educational assessments include: time sensitivity; digital performance and the problem space for analysis; the hierarchy of tasks, turns and translations between different levels of an interactive system, and how to express and control the dynamics of interrelationships.

Time sensitivity

A metaphor that helps illustrate the time sensitive aspects is to think of the problem of understanding the performance of a Beethoven symphony, a kind of collaborative problem-solving challenge for the orchestra (interpreting and performing) as well as the audience (listening and re-interpreting). It is not helpful to think of averaging all the notes into one event for all four movements (34 minutes), or for one movement (8 minutes), or even for one moment of one movement. It is the richness and complexity of the separate notes and how they change over time that is the appropriate context for an assessment of the performance; likewise with learning processes and performances such as collaborative problem solving and many other learning situations. Some problem-solving contexts, such as coordination of actions in group-based scientific inquiry and experimentation, require the data to be understood as patterns of simultaneous and sequential interactions. This is what we mean by time sensitivity.

Digital performance space relationships

A learning experience entails a designed structure of knowledge and action (Jonassen, 1997) and when that experience is interactive and digital there are many measurement challenges (Quellmalz et al., 2012). Network analysis (e.g. social networks, visualization, artificial neural networks, decision trees) are critical new analytical tools and methods for understanding technology-enhanced learning (Choi, Rupp, Gushta, & Sweet, 2010; Shaffer et al., 2009). The traces of knowledge and action (i.e. the actions, communications and products) created by a learner during the course of interacting with a digital learning application bear a relationship to his or her mental representations of the problem (Newell & Simon, 1972) and the knowledge and capability they acquired, accessed and utilized during the interaction (Pirnay-Dummer, Ifenthaler, & Spector, 2010; Thagard, 2010). These are the ‘digital performance space relationships’ that big data increasingly contains and that analysts need to be able to
find and visualize. Digital performance space relationships examined with time sensitive network analysis has increased the ability of research to characterise and make comment on processes, products, knowledge and know-how, and their complex entanglements in authentic performance settings.

Layers of aggregations and translations

Aggregations of data events aligned to a learner’s tasks takes place in a hierarchy that begins at the top with a performance scenario (e.g. writing an essay, playing a sonata, tying a knot) and ends within each task of the scenario at the level of a ‘turn’ taken by the learner (e.g. the learner writes a topic sentence, then the second sentence of the paragraph, and so on until the paragraph is complete. The challenge of which data concerns the scenario, which parts belong to the tasks and which parts belong to the individual turns) can be addressed with analysis techniques such as moving averages, sliding time windows, and event recognition. In event recognition, an action, communication or product of the learner triggers a reaction by an educational application (or teacher) to update the scenario, which might include rescuing the learner from a bad choice of answer or a mistake they are in the middle of making. In a moving average, a window of time is selected (e.g. every second, or after every three turns) and an average is performed on the data, which form a new data layer that smoothens out the shape of the data. In the sliding time window technique (Choi et al., 2010; Han, Cheng, Xin, & Yan, 2007), a combination of event recognitions and moving averages, or some configuration of both, is used to create an abstracted data layer. These examples illustrate that when big data is involved (e.g. many data points per record per unit of time) and where there are complex aggregations (e.g. widely varying sources of data and different units of measure) there are applicable and helpful techniques available.

Representations of dynamics

Systems dynamics (Bar-Yam, 1997; Sterman, 1994) entails a mathematical modeling technique for framing, understanding, and discussing the preceding sections’ issues of time, digital performance space relationships and aggregation-translation in highly interactive technology-enhanced assessments. The process of building a model from snapshots of a dynamic system results in a reconstruction of aspects of the performance space (Sugihara et al., 2012). In such a reconstruction – called a ‘state space’ - all the data falls within a finite band of behaviour. That is, every possible data point of the system will lie in the reconstruction and can usually be visualized. Such reconstructions of the underlying space can help uncover the causal relationships in a complex system (Schmidt & Lipson, 2009) including relationships that support inferences concerning what a user knows and can do.

Visualizing the current status of a learner’s progress on an assessment is an example of representing a state of the learner as a dynamic actor with the assessment. A visualization of the progress of the learner in relation to the assessment’s domain model is another example. Visualizations can aide pattern discovery involving both nonverbal and verbal expressions; for example, from bodies of text, from online student discussion forums, and from cognitive and mental model representations (Pirnay-Dummer et al., 2010). However, ‘movies’ of dynamic educational processes, such as or visualizations which change over time, have not yet been documented in some instances of learning, and if they do exist, have not been widely disseminated into common practice. This lack of a practice base and experience hampers theory as well as practice in technology-enhanced teaching and learning, and points to the need for future research and practice to create a shared understanding of the methods of data science in educational assessments.

Conclusion
This brief article has introduced four challenges of big data in educational assessments that are enabled by technology: how to deal with change over time and time-based data; how a digital performance space’s relationships interact with learner actions, communications and products; how layers of interpretation are formed from translations of atomistic data into meaningful larger units; and how to represent the dynamics of interactions between and among learners who are being assessed by their interactions in digital performance spaces. In moving forward to embrace the opportunities that could be provided by technology enhanced teaching and learning and the big data it produces, we must not underestimate the challenges that remain to be addressed. But we can be confident in calling for an increased awareness and understanding of the issues and for better preparation of educators (practitioners, researchers, and policymakers) to possess a nuanced understanding of the issues of big data.

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References:


*Note: The opinions expressed in the articles included in this newsletter are those of the authors and editors and do not necessarily reflect the policies or views of UNESCO, nor of any particular Division or Office.*

**An Overview of Big Data in Education (by UNESCO Bangkok)**

An article by the UNESCO Bangkok ICT in Education team on the importance and value of utilizing big data for education, its challenges, and ways forward.

**Sub-regional Corner: East Asia**

**East Asia ICT and Education Indicators (by UNESCO)**

*This article provides an overview of East Asia’s demographics, education challenges and improvements, as well as key ICT indicators.*

The region of East Asia has been enjoying rapid economic progress and consequently benefitting from better investments in health, education and employment. For example in the Republic of Korea, the government expenditure on education as a percentage of its GDP has increased from 4.37% in 2003 to 5.25% in 2011. There is also greater access to education compared to the other regions in Asia as indicated by the progressively increasing pre-primary gross enrolment ratio (GER) over the last decade, from 40.84% in 2003 to 71.25% in 2012. Progress towards universal primary education (UPE) has been made with Japan reporting an adjusted net enrolment ratio (ANER) of 100%. There has been a steady
decrease in the number of out-of-school children (from 3.3 million in 2003 to 2.7 million in 2012) and the primary education ANER of East Asia (95.36%) is also the highest among the various sub-regions of Asia. As a result, at least nine out of ten youths and adults (youth literacy rate of 99.65% and adult literacy rate of 95.21%) are able to read and write in East Asia unlike South and West Asia where the youth (80.15%) and adult (63%) literacy rates are both below the global average. However, it is noteworthy that this disparity in literacy rates is also due to the less diverse languages that the East Asian countries speak as compared to those in South and West Asia.

### East Asia Education Indicators

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<td>Pre-primary, Total</td>
<td>40.84</td>
<td>43.34</td>
<td>45.87</td>
<td>48.37</td>
<td>50.66</td>
<td>52.16</td>
<td>54.03</td>
<td>57.89</td>
<td>63.66</td>
<td>71.25</td>
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<td>Primary, Total</td>
<td>111.28</td>
<td>113.59</td>
<td>115.87</td>
<td>117.74</td>
<td>122.18</td>
<td>126.13</td>
<td>127.82</td>
<td>127.36</td>
<td>126.58</td>
<td>126.49</td>
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<td>Secondary, Total</td>
<td>61.25</td>
<td>63.21</td>
<td>65.16</td>
<td>67.97</td>
<td>72.05</td>
<td>76.03</td>
<td>79.71</td>
<td>83.47</td>
<td>86.77</td>
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<td>Primary, Total</td>
<td>96.55</td>
<td>96.08</td>
<td>95.50</td>
<td>94.54</td>
<td>95.46</td>
<td>95.45</td>
<td>95.48</td>
<td>95.37</td>
<td>95.42</td>
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<td><strong>Literacy rate</strong></td>
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<td>Adult (15+ years)</td>
<td>91.27</td>
<td>91.27</td>
<td>95.21</td>
<td>95.21</td>
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<td><strong>Number of</strong></td>
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<td>out-of-school children (in millions)</td>
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<td>Primary school age, Total</td>
<td>3.33</td>
<td>3.48</td>
<td>3.75</td>
<td>4.40</td>
<td>3.20</td>
<td>2.95</td>
<td>2.77</td>
<td>2.77</td>
<td>2.69</td>
<td>2.73</td>
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<td><strong>Government expenditure on education</strong></td>
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East Asia has also reached a gender parity index (GPI) of 1.00. The ratio of female to male literacy rate of 0.95 is also above the global level of 0.90 and the progress in adult literacy rate can therefore be attributed to the substantial improvements in literacy among women in the last decade: between 1990 and 2011, female adult literacy rate grew by 18%, while the male literacy rate increased by 8% over the same period (UNESCO, 2008, 2014; UNESCO-UIS, 2013; UNDP, 2014).

Despite the progress and positivity of the situation in East Asia as a whole, disparities still exist between and within countries, for example, in providing access to vulnerable and disadvantaged children. Socially and economically marginalised children would stand to benefit the most from early childhood care and education (ECCE) but are also most likely to be excluded from it. In Mongolia, there is a wide gap in access to pre-primary education between the richest (72%) and poorest (13%). While high pre-primary GERs are found in Japan (88%) and the Republic of Korea (119%), the GER is relatively low in China (61%), almost half of that in the Republic of Korea. A contributing factor to this disparity in access is due to a greater rural-urban gap. China has the largest rural population in East Asia with it accounting for 48% of the total population. However, efforts have been made to improve the accessibility to education within the country and results are apparent. For example, in semi-arid areas of China, educated farmers are now more likely to use rainwater harvesting and supplementary irrigation technology to alleviate water shortages. The knowledge of farming technologies has therefore led to an increase in the productivity of traditional crops which would consequently increase earnings from agriculture (UNESCO, 2008, 2014; WIDE, 2005).

Countries in East Asia have also been noted for their ability to ensure that even the marginalised can learn. In Japan and the Republic of Korea, all students make it over the lowest threshold of learning as emphasis has been placed on the implementation of programmes designed specifically to promote equitable learning which includes investing in quality teachers. In the Republic of Korea, strong and more equitable learning outcomes are achieved due to higher quality teacher education and well-managed planned deployment of teachers resulting in disadvantaged groups having better access to more qualified and experienced teachers (about 77% of teachers in rural villages have at least a bachelors’ degree) (UNESCO, 2014).

### Table: Literacy Rates in East Asia

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<tbody>
<tr>
<td>Macao (China)</td>
<td>2.89</td>
<td>2.32</td>
<td>2.35</td>
<td>2.24</td>
<td>2.09</td>
<td>2.23</td>
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<tr>
<td>Mongolia</td>
<td>-</td>
<td>4.33</td>
<td>-</td>
<td>4.69</td>
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<td>5.14</td>
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<tr>
<td>Japan</td>
<td>3.64</td>
<td>3.60</td>
<td>3.48</td>
<td>3.46</td>
<td>3.44</td>
<td>3.78</td>
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<tr>
<td>Republic of Korea</td>
<td>4.37</td>
<td>4.36</td>
<td>4.15</td>
<td>4.22</td>
<td>4.23</td>
<td>4.80</td>
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In general, the region of East Asia is reaping its rewards of its commitment to improving the education system and progressing towards the EFA goals. And as a result of rapid gains in education and training, countries are able to leverage the new knowledge-driven global economy (UNDP, 2014).

In terms of ICT development, the sub-region of East Asia stands at the top of the regional ranking with front-runners in the field of ICT such as the Republic of Korea, Japan and Macao (China) representing the sub-region. This is measured using the ICT Development Index (IDI), a composite index combining 11 indicators – categorised into ICT access, ICT use and ICT skills – into one benchmark measure, is a tool used to monitor and compare developments in ICT across countries[1]. Theoretically, IDI values range from 0 to 10 and the greater the value, the higher the level of ICT development – globally, the average IDI value is 4.77 with the lowest IDI value of 0.96 in the Central African Republic and highest of 8.86 in Denmark. The Republic of Korea (8.85), a long-time front-runner in terms of global ranking, Japan (8.22) and Macao (China) (7.66) are ranked in the top 25 on the global IDI with IDI values that all exceed the developed-country average of 7.20 (ITU, 2014).

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<tr>
<td>China</td>
<td>12</td>
<td>86</td>
<td>4.64</td>
<td>86</td>
<td>4.39</td>
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<tr>
<td>Democratic People’s Republic of Korea</td>
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<td>Macao (China)</td>
<td>7</td>
<td>22</td>
<td>7.66</td>
<td>20</td>
<td>7.59</td>
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<td>Mongolia</td>
<td>14</td>
<td>92</td>
<td>4.32</td>
<td>90</td>
<td>4.19</td>
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<tr>
<td>Japan</td>
<td>3</td>
<td>11</td>
<td>8.22</td>
<td>10</td>
<td>8.15</td>
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<tr>
<td>Republic of Korea</td>
<td>1</td>
<td>2</td>
<td>8.85</td>
<td>1</td>
<td>8.81</td>
<td>-1</td>
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ICT Access Indicators

<table>
<thead>
<tr>
<th>Economy</th>
<th>Fixed-phone subscription per 100 inhabitants</th>
<th>Mobile-cellular subscription per 100 inhabitants</th>
<th>Percentage of households with computer</th>
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</table>
### Internet Access

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<tbody>
<tr>
<td>China</td>
<td>20.2</td>
<td>19.3</td>
<td>80.8</td>
<td>88.7</td>
<td>40.9</td>
<td>43.8</td>
<td>37.4</td>
<td>43.9</td>
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<tr>
<td>Democratic People’s Republic of Korea</td>
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<tr>
<td>Macao (China)</td>
<td>29.2</td>
<td>28.0</td>
<td>289.8</td>
<td>304.0</td>
<td>82.6</td>
<td>81.9</td>
<td>82.5</td>
<td>82.6</td>
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<tr>
<td>Mongolia</td>
<td>6.3</td>
<td>6.2</td>
<td>120.7</td>
<td>124.2</td>
<td>30.3</td>
<td>34.3</td>
<td>14.0</td>
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<tr>
<td>Japan</td>
<td>50.5</td>
<td>50.4</td>
<td>108.7</td>
<td>115.2</td>
<td>76.2</td>
<td>76.2</td>
<td>86.2</td>
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<tr>
<td>Republic of Korea</td>
<td>61.4</td>
<td>61.6</td>
<td>109.4</td>
<td>111.0</td>
<td>82.3</td>
<td>80.6</td>
<td>97.3</td>
<td>98.1</td>
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### ICT in Education Indicators

<table>
<thead>
<tr>
<th>Economy</th>
<th>Learner-to-computer ratio</th>
<th>Educational institutions with internet access (%)</th>
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<td>Pri</td>
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<td>China</td>
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<td>Democratic People’s Republic of Korea</td>
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<td>Macao (China)</td>
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<tr>
<td>Mongolia</td>
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<td>17</td>
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<td>Japan</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>7</td>
<td>5</td>
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</table>

Source: UNESCO-UIS. ICT in Education in Asia 2014. Retrieved from:  
Further details on the methodology used to compute IDI values can be found in:


References:


For the next (February) issue we will present an overview of education and ICT indicators in the Pacific sub-region. We welcome your contributions, sharing of first-hand experiences, success stories, and innovative projects. To share your stories, please contact: [ict.bgk@unesco.org].

Programmes and Projects:

- **Crunching data to figure out the best way to teach each student**
  To break away from the one-size-fits-all approach to teaching, and to address the gap between the well-performing students and those who are struggling, the potential of data analytics comes as a promising benefactor: the assessment of each student that could be possible through data analytics to understand how he/she learns, and what learning and teaching approach they require.

- **Rethinking Personal Data**
  This initiative aims to foster innovation and use of personal data, especially in growing economies for social development.

- **Personalized Learning, Big Data and Schools**
  From Google to Netflix, from the field of medicine to education, big data is being used to provide the end user with what he/she wants according to the data received. More personalization to learning and teaching can bring about more choices and options for the students. Teachers can come up with unique approaches based on lessons learnt and successful practices of others. Some of available platforms for students and teachers include OpenCurriculum, Activate Instruction, and Gooru.
**Nowcasting food prices in Indonesia using social media signals**
This project developed between the Indonesia Ministry of National Planning and Development (Bappenas) and the UN World Food Programme (WFP) addresses the food security issues in Indonesia due to the high poverty rates and high food prices. In order to provide policymakers and organizations with feedback to improve the situation, data on food prices is critical. In other words, “nowcasting”, or “forecasting in real time”. The selected food commodities were nowcasted using tweets in Bahasa. This data was then compared against the official food prices in the country, which helped generate a version of a real-time food price index. The findings from this research led to the development of a tool that compares the Tweets on the food prices as statistics. Consequently, this tool could be used in several beneficial ways for the policymakers, including unforeseen spikes in food prices. For more detailed project results, please [click here](#).

**News and Events:**

**Supporting Competency-Based Teacher Training Reforms to Facilitate ICT-Pedagogy Integration in Uzbekistan (January 21-23, 2015. Bostanliq, Uzbekistan)**
With the goal of supporting the ministries of education in developing sound ICT competencies for teachers, the UNESCO Tashkent office, supported by the Korean Funds-in-Trust (KFIT), and facilitated by UNESCO Bangkok office together with IITE, will be hosting a national workshop on ICT-Pedagogy Integration.

One of the main ICT in Education events will be taking place at the UNESCO Headquarters in Paris, focusing on empowering women and girls through mobile technology. The focus areas include access, gender-sensitive and include content, literacy and skills development.

**Big Data Innovation Summit** (May 13-14, 2015. London, UK)
This Summit will bring together more than 20 industry speakers, more than 200 delegates, and is the largest gathering of experts in big data.

**Strata+Hadoop World: Make Data Work** (Feb 17-20, 2015. San Jose, CA, USA)
This conference combines science and business, diving into the innovative technologies, case studies, best practices, and more. Almost 200 sessions, networking opportunities, discussions, and other events are part of this event.

**United Nations Global Pulse**
Initiated by the United Nations Secretary-General, Global Pulse focuses on big data, and the vision of its use in a safe and responsible way for the public good. Recognizing the potential of data, Global Pulse encourages discovery, development, awareness, partnerships, and approaches toward understanding big data.

**“Big Data in Education” course by Coursera**
This online course will provide those interested in how and when to use data mining and learning analytics. Some of the themes include visualization of educational data, databases, and much more.
A Report on Building the Field of Learning Analytics for Personalized Learning at Scale (The Learning Analytics Workgroup)
This report focuses on developing a general framework for learning analytics, raises questions to better understand it, defines tools and approaches within the field, determines key aspects needed to achieve these goals, and articulates a future plan for implementing these strategies.

Applications
- BubbleScore (allows teachers to export results of tests via mobile devices to grade books and track learners’ progress)
- iParadigms (leverages big data to cross-reference learners’ written work with public databases and other online resources to verify that all material submitted is original

Gooru
This is an online platform that captures the data generated by the users, learning outcomes to build a profile for the user and provide recommendations, as well as useful tools for teachers. This platform allows big data to be used directly for classroom use.

Activate Instruction
To address the needs of standardized tests, this platform analyzes student data, helping teachers gather and share resources with their students; allows students rate and “like” their teachers; provides parents with opportunities to participate in their children’s learning experience; and much more.

OpenCurriculum
Convenient for teachers, this platforms allows them to upload content and information to create, edit and share with the students.

Junyo
This tool provides support for teachers in personalizing student learning as well as an analysis of the data collected.

Knewton
This platform is useful to both students and teachers. Students receive a personalized learning experience through engaging courses. Teachers receive information on how and what the students learnt, recommending next steps.

Hadoop
One of the most important data management and analysis software, Hadoop is able to process huge amounts of data, is open source, and can scale nearly without limits.

New Publications:

Measuring the Digital Economy: A New Perspective (OECD)
This report provides a map of indicators set in place for the ICTs, describes the gaps in the framework, looks at the progress, and provides a future global measurement agenda. As ICTs have transformed our lives, economies and societies in substantial ways, they can also encourage innovation. Among other recommendations, the report urges new statistical tools to be developed to measure the digital economy.
**Education at a Glance 2014: OECD Indicators**
This report provides a glance at the crucial role of education in progressing our development, in this case, in OECD countries. Although clear improvement in education and the level of skills development has been observed, the continuing gaps among different groups are still growing, influencing the unemployment rates in these countries.

**A World That Counts: Mobilising the Data Revolution for Sustainable Development** (Data Revolution Group)
Expanding on the theme of data revolution, this report uncovers some of the existing inequalities in the access, resources, or capacity to participate in this new era. Although data can provide an innumerable amount of information that can be utilized to improve the quality of our lives, many communities around the world do not have the ability to be part of the data, making them data invisible. This does not only limit the capacity and effectiveness of the data, but can be considered as the denial to the basic rights. In order to reach the new Sustainable Development Goals (SDGs), the data revolution must take place in an all-inclusive manner in order to better assess situations and progress, and hold governments accountable to their people. Some of the action points include developing a global benchmark on standards, share technology and promote innovation, invest in capacity development, provide strong leadership, and develop SDG indicators in order to be able to analyze and visualize the data. The crucial message this report calls for is not how to create data, as that is already happening, but how to mobilise it to reach our SDGs. We should be minimizing the gap between the data haves and have-nots, those who know and who do not. Therefore, the data revolution should be a revolution with a mission of equality. Governments are some of the most important leaders in enforcing sound laws to provide privacy and security of data available. They are the ones who can ensure that the inequalities in their countries are lessened and that proper systems are in place to support that.

The need for data revolution is even more urgent due to the poor quality of data available, speed and lack of coverage, keeping many communities as invisible, including women, whose issues are still underdocumented. Additionally, a lot of the data is either not being used properly, or is not usable, relevant or simply accessible. Therefore, the vision for our future would be one where data is available and serving the interests of the people, usable and available at the right time for decision making, and helpful in preparing for the future. Another key aspect of the future should include a dynamic “global data ecosystem” in which governments and public institutions respond to the data age and have appropriate frameworks to protect as well as provide data information. The key principles of the data revolution include: data quality and integrity, data disaggregation, data timeliness, data transparency and openness, data usability and curation, data protection and privacy, data governance and independence, data resources and capacity, and data rights.

**Fixing the Broken Promise of Education for All: Findings from the Global Initiative on Out-of-School Children**
Despite the remarkable global achievements in access to primary education, the issue of equity remains to be of utmost importance. Pertinently, this report explores the new data from the Global Initiative on Out-of-School Children, which has identified the information on these children, who they are, and where they live. Thus, this report points to contextualized policies to address the issues in those countries, using data to assess and fill these gaps.

**Technical and Vocational Teachers and Trainers in the Arab Region: Review of Policies and Practices on Continuous Professional Development**
This publication focuses mostly on pre-service and in-service training of teachers. It provides a
comparative overview and analysis of approaches and outcomes throughout the ten Arab countries. It then situates the region in the global scheme of TVET, exploring the question of quality and effectiveness of the sector.

**Next Issue:** The February issue will focus on the theme of Distance Education for the Marginalized. If our readers are interested in contributing to this edition, please do not hesitate to contact us.

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