
Exploring Data Driven Youth Character Education Frameworks: A Systematic Literature Review on Learning Analytics Models and Participatory Design

Análisis de la educación del carácter de la juventud en los estudios basados en big data: revisión sistemática de la bibliografía sobre los modelos analíticos de aprendizaje y diseño participativo

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Abstract: Character development requires not only high-quality curriculums, but also educators who are able to adapt programs to learners' needs and context and staff development strategies. Big data and learning analytics strategies may improve youth character development especially in developing countries facilitating educators' development and practical wisdom, as well as curriculum implementation's effectiveness in countries with less knowhow in the issue.

This study presents a systematic mapping literature review on the models and methods of learning ana-

lytics applied in the improvement of youth character education. Based on the literature review results, the research provides insights for future research and implementation of character education programs, and proposes a revised participatory knowledge management data-driven procedure that may facilitate educators to identify and undertake the best character formation actions in specific situations.

Keywords: Learning Analytics, Knowledge-management, Big data, Character education.

Resumen: El desarrollo del carácter no sólo requiere programas de alta calidad, sino también educadores que puedan adaptarlos a las necesidades y al contexto de los alumnos, y estrategias de desarrollo del personal educativo. El *big data* y las estrategias de analíticas de aprendizaje pueden mejorar el desarrollo del carácter de los jóvenes, especialmente en países en vías de desarrollo, facilitando el desarrollo y la sabiduría práctica de los educadores, así como la efectividad de la implementación del currículo en países con menos experiencia sobre el tema.

Este estudio presenta una revisión sistemática de la bibliografía sobre los modelos de analíticas del

aprendizaje utilizadas en la mejora de la educación del carácter de la escuela secundaria. Basada en los resultados de la revisión bibliográfica, la investigación proporciona información para futuros estudios y para la implementación de programas de educación del carácter, y propone un modelo revisado de gestión del conocimiento basado en la participación y orientado por datos, que puede ayudar a los educadores a identificar e implementar la mejor acción formativa del carácter en situaciones específicas.

Palabras clave: Análisis de aprendizaje, Gestión del conocimiento, *Big data*, Educación del carácter.

INTRODUCTION

Some studies show that the quality of education in a country is an important predictor of its economic growth and social development (Fägerlind and Saha, 2014), especially when educational systems foster adolescents' moral development (Hunter, 2008): they acquire skills that are vital for democratic societies (Althof and Berkowitz, 2006).

Despite considerable economic and educational progress in several developing regions, youth and children continue to face challenges in positive development. In Latin America, violence and exclusion continue to increase (Rivas, 2016). Something similar happens in Sub-Saharan African region, where youth developmental challenges include low human capital investment outside of school, female segregation, etc. (García and Fares, 2008). "Youth in Africa struggle with poor health conditions, including diseases ..., unhealthy behavior, violence and substance abuse" (Gyimah-Brempong and Kimenyi, 2013, p. 13). Character education, defined as "the deliberate effort to develop the virtues that enable us to lead fulfilling lives and build a better world" (Lickona, 2004, p. 228), is an effective alternative to tackle some of those challenges. It promotes core ethical values (Smagorinsky and Taxel, 2005), builds prosocial skills (Lassiter and Perry, 2009, pp. 54; 73), fosters higher levels of educational outcomes and higher levels of expressions of love, integrity, compassion, and self-discipline (Jeynes, 2019). However, character development programs are effective if include program evaluation and staff development that facilitate educators to adapt the programs to students' needs and contexts (Berkowitz and Bier, 2004; Lickona, 1996). Character education programs should be tailored for the population they serve: "one-size-fits-all approach does not meet the many diverse needs of schools and communities, and can potentially exacerbate problems" (Lewis, Robinson and Hayes, 2011, p. 229).

In character development, evidence-based design and evaluation facilitate adaptation and effectiveness (Marsh, Pane and Hamilton, 2006; Nsamenang and Tchombé, 2012) not only through systematised data but also helping professionals “... to reflect on the specificities of the situation and negotiate dilemmas in order to reach virtuous outcomes” (Harrison and Khatoon, 2017, p. 11). Although skills like literacy could be evaluated through standardized tests and quantitative data, accountability of character growth interventions requires development of educative community understanding of what to do to foster it (Lickona, Schaps and Lewis, 2007), through interpersonal dialogue, which requires cooperative discussions on community practices that would improve students’ behaviours. Information and communications technologies (ICTs) facilitate that (Picciano, 2012). Big data (BD) and learning analytics (LA) applications are driving innovation and growth (OECD, 2013), improving social policies (Rodríguez, Palomino and Mondaca, 2017) and education effectiveness, giving educators access to data about background, character, lifestyle, etc. (Education World Forum, 2019). “Can big data bridge the gap between knowing and doing? It could. But only if those collecting and using big data to shape national conversations fess up to the limitations of these instruments” (Robertson, 2019). Data would improve character education not only through information but also facilitating community conversations and collaborations to identify and undertake the best moral formation action in a specific situation.

This study will be structured as a reflective essay on how learning analytics could be used to improve character education in schools, which is particularly relevant in developing regions, where ICTs applied to education are growing faster than in developed countries (Gasevic, Dawson and Jovanovic, 2016; UN Global Pulse, 2012). After presenting the results of a systematic literature review, and based on its results, we will present a revised version of an educational model to enhance data-based decision making in schools (Schildkamp, Poortman and Handelzalts, 2016). The new model may facilitate further applied research on the topic and become a tool for introducing community data-driven decision-making in character development programs.

EDUCATION INTERVENTIONS AND DATA-DRIVEN DECISION-MAKING

In the last decades, developing regions like Latin America and Sub-Saharan African (SSA) countries applied important reforms to expand and improve education quality. For example, Chile, Brazil and Mexico focused their efforts in the improvement of students’ learning results and application of assessment systems through

tests as leading mechanisms, while Argentina and Uruguay provided new resources for schools (Rivas, 2016). Simultaneously, South Africa provided high-quality books to students and training to teachers on lesson plans strategies. Something similar was done in Kenya and Uganda (Conn, 2017). Policy reforms implied its re-centralisation through curricular changes, new textbooks, and quality assessments, in some cases without any kind of governance, training or positive impact (Rivas, 2016).

Although countries like Chile, Brazil, Mexico and Colombia applied PISA (Programme for International Student Assessment) and UNESCO tests, and SSA countries like Botswana, South Africa and Ghana applied TIMSS (Trends in International Mathematics and Science Study), some developing countries educational systems continue to face quality and performance challenges (Martens and Niemann, 2013; Rivas, 2016). Students' low performance cannot be attributed to using data and evidence for educational management (World Bank, 2008). On the contrary, they would be a consequence of the lack of training on the process of evidence-based decision-making: "The introduction of new and reliable assessment instruments need to be supported by professional development programs in support of teachers introducing them" (World Bank, 2008, p. xvii). The most successful countries (like Chile or Peru) in terms of students' skills improvements took the lead in changing its educational policies' priorities based on evidence and knowledge management systems (Rivas, 2016).

Knowledge management (KM) is about using data to inform experience, expertise and judgment in the process of choosing, applying and evaluating a course of action. It is a rational model directed by data insights (Picciano, 2012) that grew in popularity with the development of two types of data strategies: BD and LA.

BD is '... a generic term that assumes that the information or database system(s) used as the main storage facility is capable of storing large quantities of data longitudinally and down to very specific transactions' (Picciano, 2012, p. 12). BD strategies imply the continuous collection and analysis of massive information. For LA we understand a set of tools, techniques and algorithms "used for capturing, processing, indexing, storing, analysing and visualising" (Ben Kei, 2017, p. 1). They are applied in education to predict performance, prevent drop out, segment groups, adapt curricula to specific needs, etc. (Sin and Muthu, 2015). LA is a key dimension of BD strategies (Ben Kei, 2017, p. 22), which would allow better management and matching of programs' curricula to students' needs (Drigas and Leliopoulos, 2014). Analyses of learning transactions can be used as a critical instrument for creating opportunities of curriculum improvement, teacher-student interaction, learner personal reflection, and program quality assessments that provide useful insights for managing an education institution. In fact, recent studies report higher education institutions that

improved students' degrees completion through data-driven decision making involving monitoring and analyses that optimized students' learning, identify and develop key attributes of good teachers, and test and evolve curricula (IBM Software Group, 2001; Picciano, 2012). In education, LA are used to personalise materials and experiences, receive feedback about instruction, and assess students' outcomes and behaviours to evaluate and maintain curricula, provide insights for students and teachers' selection and training, and organise institutional resources, thereby enhancing the decision processes (Romero and Ventura, 2010).

Despite the growing interest on the topic, previous studies are mainly focused on technological and statistical issues (Rojas-Castro, 2017; Sin and Muthu, 2015). A few are focused on pedagogical matters: Sin and Muthu (2015) report only 7 papers (in a sample of 90) focused on pedagogical models and character development. That gap is related to the lack of data-driven mindset in the education sector, complexity of data integration, limited users computational skills, high development cost of user-friendly tools, and data quality (Drigas and Leliopoulos, 2014; Marsh, Maurovich-Horvat and Stevenson, 2014). Those challenges may be overcome if the data-driven strategies include educators as active agents, and, especially in developing countries, do not require huge amount of financial investments and training.

LA IN EDUCATION: A MAPPING LITERATURE REVIEW

While BD strategies can be costly, there are LA successful self-designed interventions implemented with minimum investments on training and ICTs (using free of charge applications and any devices with internet connection –see Choi, Lam, Li and Wong, 2018). Considering the goals of our study, we will focus on the design of a LA framework applicable for data-driven decision-making in character education, which requires a synthesis of previous scientific research and case studies. That is one of the main goals of a systematic literature review (Booth, Papaioannou and Sutton, 2012; Cronin, Ryan and Coughlan, 2008): to focus a broad research topic for designing, refining, and applying theoretical models and strategies that will facilitate further investigations and implementations.

In the last few years, a few literature reviews on LA have been focused specifically on education (Avella, Kebritchi, Nunn and Kanai, 2016; Leitner, Khalil and Ebner, 2017; Li and Zhai, 2018; Muthukrishnan, Govindasamy and Mustapha, 2017; Rojas-Castro, 2017; Silva, Fonseca and Silva, 2017; Sin and Muthu, 2015). They proposed useful state-of-the-art reports, but did not consider focusing the analysis on character education. Moreover, their main limitation involves the lack of strategies (like web crawling) for indexing relevant literature in the three major

bibliometric databases: Google Scholar (GS), Scopus (SC), and Web of Science or WoS (Harzing and Alakangas, 2016). A few of them include GS (which provide broader coverage), and when they used it, the authors applied manual techniques without specifying the inclusion / exclusion criteria. For example, Sin and Muthu (2015) selected 90 articles from a total of 12,550 GS results. And Rojas-Castro (2017) did not use that database.

Consequently, the objective of this study is to offer a new systematic mapping literature review of the applied LA frameworks that avoids those gaps and provides an alternative for applying data analytics strategies in character education. To achieve that goal, we should answer a first research question (RQ): what are the main LA frameworks and models applied for data-driven character education in high schools? (RQ1). The results of that first analysis would help us to find out if applied LA strategies include a design that train educators to become protagonists of a broader KM process oriented to the development of organisational wisdom (RQ2), which should empower teachers to take and implement wise decisions in character formation. Finally, and considering the data presented in the introduction, those insights would lead us to discuss if LA strategies are applied for youth character development (RQ3).

METHOD

Following Booth, Papaioannou and Sutton (2012), we intended to generate a descriptive map of the pivotal frameworks and applications that would allow us to identify the key theoretical concepts and approaches (Cooper, 1988). For the purpose of this study, we decided to perform the literature review of GS, SC and WoS. The search period was wider than previous reviews and set from 2008 to 2018 to investigate the most important (based on publications' citation rate) and recent trends.

Based on the most cited published reviews, we extracted two keywords in combination to make the indexing task valid and easier: "Educational Data Mining" (EDM) and "Learning Analytics" (LA). For SC and WoS, we applied the advanced search functions. For indexing GS, we used a free software program (Harzing, 2007) that automatically retrieves academic citations and metrics.

Once we indexed the literature, we applied the following inclusion criteria:

- related to data and analytics for children and youth education;
- published in English, Spanish, or Portuguese;
- published in academic journals or other outlets that apply peer review methodology;

–ranked by number of citations in the first quartile of the indexed database or provide a theoretical framework for developing data-driven decision-making in schools or youth character development.

We excluded duplicated records, literature reviews, papers focused exclusively in coding, technology or eLearning (mainly MOOCs) without a reference to decision-making processes in education, and papers that could not be retrieved for inspection.

We applied a four-stage selection process. Table 1 shows the results of the first phase at which we identified relevant studies using defined search items and timeframe.

Table 1. Search results for Keyword

KEYWORD	GS	WOS	SC
learning analytics	1,335	1,236	1,747
educational data mining	1,052	612	779

In the second stage, we applied the defined inclusion / exclusion criteria. This second filter reduced the number of documents to 108 records that accounted for 17,216 citations, or 19.98 % of the total citations in GS on the two searched keywords. The majority (95%) of the retrieved dataset was indexed by GS. Therefore, we consider it as the reference database for further analysis. Table 2 shows the main quantitative details on the year of publication. Data reveals a growing interest from 2008 in the two topics but particularly in LA from 2013.

Table 2. Articles by Year indexed by GS

	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
LA	67%	80%	75%	62%	57%	52%	45%	38%	9%	0%	2%
EDM	33%	20%	25%	38%	43%	48%	55%	63%	91%	100%	98%

The literature reviewed covers a wide range of topics and themes. Therefore, in the third stage of the analysis, and following Muthukrishnan *et al.* (2017), we classified the 108 records using a bottom-up approach, which consists of extracting the classification theme by reading the selected documents:

1. Introductory and conceptual (44 documents): these documents provide a definition, explain the importance for education, present applications and techniques for data collection and mining, and review other articles as well as general information on the matter
2. Data mining and tools (31 documents): these documents focus on applying techniques and methods to mine educational data and extract useful information on performance, students' profiles, and so on
3. Frameworks and cases (22 documents): the documents included in this category discuss different ways of introducing data-driven decision-making, present case studies or applications in educational settings, and attempt to integrate the topics into the wider issue of pedagogical models.
4. Performance (5 documents): these documents are focused on the design and applications of technology and algorithms for predicting and measuring students' performance
5. Character and behavioural change (6 documents): these documents explain the design and implementation of projects that attempted to improve youth character strengths or behaviours.

Finally, in the fourth step of the process, we selected 20 publications that provide a framework for developing wise, data-driven decision-making in high schools and accounts for a 14.86 % of the citations of the dataset retrieved in the second stage.

RESULTS

Considering the purpose of this research, we focused the final analysis in the following two main categories: "Frameworks and Cases" and "Character and behavioural change".

Table 3 lists the final dataset that included 20 papers used in this section.

Table 3. Mapping literature review final dataset

	Dekker, Pechenizkiy and Vleeshouwers, 2009
	Elias, 2011
Character and behaviour	Jayaprakask, Moody, Lauría, Regan and Baron, 2014
	Kondo, Okubo and Hatanaka, 2017
	Romera, 2018
	Watson and Christensen, 2017

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	van Barneveld, Arnold and Campbell, 2012
	Chatti, Dyckhoff, Schroeder and Thüs, 2012
	Dishon, 2017
	Dyckhoff, 2014
	Greller and Drachsler, 2012
	Klašnja-Milićević, Ivanović and Budimac, 2017
Frameworks and cases	Lonn, Aguilar and Teasley, 2013
	McCoy and Shih, 2016
	Piety, Hickey and Bishop, 2014
	Rodríguez, Truffello, Suchan, Varela, Matas, Mondaca y Allende, 2016
	Romero, Ventura, Pechenizkiy and Baker, 2010
	Siemens, 2013
	Song, Ren and Zhang, 2017
	Yu and Wu, 2015

The reviewed documents covered several topics showed in the main keywords used by the authors. They highlight the data-centre approach relevance: analytic approaches, tools for sense-making, understanding learning, data-driven decisions, student behaviour monitoring, behavioural analytics, student engagement, data literacy, practitioner research, learning environments, enrolment management, institutional research, detection of at-risk students, machine learning, lifelong learning, urban inclusion, little data, open data, performance prediction, personalized learning, progressive education, action research.

Literature shows a growing development of frameworks and models (RQ1) with two levels of analysis: the macro level for understanding institutions (school) and groups (class), which use BD strategies, and the micro level (little data) for analysing individuals' profiles and behaviours through LA (Piety *et al.*, 2014). BD and LA are strategies that addresses key challenges such as learners' experience; engaging, effective evidence-based decision making; and strategic adaptation to societal trends (Klašnja-Milićević *et al.*, 2017). Data analysis is intended not only for situational sense-making, but also for systematic instructional personalisation through prediction of learning contexts, discovery of behaviour-learning relationships and production of data-driven knowledge (Klašnja-Milićević *et al.*, 2017). The relevance of analytics in education and the unique properties of educational data (fragmentation, human manipulation, limitations in terms of precision, and comparability across different areas that can be impacted by contact variation) indicates

the necessity of a science that would build the human capital necessary to work with educational data (Piety *et al.*, 2014).

Klašnja-Milićević *et al.* (2017) present a four stages general process (data, information, knowledge and practical value) that require to collect, classify, summarize, synthesize, evaluate and decide about educational data. That model agrees with Song, Ren and Zhang (2017), and implies a data mining system supporting multi-structured data sets through independent platforms, easy-to-use interface, analytic modules, and embedded statistical functions. LA models include seven main components: “collection, storage, data cleaning, integration, analysis, representation and visualization, and action” (Siemens, 2013, p. 1392).

Studies show that LA would benefit and be integrated with reflective educational practices such as Action Research (AR), a method for boosting educators’ empowerment and continuous learning which, after developing a research question and plan, collect, analyse and reflect on data for developing an action plan (Dyckhoff, 2014). Chatti, Dyckhoff, Schroeder and Thüs (2012) propose a reference model for LA that has four dimensions: the data that the system gather and use, the target and stakeholders of the analysis, the goal of it, and the applied method, techniques and processes. Greller and Drachsler (2012) propose an alternative model with two additional dimensions: the external and internal limitations, like the design and usability constraints, and the ethical and privacy issues of data management. Dyckhoff suggests an alternative model based on the previous ones, but presents educators as beneficiaries, and not stakeholders. Quoting Siemens (2013), the author states that the next generation of tools must be designed in a way that allows users to create their own analytics, interacts directly with data, and derives more meaningful information from it.

In fact, literature highlights the importance of educators’ participation and training (RQ2) in data collection and analysis (McCoy and Shih, 2016). One of the most prominent application areas of LA involve the creation and management of user knowledge (Siemens, 2013). Evidence from different timescale contexts (immediate, close, proximal, distal, remote), on different targeted educational content and formats, and for different functions or goals (Piety *et al.*, 2014), shows there is a paradigm shift from performance-centred to educational process-centred. Data-driven educational interventions based in LA promote participatory design, peer-to-peer engagement and cross-departmental collaborations (Jayaprakash *et al.*, 2014; Siemens, 2013). From that perspective, some studies (van Barneveld, Arnold and Campbell, 2012; Dyckhoff, 2014; Greller and Drachsler, 2012; Lonn, Aguilar and Teasley, 2013; Siemens, 2013) raise the importance of collaborative models that involve several stakeholders (educators, researchers and also students) work-

ing together to support open and collaborative learning scenarios (Dyckhoff, 2014) and bottom-up approaches (Greller and Drachsler, 2012).

Although performance measurement was the initial objective of analytics in education, there are few LA interventions focused on youth character development too (RQ3): besides cognitive traits, the variety of non-structured information allows the identification of differences in students' personal experiences and deviant behaviours (Jayaprakask *et al.*, 2014). However, the heterogeneity of the educational data makes the work of educators more complex and interdisciplinary and requires specific and continuous training. Teachers are "... positioned to blend data-driven decision making with human judgement to impact the learning environment" ... [but they] ... encountered two types of data issues: data access barriers and data analytics skills deficiencies ... future research is needed to better understand how teachers integrate the insights from teacher-generated analytics into learning design" (McCoy and Shih, 2016).

DISCUSSION

This study presented a systematic mapping literature review on how LA are used to improve the impact of character development interventions. Data-driven decision-making is clearly more than assessment systems. Our results presented models for developing data-driven programs, and showed that LA could be applied in a participatory way that empowers educators as a part of a broader KM process oriented towards the development of character. However, we would like to highlight that previous studies have the following relevant limitations:

- a. They usually consider educators and educational community as targets or stakeholders, but not as active agents and protagonists of the LA process.
- b. There are a few studies on the usefulness of LA for curriculum design and pedagogical reflection. Furthermore, we could not identify any research on the application of LA for virtues development in young people.
- c. Analysed literature presents the cost of LA technologies as an important constraint for its implementation in schools, although there are free of charge applications that could be used with enough training and proper design (Choi *et al.*, 2018).

Although it is clear that LA facilitates the collection and organisation of data as well as the algorithms for analysing it, human knowledge plays a critical role in the decision-making process. Whether the data generated is used in character

development programs design, implementation and assessment, knowledge and ethics should guide its use (Pauleen and Wang, 2017): from a critical perspective, ICTs require professionals who must be capable of controlling them for the common good. That is the role of wisdom, a virtue that is vital for personal and organizational action (Schwartz, 2011), that uses knowledge, skills and reason, and enables decision-making and action. Wisdom implies good discernment and decision-making, bridging theory and practice through a path that begins with experience and returns to experience (Coulter and Wiens, 2002). But wisdom is more than knowledge: it implies not only a cognitive dimension, but also a reflection on events and experiences as well as a sympathetic and relational dimension that should consider other's well-being and personal development, as an important aspect to consider in decisions and actions (Ardelt and Edwards, 2016; Ekmekçi, Teraman and Acar, 2014). Data and LA strategies could improve character development programs design and effectiveness, but they require active participation of educators and relational processes of collective knowledge generation.

Based on the concept of collective wisdom or the wisdom of the multitude (Waldron, 1995), some studies have pointed out the characteristics of wise social research and organisations (Uggerhøj, 2012), which are those where there is embodied learning, ethical deliberation and decision-making, shared sustainable vision, and personal wisdom development (Rowley and Gibbs, 2008). From this perspective, wise education institutions and character development programs are those that use data, but also create collaborative knowledge and develop organisational wisdom. In fact, some of the reviewed studies highlight the importance of collaborative knowledge management in the design and implementation of data driven character education frameworks. Although one of our primary objectives (RQ2) was to analyse applied KM processes in LA models, our results indicate that we should explore possible synergies between LA and KM frameworks in the field of character development. In that sense, “one of the most famous knowledge creation models, which is the process oriented model, is the Nonaka and his colleges’ SECI (socialisation, externalisation, combination, and internalisation) model” (Harmokivi-Saloranta and Parjanen, 2018, p. 39) of KM (Nonaka, 1991; Nonaka, Takeuchi and Umemoto, 1996). SECI was the basis for the development of an evidence-based model applied in education: Data Teams procedure (Hubers, Poortman, Schildkamp, Pieters and Handelzalts, 2016; Schildkamp and Poortman, 2015; Schildkamp *et al.*, 2016). “In examining the role of knowledge processes in shaping innovation dynamics it is virtually impossible to ignore Nonaka’s knowledge creation theory” (Hislop, Bosua and Helms, 2018, p. 110). In 1991, Nonaka published a seminal paper that showed how a four-step model could help in gen-

erating a spiral of knowledge among company employees, which externalise their knowhow, reflect on their own experiences, integrate them with others, and use that explicit knowledge to improve one's own tacit knowledge base. The model was proposed as a paradigm for managing and improving organisational knowledge (Nonaka, 1994; Nonaka, Takeuchi and Umemoto, 1996). In recent years, the framework was used in education as the theoretical model of a standardised operating procedure called Data Teams.

Data Teams are '...groups of educators that can work and learn together as they engage in the process of using student data to examine and improve their craft' (Wayman, Midgley and Stringfield, 2006). They are professional learning communities using a standard data-driven procedure (Hubers *et al.*, 2016) that facilitates community conversations and collaborations to identify and undertake the best moral formation action in a specific situations through an eight stages process: problem definition, formulation of hypotheses, data collection, data quality check, data analysis, interpretation and conclusions, and evaluation (Schildkamp *et al.*, 2016). In order to enrich Data Teams models with the main models identified through the systematic literature review (Chatti *et al.*, 2012; Greller and Drachler, 2012; Klačnja-Milićevi *et al.*, 2017; Siemens, 2013), we propose an inductively derived five-stages model (STREP):

Situation analysis: after collecting structured and unstructured data, Data Team members discuss and share knowledge on students' practices, competences and problems.

Team reflection: data is analysed using LA techniques to segment students' population into meaningful and actionable targets of educational programs (Rivera, 2016; Rivera, Santos, Brändle and Cárđaba, 2016). Reflection implies dealing with moral dilemmas and endorsing to a shared community project.

Resources analysis: Data Team searches and selects educational resources, improving curriculum implementation's effectiveness as well as students' participation in the process of program design.

Educational program preparation: Data Team personalises the educational program to adapt it to the different types of students and groups.

Program implementation and evaluation: evaluation provides feedback for further improvements both in the LA strategy and the educational program.

STREP model may facilitate teachers to build knowledge from data and generate personal and organisational wisdom. Simultaneously, its implementation would be a path to approach the main limitations of LA strategies, particularly in developing countries, which have limited training and financial resources.

Furthermore, a problem related with measurement of education is the ten-

dency of using it only as a way of standardising and auditing institutions and professionals (principals, teachers, and so on), without giving back to schools the necessary feedback and training that would allow them to implement real changes. A decentralisation process of education system, which facilitates the empowerment of principals and teachers' leadership roles in schools' decision-making based on a culture of continuous applied and formative research, would have a positive impact on students' personal and character development.

LIMITATIONS

The present paper offers a systematic mapping literature review on the role of LA strategies for the improvement of character education programs. To the best of our knowledge, this is the first study that not only summarises previous literature and frameworks with a focus on the topic, but also the first to incorporate KM in the design process of character development interventions.

Although our study is the first to carry out a mapping literature review using automatic retrieval of documents from the most comprehensive scientific databases (GS, SC and WoS), it has some methodological limitations related to the objectives and funds available. We had to take decisions for limiting the number of papers and documents that had to be read and could not access a panel of experts to validate the classification of the literature in the selected themes. Further research could work with the dataset we generated and submit it into a Delphi process for validating the final classification.

Finally, further empirical studies should validate the theoretical model presented in the last section of this paper.

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