

Look Taiwan Education Big Data Research and Development

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Abstract. With the coming of 4G era, the popularity of various kinds of online equipment, the maturity of Web 2.0 skills, and the effects of increased ability of internet of students and teachers, Taiwan Education Cloud has been progressively emerging with the characteristics of large volume, velocity, and variety of education big data. This has made the currently familiarized techniques of statistical learning and data mining of all departments of MOE (Ministry of Education), such as news briefing, artificial retrieving and synthesizing information, and personnel experience judgment, unable to efficaciously analyze education big data that rapidly accumulate. We develop a new analytical steps and logical thinking so that, while facing such digital information accumulation trend, composedly extract information of valuable teachers and students feedback from such education big data mighty torrent. The paper is to aim for “Look Taiwan Education Big Data Research and Development”, and we use the currently big data techniques to analyze the learning background of individual learners in Taiwan Education Big Market. Through the collection, conduction, and analysis of the past using experience, it was further predicted, suggested, and giving feedback on the need of Taiwan Education Big Market for teachers and students.

Keywords: Big data techniques · Taiwan education cloud · Taiwan education big market

1 Introduction

In 2012, the Ministry of Education (MOE) implemented “Application of Education Cloud and Interface Service Promoting Plan,” and established infrastructure of education cloud environment [1]. The goal of MOE integrated on cloud learning resource and service, and they aimed at the following four perspectives: (1) to integrate the various existing cloud learning materials and service of MOE, universities, and industries, to induce the categories according to the areas and phases, etc., and to help learners search and access easily, which will accomplish a “learner-centered” resource requirement; (2) under the learner-centered concept, to provide learners with autonomous learning service, which will make each learner refer to the learning advice and guidance, based on his/her own learning phase, and to arrange personal learning progress for autonomous learning ability; (3) to integrate various learning resources and learning services through education cloud, which will avoid the waste of learning resources from repeated development and static investment; (4) to expect that teachers and students can “Bring Your Own Device, (BYOD)” at school, as a world-wide trend. Many schools have implemented mobile learning, and the MOE has supplied tens of tablets at school to enhance e-learning environment.

Taiwan education cloud [1] makes relevant websites of teaching resources (learning station, exchange platform, learning resource, interscholastic resource share, and creative commons), through common regulations of the platforms, back-end data standardized learning materials, and cross-platform search engine, etc., integrate as a convenient and functional “MOE Digital Learning Resource Entrance,” providing with single portal sites for teachers and learners to easily grab digital teaching resources. Hence, it can make more interactive applications for teachers’ communities. Taiwan education cloud, for the instantaneity of the future and characteristic of mobile digital learning, integrates the education resources from direct-controlled municipalities, city and county governments, organizations affiliated to the Ministry of Education, and some folk units through “Taiwan Education Big Market [2].” Figure 1 shows, based on the statistics by May 23rd 2014, the Web education resources, educational e-books, and education APPs. There are approximately 150,000 Web education resources of education ISP website, 900 market teaching APPs of nationwide education, 5,000 city and county education resources, and 14,000 resources from the affiliated units.

With the coming of 4G era internet, high speed network will enhance the digital data traffic of the internet, and it also boost the need of e-traffic. The need of applying education cloud big data will be increasing in the coming 3 years [5]. In a published and authorized document from the US Department of Education [6], it emphasized the importance between data exploration and learning analysis on education. In this paper, we use the existing Taiwan Education Big Market Data to execute basic exploration as well as analysis on the practical education application of the future. Therefore, we want to look Taiwan education big data to analyze the applied information accumulated from Taiwan education big market, and further figured out the value of the date and extracted usable information.



Fig. 1. Taiwan education big market shows the statistics of the Web education resources, educational e-books, and education APPs.

2 Literature Review

Based on the prosperity of world-wide web and cloud technology, the operation history of users is totally recorded. The foci of the communities are not only the analyzing skills and the development of the tools but also the abundant information extracted and decoded from the great number of data. Furthermore, the feedback of people on various cases is elicited to predict the trends of the future. To use the huge data to analyze, evaluate, improve, and predict like this is the application [1, 4] on Taiwan education big data. The trend of using Taiwan education data has gradually influenced education. The recently grown up Massive Open Online Course (MOOC), Online Tutoring, Learning Management System (LMS), integration of technology into teaching, and so on [8–10]. Students’ learning progress will thus be recorded, and the records provide teachers with tips to improve teaching and carry out adaptive teaching as well. Therefore, some researchers [3] remained reserved. They worried too much dependence on the technology-oriented data will narrow and limit the development of education and influence students’ privacy. No matter how we concern about the application on Taiwan education data, this issue has been a trend of analysis. The educators must remain concerned about this issue and make discussion on the relative applications as well as limitations.

Some high education studies [7–9] indicated that the concept and analysis of big data can be used on various educational administrations and teaching applications, taking examples of manpower hiring and management, financial planning, donation following, or monitoring students’ performance. Generally, the exploration and analysis of data can

offer instant feedback or prediction. On students' learning, we can predict their learning behaviors through digital data, like if they will drop out the school, need helps or be able to face more difficult challenge, and so on. This seems to help us to discern which pedagogy will be effective to some students, which corresponds adaptive teaching [5, 6].

Besides this, the application of big data can also develop core architecture and technique instrument [10] to evaluate the performance of students or teachers. Therefore, the model of education treatment on these choices will base on existing recommendation systems. From this, it can be seen that the development and application of big data on education will be necessary and promotable. Using big data [7, 9] to estimate and predict the development of education and so on seems a good way to progress. However, to use these data remains risky and needs awareness. According to the findings from two researchers [5, 7], it was necessary to have data provided by professional analysts to ensure the accuracy of the research. Therefore, the practicality of big data may limit the research questions because we would not have the data of all kinds of cases. The data would confine our study. Hence, it would be more important to sort and analyze the available data in the paper. Privacy would be the most vital but perhaps the most neglected case. To analyze, users' digital data need to be collected. That is why we need to be aware of their privacy to protect the rights and interests.

3 Methodology

Figure 2 depicts the framework diagram, and it shows the application and research of Taiwan education big market in Taiwan education cloud. Through big data technique, we can have deeply analyze contents and records of education application in Taiwan education big market. We hope to improve the procedures of adaptive education and boost educators' teaching efficiency. Moreover, we also hope to, through big data analysis, expand the high quality and multielement teaching contents, and then to enhance learners' learning attitude and immersive effect.

In the framework diagram in Fig. 2, we designed the integration of big data core architecture, big data analysis, and instrument techniques. From the right to the left, we can see (A) taking Taiwan education big market data, (B) big data core architecture, and (C) big data tools. Aiming at the big digital data base of Taiwan education big market, we used big data core architecture and technique instrument to analyze the learning history of teachers and learners, and through various statistics learning and data exploration, to understand the learners' learning condition.

(A) Taking Taiwan Education Big Market Data

First, we needed to understand the needs of Minister of Education and data characteristics of Taiwan education big market, shown in Fig. 1. Second, the accessibility of data should be confirmed and thus categorized to confirm the field, which provide the back-end data analyzing system with assess to application and ensure the research directions of Taiwan education cloud. Hence, limits of authority should be also confirmed to protect privacy and copyright.

(B) Big Data Core Architecture

We provide a core architecture conducting education big data analysis, and develop the technique based on this framework. The smart resource managing mechanism can effectively control the computing learning resources, and let multimedia learning data analyzing applications work rapidly under the limited resources. Therefore, the global big data analyzing tasks will work directly on these physical machines, to avoid efficacy losses during data transit and duplication.

(C) Big Data Tools

We overcame the challenge of big data management, and to fill the need of the organization, we carried on big data handling analysis mechanism on Taiwan education cloud condition through collecting, integrating, and analyzing the mass user history on Taiwan education big market. From the past using experience data, including words, emotional contents, interpersonal network, relative communication, as well as message flows, we presented quantitative statistical data and saved them on big data database. At last, the users can present quantitative statistics through visualizing user interface and understand efficiently student’s learning condition. Thus, they can predict, suggest, and give feedback to students, which boosts the efficiency of work.

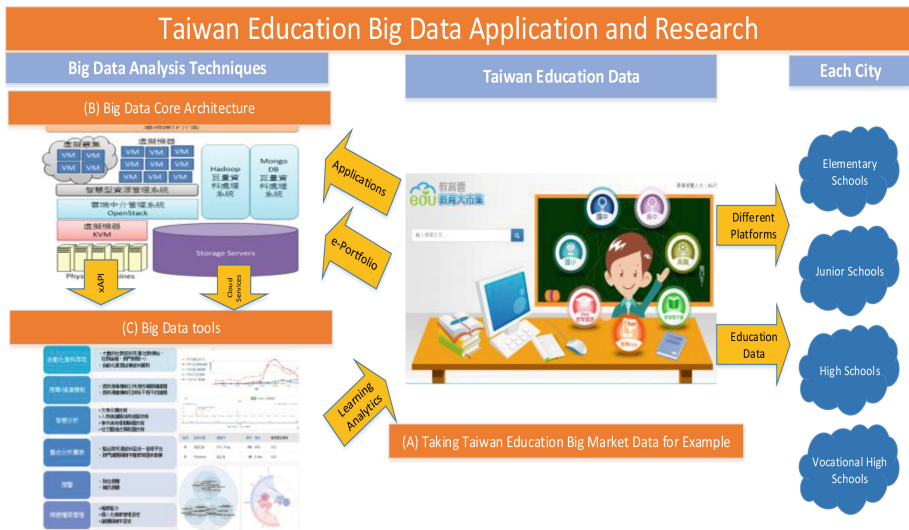


Fig. 2. The framework diagram of Taiwan education big data application and research.

4 Conclusion and Further Work

We focus on the communication and consultation with professionals of every field, in order to confirm the execution of every task. In view of this, we establish consulting group and invite, on or off scheduled, group members to attend the meetings about the

need analysis of Taiwan education big market application, category platform data record, resource field confirmation, judging mechanism of digital resources, and authority limits of resource confirmation, etc.

The preparation of a lesson by a teacher is like that of a delicious dish, which needs a lot of ingredients. Beside textbooks, teacher's manuals, and some basic materials, in order to enhance students' interest and learning effect, we would collect more extracurricular materials about the lessons, including Web learning resources, education e-books and teaching Apps, etc. Taiwan education big market provides these resources, but the included ones are so many and complicated that they need to induce the way to categorize its recourses. Therefore, we will make thorough inspection and categorization on the mass included resources and users' behavior records in Taiwan education big market to sum up the practicability of the characteristics and application of the resources. For example, how will the teaching resources in various educational systems (elementary school, junior and senior high school and vocational high school, etc.) influence the users' browsing behaviors? Thus, we will carry on the users' resource recommendation based on this concept.

The resource exchange and sharing mechanism of Taiwan education big market is therefore understood, and we will verify the possible data field in education analysis. When more and more future users entering the terrace collect or share learning resources, there will be increasing system logs. Hence, how we extract the meaningful categorized items from these system logs and conduct relative data field analysis on the operation behaviors for the sake of the future studies seems significant. In this paper, we will provide metadata recording explanation Standard Operation Procedure (SOP) for the users to browse, consult, and orient the planning of application.

One of the most concerned issue of the retrieving and applying of education big data is the privacy and copyright, etc. The present study clarify the related issue on two aspects: first, copyright, and second, right of privacy. For the sake of copyright, through the assistance of law professional, the authority range of resource use will be acquainted in order to insure the usability of teaching resources. According to the filling-in of metadata, ways of sharing resource authority, uploading of data and presenting of complete data structure, the usable data will be retrieved and computed analysis. On the aspect of right of privacy, we shall understand the "limit" of objective data. In other words, not all data recorded in the back-end terrace can be retrieved and used. Therefore, we should clarify the relative using range information as anonymous processing. However, whether these processing will influence the application of Taiwan education big data needs further estimation.

At last, we had negotiation and cooperation with professionals of related areas and acquired usable Taiwan education big data. Then, we analyzed the characteristics of the data, clarified relative data field and authority limit in order to provide practicability of resource application and further establish the applicable environment of the future. Hence, it provided with back-end big data analyzing system for applying to ensure the direction of applied study of Taiwan education cloud. For basic estimation and comprehension of the possible influence of the future in the present study to accomplish the planning of the complete Taiwan education big data research, we need to invite professionals, scholars, teachers, students, and so on to carry on discussion of the issue and

give suggestion of the planning, in order to ensure the correctness of the research direction and avoid negative impacts.

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References

1. Taiwan Education Cloud. <http://cloud.edu.tw/>
2. Taiwan Education Big Market. <https://market.cloud.edu.tw/>
3. Chen, D.-Y., Hu, L.-T., Tseng, K.-C.: Engaging citizens through E-government 2.0: hopes and problems as evident in the case of Taiwan. In: Shark, A.R., Toporkoff, S. (eds.) *Beyond eGovernment - Measuring Performance: A Global Perspective*, pp. 99–108 (2010)
4. Eynon, R.: The rise of big data: what does it mean for education, technology, and media research? *Learn. Media Technol.* **38**(3), 237–240 (2013)
5. West, D.M.: *Big Data for Education: Data Mining, Data Analytics, and Web Dashboards*. Governance Studies. Reuters, Brookings (2012)
6. Picciano, A.G.: The evolution of big data and learning analytics in American higher education. *J. Asynchronous Learn. Netw.* **16**(3), 9–20 (2012)
7. Siemens, G.: *What are learning analytics?* (2013)
8. Tabaa, Y.: LASyM: a learning analytics system for MOOCs. *IJACSA Int. J. Adv. Comput. Sci. Appl.* **4**(5), 113–119 (2013)
9. Chen, H., Chiang, R.H.L., Storey, V.C.: Business intelligence and analytics: from big data to big impact. *MIS Q.* **36**(4), 1–24 (2013)
10. Eaton, C., Deroos, D., Deutsch, T., Lapis, G., Zikopoulos, P.: *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*. McGraw Hill Companies, New York (2012)