

## Exploring Innovative Learning Environment (ILE): Big Data Era

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### Abstract

The emergence of digital technology development such as smart phones, tablets and iPad has been widely raised to utilise among the society at large and particularly in the higher education (HE) context. The massive amounts of data can be enhanced to provide the content transformed into the integration of online learning. This study attempts to elucidate the design of innovative learning in big data approach. The review of literature was conducted from referred journals by the keywords of innovative learning environment (ILE) and big data. The findings reveal that big data approach in ILE entire initiative has potentially to improve students' learning process mainly in online resources. In terms of the extent to propose the design of innovative learning basis in big data analytic process, the model reference of virtual learning approach is expected to contribute in expanding the extent of pedagogy and technology skill to support the initiative way of teaching and learning process in the HE context.

**Keywords:** Online learning, big data, higher education, technology-rich teaching, innovative learning environment (ILE)

### INTRODUCTION

Attempts to utilize the technology development such as smart phones, tablets as well as laptop have a wide chance in promoting the an appropriate way of practices on teaching and learning in higher education (HE) in improving effectiveness and efficiency [1][2][3]. With worldwide emerged to the online learning, any approach to fulfil the needs in improving the learning quality process to provide information from multiple sources refers to adopt the way which facilitates in getting teaching and learning resources. Facilitating this process committed in assessing online learning supported easily through the recommendation enhances the entire initiative to transform the sources.

Through existing recommendation approaches to address learning sources, providing learning design configured into an attempt with a better service has a wide range of task necessary to directly respond through gaining the management

of teaching and learning process. Moreover, Information and Communication Technology (ICT) with the process in preparing practical basis with the standard is adopting the framework of big data should be transmitted into the particular task to assist the societal concern in terms of teaching and learning, running for business, and communication purposes. With regard to ICT with the advancement through the big data adoption, the entire initiation to utilise it can be viewed from the wide range of fields such as businesses in the running process of reaching the advantage of competitive achievement [4][5] and it can be seen in increasing the growth of knowledge productivity [6]. Moreover, spreading into the field of education in terms of learning with online basis [7][8] teaching with innovative strength [9][10] and awareness of careful competencies transmitted into the context of higher education [11][12].

Accommodating the big data in order to begin with absorbing the strategic basis of information systems is actually a point of view to determine the particular enhancement to provide the tools through giving feedback. For instance, it can be taken as serious effort in the way to enable students with enhancing innovative learning performance by searching for resources in the context of borderless space [13]. Recognised as the new approach of technological basis, framework of big data in incorporating such aspects in terms of massive data generation growth to support innovative and interactive learning environment has to be involved with the technology tools so that the resources can be easily gained in accordance with the needed basis of teaching and learning [14][15]. Although some studies were already conducted in the basis of big data adoption in innovative teaching, there has been lack of scholarly attention to elucidate learning basis of environment to assist in providing the learning resources. As a result, this paper attempts to explore big data approach in innovative learning environment (ILE) through proposing the model framework. Moreover, incorporating framework of big data to utilize a wide source of information and knowledge in higher education context, creating innovative learning should be aligned with designing big data integrated into the specification referring to underlying the learning process

particularly in the implementation processes with maximizing the technological elements.

## LITERATURE REVIEW

### Towards Big Data in Education

As the term in extending the communication basis integrated in the way of transmitting communication, Information and communications technology (ICT) has been widely arranged to underlie such process as the transmission basis through the enterprise software use such as wireless signal and telephone lines [16]. In the effort to access, transmit and store the data convergence constructed through the link system use [17], the wide range of devices is necessary to apply in transferring information data in order to enable the society in the way of running their needs basis [18]. As a result, attempts to transform with the regard to facilitate the medium to deliver the potential data should be widely engaged into platform of big data adoption, as the following stages from patterns, trends, and associations [19].

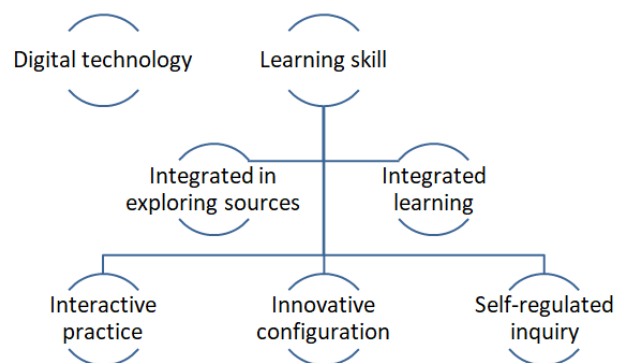
In line with elucidating the potential data coming from interactions of human behaviour transformed into the pattern, big data refers to the architectures of technologies with the extent of generation configured through collecting, aggregating and analysing large amounts of data [20]. In the effort to facilitate the societal concern as the medium to transmit big data potential, the specific concern in terms of the medium in the way to utilising the massive data amounts is created to maximize the pattern which will be configured through data creation in every second. Aimed at the utilization of data with massive amounts created across internet, large data collection utilized into the setting of maximizing its potential data should do with utilizing the fine-tuned extraction from potential value to enable the users in gaining the sources [21].

Moreover, design of innovative learning with big data approach in relation to gain its potential and value for the user from multi channels needs to enhance the initiative essence on making learning with online basis. With this regard, extracting the massive amounts of data to provide learning activities would give the extent of benefits which potentially transform to the innovative learning design [42][43]. Since considered as innovative based learning model through utilizing extraction of massive data amounts created every second across the Internet, this kind of learning activities and subsequently from the technological based learning provides the entire extent of beneficial values in order to strengthen pervasive learning [14]. Through anywhere and anytime context of learning sources, big data based technological tool with the availability to enhance a sufficient support in the way of influencing the effectiveness of learning by pointing out the academic skills and social interaction can be seen as an attempt to empower the orientation with the collaboration basis. Enhancing the practical strength to make easily in gaining the learning

sources has to be prepared with the analytics of big data approach within the learning process. With regard to the use of big data analytics in a whole context, the indicators of online sources to underlie learning process should be engaged with making perfect in terms of preparing well with emphasizing the voluntary data complemented and modified to check in assessing the practice by widening the use of data which students create through their interest on particular subject or certain topic [7][22].

### About Innovative Learning Environment (ILE) as Digital Technology based Learning Skills

In line with the combination between digital technology and virtual communication in order to enable the learners to gain the sources of information, the unique of (ILE) with its pedagogy enhancement refers to the condition and dynamics with an entire integral part of extending materials across creating the learning space through the online resources [23]. At this point of view, attempts to recognise the interactive practice through social networking in generating the innovative basis together with inspiring configurations for learners within the design of course play a pivotal essence in creating the environment of innovative learning adopted with a significant essence to address ethical enhancement and professional engagement [24][25][26][41]. In terms of the strengths-based learning, facilitating the students in obtaining the flexible awareness and connectedness in the way to supporting the process refers to empower working together within an environment of innovative learning [27][28][29]. With this regard, making the process of learning in the practical way together with self-regulated inquiry could make a potential enhancement between digital technology and learning skills integrated in obtaining the sources.



**Figure 1:** Design of Environmental Basis on Innovative Learning

The initiative to transform the learning way has to prepare the integrated enhancement between digital technology and learning skill. As the opportunities in creating learning actively to explore in presenting knowledge understanding and powerful skills, the design of big data in ILE initiative

should help the learning process to develop the activities of learning enhancement within capturing the knowledge. This refers to facilitating the learning process by discovering and building the extent of understanding of information largely through conceptualising principles and relationships in order to gain the extent of innovative configuration with self-regulated inquiry.

## RESEARCH METHOD

Proposing the model of reference on the design of innovative learning environment (ILE), this paper attempts to specifically examine the approach of big data value with its analytics process. The review of literature was conducted from referred journals by the keywords of innovative learning environment (ILE) and big data. Exploring the thematic analysis across this study scope, journals and books with peer-reviewed process were chosen subsequently for critical review.

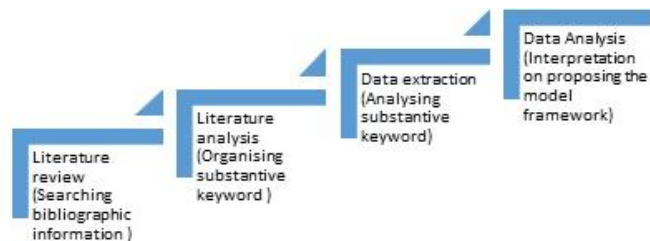


Figure 2: Design of Research Stage

The figure above shows the stage of research conducted from searching the literature in connection with big data and innovative learning. Obtaining the literatures was followed by analysing the theme from the organisation on substantive keywords on big data and innovative learning. The subsequent stage is the extraction of data within literature analysis deeply in the attempts on interpreting the findings. Gaining the interpretation, attempts to integrate, evaluate and interpret meta-synthesis of the results will propose the framework of model. The identification about elements and common features of big data approach on ILE comes from examining critical analysis of literature mainly on synthesizing the key elements into the extent of conceptualizations, new interpretations and modelling.

## ANALYSIS AND DISCUSSION

### Analytic Process of Big Data

As the platform to create data across internet in every second, the approach to extend the capacity through analytics of big data refers to explore the velocity, volume and variety of huge amounts of data in discovering and analysing the extraction of the potential value which can transform to the pattern

[19][39]. Moreover, analytic process of big data attempts to extract the data value with considering the process in terms of collection, organization and analysis about large data sets [21]. Covering information related to the demand which comes from uncovering hidden patterns for instance has entirely to do with trends of the market from unknown correlations in underlying the preferences of customer [4] where this refers to discover the large of data [22]. As entirely big data with analytic process set out from sharing and transferring the data, it has the strength to extract big data value to assist in making the pattern in providing the access to sources of data. The initiative to support the learning process by helping the students' engagement on environment interaction is represented to illustrate analytics process of big data approach to underlie the design of learning environment in the basis ILE.

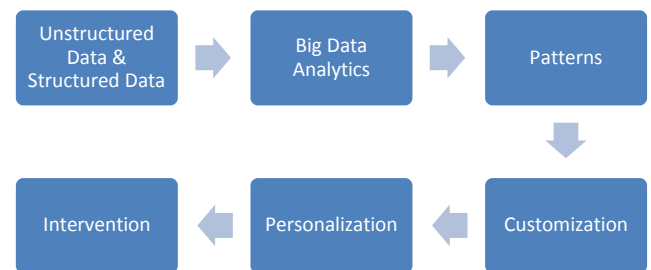


Figure 3: Analytic process of big data

Based on the above illustration, the general concept about big data in generating the potential value in education setting, it can be seen the extraction process of raw data coming from structured and unstructured data sources. As seen in the model above, the two starting sources would enhance big data with its potential value of data transformed into the analytic process to build the pattern. As a result, this pattern will deliver the customization together with personalization and intervention to capture the theme suited to the demand. In the learning process, the potential data of structured data here refers to the sources deriving from such activities like e-library records, financial records, behaviour of web click and planning of enterprise resource etc. [30]. While, unstructured data sources come from interactions of social networks interactions, voluntary data audio for instance [31]. In terms of data analytic outcome, attempts to exert in the way of predicting the pattern has to be involved with enabling the learning process by delivering the source of information. With this regard, pattern and prediction can be extracted by delivering the service in offering personalization of customization of modules, services and interventions appropriately in order to make sure the quality control and performance [5]. Moreover, the extent of customization here derives from referring to way of students' ability to choose and pick up the particular topic within the module suited to

the interest or demand [7]. In particular, intervention stage here should be engaged with the attempts to decline the performance by alerting it sent to the learners as a notification. It indicates that the notice will deliver when students cannot show their performance well towards the particular course taken during the process.

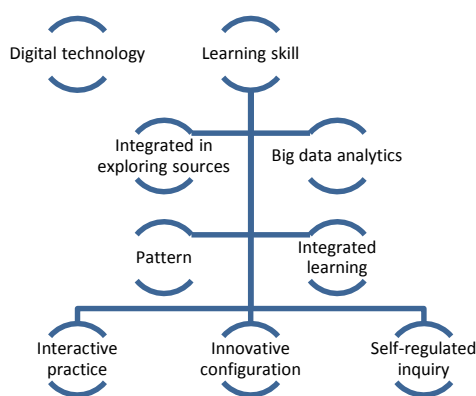
### Big Data Approach for Innovative Learning Design with Environment Strength

With the distinct characteristic which big data has in the way to transfer the data value, it took the entire process by engaging with extracting the learning sources from the pattern resulted from structured and unstructured data [14]. With this regard, the potential value of the content refers to improve the experiential basis of learning with adopting the online sources within massive open basis which enables the learners can access freely [15]. Towards the convenience about the point of enhancing the participant unlimited number, students can work together within the same time on online activities [9][10]. In terms of the competence on technological basis in the way to manage the learning style configured into the strategies and innovation, big data analytic process can be enhanced to assist the learners to enable finding out information effectively in accordance with their interest and needs [32]. Moreover, the resources from any subject aligned with technology adaptive skills to assist the learning way refers to the raise the potential enhancement on the effective online learning by achieving the easy access available in online basis. With regard to an initial requirement to enhance the particular achievement, attempts to obtain the design of computer interface should determine the usability extent towards the technology-based learning [33]. Towards the benefit referring to make useful about the potential data, getting involved into the design of learning basis in innovative approach, the application of big data could be enhanced to transform the reflective essence to empower the learning environment actively and innovatively in the basis of providing the integrated resources platform.

In line with providing the opportunities in the way to maximizing the potential data value collected within big data approach, attempts to obtain the distinct feature in online learning systems refer to the pattern of integrated learning innovatively to transform the interactive practice together with configuration on self-regulated inquiry. In terms of services customized and personalized into the learning process with offering the delivery of knowledge, the entire initiative in exploring potential data should do with viewing students' behaviour in the way regarded as more precision on the ability to manage such extents. For instance, online learning can be taken from the materials prepared in the system to be discussed with the peers in the same programs where every discussion topic can be supplied throughout the resources link relevant to the interest and needs [34]. Moreover, understanding the learning quality by developing the structure of learning course in determining to generate records of their activities is entirely a pivotal essence to enable them to perform learning activities well. Posting the activities details frequently refers to entire effort in undertaking to understand the wide range of webpage [36]. With this regard, the initiative in providing the topic content related to the needs of personal learning appropriately can be achieved from the pattern by adopting their activities to the system [4]. In terms of the initiative to raise the platform in attracting increasingly to the attentional basis, the effective learning integrated into big data approach is enhanced as an essential competence where this could be taken seriously in the operational system design of the models within big data integration stage [34]. In particular, technology usage demand on internet basis would make the model of learning style adopted specifically among the learners in their own capacity basis.

### Improving Learning Environment Basis to Raise Learning Achievement

The basis of ILE with its distinctive pattern of learning environment specifically to provide the learning sources refers to enhance the learning performance in the way which is more active and convenient. In terms of contributing to support the learning performance, with more convenient and innovative approach, it should be engaged with adopting the way to assess the sources of learning material adopted from customization, personalization and intervention within big data pattern. Seen as the attempts to absorb the massive amounts of data, ILE with pointing out the data sources such as surveys, social network sites, newspaper and other sources with covering the assortment and volume [1][17]. With regard to the self-regulated inquiry, attempts to achieve practical basis of interactive essence configured into the innovative style may become an entire element to commit the learning style by maximizing the resources of learning material assessed in the way to strengthen the learning environment basis [7]. Moreover, it can be seen to empower the importance of ILE with big data approach committed to ensure in



**Figure 4:** Design of Big Data Approach on Innovative Learning Environment (ILE)

maximize the way in assessing material resources more flexible referring to the time and place. In terms of contributing the significant enhancement to explore online resources, the initiative of big data approach to support the process of learning to gain multitude resources attempts to determine the guide way to enable them to get more benefits definitely with encouraging them with control basis.

In addition, the determination of guiding a way supported in learning instruction, the subsequent enhancement of development in the way to transform the performance basis to raise achievement can be taken in benefiting the students to strengthen the entire interaction within the process of interaction. Attempt to achieve in encouraging the learning style more actively engaged into getting the way entirely with instructional process to improve thinking skills has to do consequently with boosting their confidence to raise the skills of learning enhancement. Between the powerful skill and adaptive technology in achieving ubiquity, flexibility and connectedness, adopting big data approach with actively presenting the knowledge basis and skills is fundamental to give insights to go through online learning basis undermining the control basis within integrating high-quality information [44]. As the effort which students can go further in the way which allows them to interact with in the learning environment, such distinct kinds in the following extent of engagement including meaningful learning with its interaction is significant to assist in improving the attentiveness in the learning process [37]. Moreover, transforming the design of innovative learning in the basis of integration between knowledge and skills in adaptive learning technology refers progressively to strengthen the skills with technology platform of big data [40]. Generating the valuable insights of skills integrated into the approach of innovative basis on learning enhancement, the subsequent extent of introducing, preparing and managing the arrangements of learning within online should do with considering the learning approach more upgrade in improving skills in big data approach. As a result, it is necessary to possess the implementation basis required to enhance the convenient way of learning style [20]. To successfully implement in the way to cover such usability on the technology platform, the learning process with the support of technological tool should be prepared through providing better facilitation on the activities of learning process with multi-place.

Referring to enhance the development of students' performance in adapting big data approach, learning process integrated into learning environments in the basis of data-informed in helping to get access of the information on subject material can be achieved to deliver the students in the way which enables them to see the activities. On getting the chance to see the way in assessing the learning process, attempts to obtain the feedback transmitted to influence the behavioral basis with the abilities aligned to utilize such online resources from technology tool. In terms of influencing the behavior in the learning process, the learning outcome

should be going to do with extent of performances in the learning basis. Moreover, curriculum design can be prepared by aligning the procedural stage to support the learning process. As a result, the process will determine the result especially in terms of providing the outcomes-based learning environment to follow the process itself with addressing the focus on the learning outcome basis referring to the self-regulated inquiry engaged into the meaningful learning interaction.



**Figure 5:** Enhancing self-regulated inquiry to raise performance and development on learning process and achievement

With pointing out the performance basis of learning enhancement, self-regulated inquiry refers to such indicators of learning process including innovative configuration, interactive practice, flexibility, ubiquity and connectedness. All these enhance the learning performance in the way to go beyond the progress which students may absorb information. Providing a feedback to design ILE configured into the process and outcome in the basis of innovative approach [27] leads to empower the ability awareness towards learning preferences [28]. This should do with orientation of the ability basis to strengthen the interactional strategy to adopt the virtual learning environment [35]. In particular, taking a benefit from getting access on the online resources is entirely a point of view set out designing ILE configured into the system of learning enhancement in the way which has a distinctive orientation to give the innovative way together with making learning more convenient.

## CONCLUSION

Through elucidating the framework model of innovative design using big data approach with ILE, this paper did explore theoretical foundations of the interactivity of big data

in the construction on learning environments. In applying to facilitate the model of big data design with a wide variety of innovative learning, designed model here refers to enhance in giving distinct educational experiences in exploring the big data approach. It enhances to assist the students' learning environment in terms of engaging into accessing online resources by mobile devices. Covering a wide variety of innovative substituting traditional learning interactions with high-impact educational experiences, the new concept of big data offers the entire initiative implemented with big data approach to improve students' achievement in learning process and outcomes. In terms of the extent to propose the design of innovative learning basis in big data analytic process, the model of virtual learning approach refers to expand the extent of pedagogy and technology skill in order to support the initiative way of teaching and learning process. Online learning integrated into big data approach addresses the entire way to sustain the learning behaviour. This study is expected to contribute in providing the insights on the reference model of big data approach for ILE enhancement.

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