Synesis, v. 15, n.1, 2023, ISSN 1984-6754

THE APPLICATION OF LEARNING ANALYTICS TO SUPPORT THE STUDENTS IN HIGHER EDUCATION

A APLICAÇÃO DA ANÁLISE DA APRENDIZAGEM PARA APOIAR OS ESTUDANTES DO ENSINO SUPERIOR

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Received: 10 Nov 2022
Accepted: 15 Jan 2023
Published: 25 Fev 2023

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Abstract: This article presents a detailed analysis with an emphasis on actual data to illustrate the value of learning analytics in boosting the retention and graduation of college and university students. The review covers a range of relevant topics, including: To fulfil the competency-building requirements of the future, educational institutions like universities and colleges will need to develop innovative teaching methods. This qualitative case study makes an attempt to establish what skills and knowledge will be necessary for college students to acquire in the future, as well as how learning analytics may aid facilitate the acquisition of these skills and information. Because future abilities are formed on the trifecta of subject development, objects, and the social environment, it makes sense to focus on all three of these aspects simultaneously. The results of a qualitative content analysis of group interviews conducted with 19 educators are the primary focus of this article. According to the findings, crucial components for future subject development include reflective competence, self-awareness and self-management, learning literacy, personal agency and self-efficacy, and learning literacy. Learning analytics have the ability to enhance individuals' development since they give people with the tools to reflect on their own learning and competence growth and to become more self-aware of both their strengths and flaws. Learning analytics were also thought to encourage learning via active engagement, self-assurance in one's own capacity to learn, knowledge of one's own learning processes, and metacognition. Students need to acquire object-related abilities such as flexibility and digital competence in order to be able to handle complex subjects and assignments.

Keywords: Learning analytics. Higher Education. Student development.

Resumo: Este artigo apresenta uma análise detalhada com ênfase em dados reais para ilustrar o valor da análise da aprendizagem no aumento da retenção e graduação de estudantes universitários e universitários. A análise abrange uma série de tópicos relevantes, incluindo: Para cumprir os requisitos de desenvolvimento de competências do futuro, instituições educacionais como universidades e colégios terão de desenvolver métodos de ensino inovadores. Este estudo de caso qualitativo faz uma tentativa de estabelecer que competências e conhecimentos serão necessários para os estudantes universitários adquirirem no futuro, bem como de que forma a análise da aprendizagem pode ajudar a facilitar a aquisição destas competências e informações. Uma vez que as capacidades futuras são formadas sobre o trifecto do desenvolvimento do sujeito, dos objectos e

do ambiente social, faz sentido concentrar-se simultaneamente nestes três aspectos. Os resultados de uma análise qualitativa do conteúdo de entrevistas de grupo realizadas com 19 educadores são o foco principal deste artigo. De acordo com os resultados, as componentes cruciais para o desenvolvimento futuro da disciplina incluem competência reflexiva, autoconsciência e autogestão, literacia de aprendizagem, agência pessoal e auto-eficácia, e literacia de aprendizagem. A análise da aprendizagem tem a capacidade de melhorar o desenvolvimento dos indivíduos, uma vez que dá às pessoas as ferramentas para reflectirem sobre a sua própria aprendizagem e crescimento de competências e para se tornarem mais autoconscientes tanto dos seus pontos fortes como dos seus defeitos. A análise da aprendizagem foi também pensada para encorajar a aprendizagem através de um envolvimento activo, autoconfiança na própria capacidade de aprender, conhecimento dos próprios processos de aprendizagem, e metacognição. Os estudantes precisam de adquirir capacidades relacionadas com objectos, tais como flexibilidade e competência digital, a fim de serem capazes de lidar com assuntos e tarefas complexas.

Palavras-chave: Análise da aprendizagem. Ensino superior. Desenvolvimento dos estudantes.

Introduction

Researchers in the fields of education, psychology, computer science, and data science have made substantial progress since the early 2010s in understanding how to effectively use learning analytics in classroom settings (Prieto et al. 2019). Therefore, despite the fact that the term "learning analytics" refers to a wide range of concepts, there are many conceptual variations that fall under this umbrella. Some examples of these variations include "school analytics" (Sergis and Sampson, 2016), "teacher or teaching analytics" (Sergis and Sampson, 2017), "academic analytics" (Long and Siemens, 2011), "assessment analytics" [Nouira et al., 2019], and "social learning (Blikstein and Worsley 2016). The topic of discussion in this article is learning analytics in higher education and how it relates to the overall academic achievement of students. The term "learning analytics" refers to "the use, assessment, elicitation, and analysis of static and dynamic information about learners and learning environments, for the near real-time modelling, prediction, and optimization of learning processes, and learning environments, as well as for educational decision-making." In other words, learning analytics is "the use of static and dynamic information about learners and learning environments, for the near real-time modelling, prediction, and optimization of learning processes, and learning (Ifenthaler 2015, p. 447).

The effectiveness of learning analytics in enhancing students' academic performance is not supported by sufficient data from controlled experiments (Lodge and Corrin 2017). There have been a multitude of studies conducted on the subject of learning

analytics, with some of these studies concentrating on individual tools (Atif et al. 2013, Sclater et al. 2016, Tsai et al. 2018), others on practises and policies, and still others on the adoption of learning analytics systems at the K-12, tertiary, and national levels (Buckingham Shum and McKay 2018; Ifenthaler 2017). As a consequence of this, there has been an increase in the number of primary research publications on learning analytics (Prieto et al., 2019). This suggests that the analysis of digital traces of learning and teaching may reveal benefits for students, educators, learning environments, and organisations (Gaevi et al. 2015). This is because the use of data in the classroom is becoming more important. Despite early reviews such as those by Ferguson et al. (2016) on policy recommendations for learning analytics, Papamitsiou and Economides (2014) on the identification of learning analytics research objectives and challenges, Kilis and Gulbahar (2016) on learning analytics in the context of distance education, and Larrabee Snderlund et al. (2018) on the effectiveness of learning analytics interventions, there is currently no up-to-date systematic review of learning analytics.

The word "study success" refers to the attainment of any degree of academic achievement, from the most significant (the graduation from a prestigious institution) to the most insignificant (the completion of all assigned homework) (Sarrico 2018). However, aspects of the learning environment such as the curriculum design, learning activities, and social components are also important contributors to academic success. Personal characteristics such as age, gender, motivation, and previous academic accomplishment all play a role in academic success (Bijsmans and Schakel 2018; Tinto 2005). The usefulness of a research is directly proportional to the extent to which it may give proof that there has been an improvement in student views of their experiences, skills, and levels of satisfaction. Pistilli and Arnold were among the first academics to see the potential of learning analytics to raise the overall level of academic attainment among students (2010). Although educational researchers, practitioners, and decision-makers face a significant challenge in developing and implementing learning analytics methodologies and systems that ensure the best possible student performance, the field of learning analytics has made significant progress in recent years (Gaevi et al. 2016). The purpose of this article is to investigate whether or not learning analytics have increased students' likelihood of successfully completing their undergraduate degrees.

Review of Literature

Since the beginning of the 2010s, education, psychology, computer science, and data science have all dedicated a significant amount of their research efforts to the topic of learning analytics (Prieto et al. 2019). Therefore, while the term "learning analytics" may be used to refer to a large variety of ideas and concepts, it can also be used to refer to a great number of more complex concepts. Several of these variations include the following: "Analytics in education can be subdivided into a number of different subfields, such as academic analytics (Long and Siemens, 2011), assessment analytics (Nouira et al., 2019), teacher or teaching analytics (Sergis and Sampson, 2016), social learning analytics (Sergis and Sampson, 2017), and school analytics. Each of these subfields focuses on a specific aspect of the field of analytics in education (Sergis and Sampson, 2017). (Blikstein and Worsley 2016). The primary topic of this article is on the significance of learning analytics with regard to the overall academic performance of college students. The term "learning analytics" refers to the practise of using both static and dynamic data on students and the environments in which they are learning for the purposes of "near real-time modelling, prediction, and optimization of learning processes, and learning environments, and for educational decision-making." [Citation needed] To put it another way, learning analytics consist of: "analysis, prediction, and improvement of learning outcomes for students and learning environments via the use of data drawn from both static and moving sources in almost real-time (Ifenthaler 2015, p. 447).

There have been very few studies that have used randomization and control to demonstrate that learning analytics are successful in improving students' test performance (Lodge and Corrin 2017). A large number of researchers have looked into learning analytics, with some of them concentrating on particular technologies (Atif et al., 2013; Sclater et al., 2016; Tsai et al., 2018); others investigating practises and policies; and still others investigating the adoption of learning analytics systems at the K-12, tertiary, and national levels (Buckingham Shum and McKay 2018; Ifenthaler 2017). As a direct result of this, there are now more original research on learning analytics than at any other time in history (Prieto et al., 2019). If research is conducted on digital learning and teaching records, there may be advantages for all parties involved, including students, teachers, educational institutions, and communities as a whole (Gaevi et al. 2015). This is due to the fact that teachers are increasingly becoming aware of the benefits of integrating data into their lesson plans. Despite the fact that Ferguson et al. (2016) published a review on policy

recommendations for learning analytics, Papamitsiou and Economides (2014) published a review on the identification of learning analytics research objectives and challenges, Kilis and Gulbahar (2016) published a review on learning analytics in the context of distance education, and Larrabee Snderlund et al. (2018) published a review on the effectiveness of learning analytics interventions; however, there is currently no ongoing systematic review of learning analytics.

The term "study success" refers to a broad variety of academic accomplishments, ranging from the most notable (attending and graduating from a well recognised institution) to the most unremarkable (completing all of your homework) (Sarrico 2018). The academic results of children are impacted in several ways, including the curriculum that is taught, the activities that take place in the classroom, and the connections that develop between students and teachers. There are a number of aspects that contribute to a student's level of success or failure in the classroom, including their age, gender, level of motivation, and previous academic accomplishments (Bijsmans and Schakel 2018; Tinto 2005). The value of a research is directly correlated to its capacity to demonstrate that students' perceptions of their own experiences, abilities, and levels of satisfaction have improved during the course of their education. Pistilli and Arnold were among the first faculty members to suggest that the information obtained from students' usage of learning analytics may potentially improve their students' grades (2010). In recent years, educational researchers, practitioners, and decision-makers have made significant advancements in the field of learning analytics. Despite these advances, however, they continue to face significant challenges in developing and implementing learning analytics methodologies and systems that ensure the highest possible levels of student performance (Gaevi et al. 2016).

Results and Discussion

Table 1: Regression analysis

R	R Square	Adjusted R Square	
.895a	0.802	0.798	
ANOVA	Sum of Squares	F	P sig
Regression	141.921	190.11	.000b
Residual	35.086		
	B	t	P sig
(Constant)	0.323	1.971	0.05
Enhancing competency level	0.347	4.157	0.00
Better performance	0.34	3.936	0.00
Creating better curriculum	0.212	2.89	0.00
a Dependent Variable: Learning analytics			

From table 1, the value of R squared is 0.798 which shows the data is more reliable and valid. The F value is at 190.11 with the significance value of 0.00, hence it can be stated that the variables are significant. The regression equation can be stated as

Y (Learning analytics) = 0.323 + 0.347 x Enhancing the competency level + 0.340 x Better performance + 0.212 x Creating better curriculum

Table 2: ANOVA between Enhancing competency level of the students and implementation of learning analytics

ANOVA	**SS**	**F**	**P sig.**
Between Groups	148.473	182.115	0.00
Within Groups	28.534		
Total	177.007		
Levene Statistic	54.149		
P sig.	0.00		

Based on the table 2, it is noted that there is a mean difference between Enhancing competency level of the students and implementation of learning analytics. Hence, learning analytics supports in increasing the overall competency of the students in an effective manner.

Table 3: ANOVA between Better performance of the students and implementation of learning analytics

ANOVA	SS	F	P sig.
Between Groups	142.433	144.186	0.00
Within Groups	34.574		
Total	177.007		
Levene Statistic	53.456		
P sig.	0.00		

Based on the table 2, it is noted that there is a mean difference between Better performance of the students and implementation of learning analytics. Hence, learning analytics supports in augmenting the better performance of the students in an effective manner.

Table 5: ANOVA between Creating better curriculum and implementation of learning analytics

ANOVA	SS	F	P sig.
Between Groups	140.147	133.076	0.00
Within Groups	36.86		
Total	177.007		
Levene Statistic	17.008		
P sig.	0.00		

Based on the table 2, it is noted that there is a mean difference between Creating better curriculum and implementation of learning analytics. Hence, learning analytics supports in creating better curriculum in an effective manner.

Discussion

Many schools throughout the world are now revising their teaching methods to better prepare their pupils for the complex and uncertain world they will inevitably enter (Buckingham Shum & Deakin Crick, 2016). Obviously, learning the specifics of one's chosen job is crucial, but there's also a rising need for more transferable abilities that can be applied in a variety of contexts (Barrie, 2012; OECD, 2019). It is not quite clear how these general abilities are learnt or made simpler, despite the fact that higher education (HE) has started to pay greater attention to them since they are necessary for the future (Barrie, 2003; Hershkovitz et al., 2016; Virtanen & Tynjälä, 2019). Learning analytics (LA) may help with this problem by pinpointing and validating important markers of the learning phenomenon

as a whole, and by promoting evidence-based practises and therapies that were previously impractical (Buckingham Shum & Deakin Crick, 2016; Hershkovitz et al., 2016; Mangaroska & Giannakos, 2018). "the measuring, collection, analysis, and reporting of data about learners and the surroundings" is what is meant by "learning analytics," or LA (Conole et al., 2011, para. 4). Using the vast amounts of data generated by the integration of technology into the pedagogical process, it is planned to satisfy the needs of several interested parties (Gaevi et al., 2017). That's what the research shows (Drachsler & Greller, 2012). The goal is to provide useful knowledge about educational practises and methods for boosting teaching, learning, and schooling (Siemens & Gaevi, 2012).

More research and development are needed to fully understand the potential benefits and drawbacks of LA as an element of learning and comprehensive competence development in HE, despite the fact that it appears to offer a number of promising approaches to gauge and capitalise on the growth of generic competences (Buckingham Shum & Deakin Crick, 2016; Gaevi, 2019). In this article, we describe a study that attempts to meet this need and add to the body of knowledge by providing new information about the types of skills and knowledge that will be essential for students in higher education in the future and how the application of LA can facilitate their development even further. Given that the demands of the modern workplace are always evolving and giving rise to new goals for competence development, it is essential that these future abilities be accurately identified and that the resulting learning outcomes be actively supported in practise. Additionally, a more in-depth comprehension of future skills paves the way for using emerging technology-enhanced approaches, such as LA, to speed up their creation. Case study methodology is used to address these concerns in this work (see Cohen et al., 2005; Denscombe, 2011). Due to their presumed importance in encouraging the development of future skills and the application of LA in practise, certain HEIs and the views of their teaching staff are given more weight (e.g., Voogt & Pareja Roblin, 2012; Rienties et al., 2018). This research adds to and expands upon the results of previous investigations and theoretical frameworks. More particularly, it is an effort to complement Ehlers' (2020) Future Skills Triple Helix-Model, which will be described in further depth below. The model's tripartite structure and the dimensions it uses serve as lenses through which the relevance of future competencies and the potential of LA may be examined from different vantage points and brought into alignment in HE (subject development, object, and social environment).

This essay will go as follows. The theoretical underpinnings of the research are laid out first, followed by a description of anticipated capabilities and a discussion of how they are currently portrayed in relevant policy papers and academic literature. Next, the foci of this study, the future competence components, are revealed. Learning analytics is then defined and its relationship to future abilities is explained within the theoretical framework. The value of generalizable, cross-disciplinary skills is rising over the world. Multiple names have been given to these skillsets, including "transformational competencies" (Marope et al., 2019), "future competencies" (Marope et al., 2018), and "critical competences" (Council of the European Union, 2018). (OECD, 2019). Competencies (Ananiadou & Claro, 2009), soft skills (Robles, 2012), graduate attributes (Barrie, 2012; Hager & Holland, 2006), and general employability skills are some of the other names for these talents (Bowden et al., 2000). Because of the lack of clarity around these terms, a variety of interpretations have arisen. They're commonly used interchangeably (Rigby et al., 2009; Sin & Reid, 2005). In this study, the phrase "future capabilities" is used to define the transferable talents that higher education (HE) students might utilise to prepare for and succeed in emerging professional contexts. Competencies of the future prepare students to work effectively and independently in a variety of settings (Ehlers, 2020). They are said to include not just the application of knowledge and ability, but also the mobilisation of intangibles like one's attitude and sense of purpose (Binkley et al., 2012; OECD, 2019; Rigby et al., 2009). Competencies of the future include a lot more than just a set of generic skills and knowledge. They are broad and cross-disciplinary in the sense that their study and application need expertise from a variety of fields (Barrie, 2012; OECD, 2019). This does not mean, however, that they are not inextricably linked to the skills, knowledge, and attitudes that are unique to a certain discipline (Barrie, 2012; Hyytinen et al., 2019).

Numerous perspectives have been utilised to talk about future skills. Numerous articles have been published on the topic, and there is a growing need for educational change on a global scale (Wang et al., 2019). However, there still does not seem to be a common understanding of what exactly these broad skill sets include, despite the growing interest in the topic (Treleaven & Voola, 2008). Future competences are commonly identified and characterised in terms of their importance in terms of employability and subsequent performance in the labour market, as both Rigby et al. (2009) and Treleaven and Voola (2009) have noted (2008). According to studies, these broad skills are very valuable to prospective employers when evaluating graduate students (e.g., Finch et al.,

2013). Research on the most effective methods of career preparation for students has been conducted in tandem with academics and professionals from the working world. An example of this is the Assessing and Teaching of 21st Century Skills (ATC21S) study, which was supported by IT giants including Microsoft, Cisco, and Intel. It took place between 2009 and 2012 to complete. The study's foundation was a comprehensive analysis of existing frameworks for measuring 21st-century talents throughout the globe, from which emerged a model for characterising and assessing these competencies (Binkley et al., 2012).

Conclusion

A broader global perspective is being used in the process of defining and classifying abilities that will be useful in the future. They are intended to facilitate your growth as a person in preparation for the difficulties that you will face in both your professional and personal lives (Rigby et al., 2009). Through a diverse set of programmes and structures, major international organisations such as the OECD, the European Union, and the United Nations Educational, Scientific, and Cultural Organization have also worked to address these more fundamental problems (UNESCO). In addition to this, a number of nations and international organisations on a national scale have also enacted their very own law that has some of the same undertones (Wang et al., 2019). The development of a broad variety of skills is the subject of a great number of models and research. These skills include critical thinking and problem solving, teamwork and communication, ICT literacy, creativity, and learning literacy (Van Laar et al., 2017; Voogt & Pareja Roblin, 2012; Wang et al., 2019). As a result of this, there is widespread consensus that it is necessary for people to develop abilities connected with social awareness, cultural awareness, and ethical awareness (Van Laar et al., 2017; Voogt & Pareja Roblin, 2012). The majority of the time, the frameworks do not concur on the scope, total number, or subset of skills that need to be included in them (Van Laar et al., 2020). In addition, there are cultural differences that are shaped by the environment of the situation (Wang et al., 2019). As a result of the multifaceted and interdisciplinary nature of future skills, a great number of models urge that educational institutions concentrate a greater emphasis on integrating them across subject areas (Voogt & Pareja Roblin, 2012).

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