Exploring Strength- and Growth-Based Learning Analytics: Possibilities and Challenges for New Data, Models and Tools*

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Abstract

As a counterpoint to a deficit-based approach to learning analytics, this paper helps concretize the conceptualization of asset-based learning analytics by unpacking some of the possibilities and challenges for new data, models and tools associated with a strengths-based approach to learning analytics. These include the opportunities and practicalities of surfacing and mobilizing students' funds of knowledge, the expansive possibilities of classroom discourse analytics that draws out the potential contributions of each and every student, and an initial exploration of the design space of asset-based teacher- and student-facing analytics tools in both individual and collaborative learning settings. The paper also briefly outlines a growth-based approach to learning analytics, as a contrasting alternative focusing on how students are developing and becoming in addition to what they have and can contribute. We hope this work offers a useful starting point for engaged conversation among researchers interested in innovating and advancing asset-based approaches to learning analytics.

Keywords

asset-based learning analytics, strength, growth, funds of knowledge, classroom discourse

1. Introduction

As a field, learning analytics has long attended to ethical questions associated with data-based education tools, for example those related to privacy, surveillance, human agency, and impact [1, 2, 3]. However, for quite some time specific consideration of equity remained on the margins of the work [4]. This left mostly unchecked and unexamined the ways in which learning analytics (intentionally or not) can reify existing systems, thereby perpetuating or exacerbating systemic biases and inequities [5].

With more recent recognition of the critical need to examine the ways in which learning analytics interact with existing systems of power, there has been a surge of work developing methods to examine questions of fairness and bias in models (e.g. [6]). This work is powerful in offering concrete tools for examining how models perform across different segments of a learner population. At the same time, there have been critical calls for a more justice-centered

LAK24 Workshop on Marrying Asset- and Deficit-Based Approaches: A Data Feminist Perspective in Learning Analytics, March 19th 2024, Kyoto, Japan

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approach to learning analytics [7, 8] that highlight the need to go beyond simply identifying and remedying problems in existing tools, particularly given such tools' general aim to promote "equivalent outcomes."

While well-intentioned, tools that aim to promote equivalent outcomes are inherently intertwined with deficit-based narratives in that they focus on identifying on what some students don't have or aren't doing that must overcome to help get them to a universal finish line (which may be set by a pre-defined standard or defined as the same as their peers). Following a simple rationalist cognitive logic this makes good sense, since once gaps are identified, students and instructors can work to ameliorate them. However, taking a broader perspective on learning that includes not just cognition and behaviors, but also attention to affect, self-concept, identity and more, such comparisons can also be found to induce anxiety, demotivation and questioning of one's own place in the academic endeavor [9, 10].

As a counterpoint to a deficit-based approach to analytics, several scholars have pointed to the potential to draw from the rich literature on asset-based approaches on teaching and learning, including funds of knowledge, culturally responsive teaching and others to develop an alternative (or complementary) approach [5, 7], but the details of what such a paradigm shift could look like have yet to be laid out in detail. In this paper we first explore the possibilities and challenges of developing asset-based learning analytics centered on the core concept of *strength*, we then briefly discuss an alternative approach we are working on centered on the core concept of *growth*.

2. Strength-Based Learning Analytics

At its core, the notion of strength-based analytics shifts focus from what students lack to what they bring to the table. This means generating learning analytics data, models and tools that surface students' relevant experiences, knowledge, skills, and cultural assets can be valuable resources for their current learning. Doing so necessarily values and elevates a pluralistic view of the diverse strengths, perspectives and funds that students bring when they enter the classroom [11] rather than narrowly focusing on a desired end-point of cognitive sameness when they leave. It also expands the bounds of current analytic practices by emphasizing a recognition of the socio-historical context of students' lives as an important influence on their learning [8]. While data feminism [11] and design justice [12] approaches highlight the importance of co-creation of such analytics with students and educators, these participatory design practices also need conceptual framing and starting points to be successful. Below we thus offer an initial exploration of the design space for strength-based learning analytics in terms of possibilities and challenges for new kinds of data, models, and tools.

2.1. New Data Needed: Considering a Funds of Knowledge Approach

A central premise of strength-based learning analytics is the expansion of what is valued in students. So while a strength-based approach can be imagined with the data typical of current learning analytics applications (e.g. cognitive data about knowledge and skills in specific domains, discourse data about how students contribute to class activities, and process data related to study habits, self-regulation; see applications in models and tools sections), this alone will be insufficient to embody the principles of inclusion, equity and recognition of diverse cultural assets at the heart of this endeavor. Thus generating new kinds of data to speak to

students' culturally grounded strengths, while guarding against the possibilities for harm of sensitive data is a foundational challenge to be addressed.

One promising, yet challenging, avenue builds on a long tradition of work considering funds of knowledge (e.g. [13, 14]). This research, deeply-steeped in the ethnographic tradition, historically combined home visits to better understand the cultural and life experiences which students draw from with critical examinations of existing classroom practices in order to innovate new ways of teaching that would develop strategic connections between the two. The pattern here works well with the modus operandi of learning analytics - surface historically "invisible" information (in this case family- and culturally-based strengths) to inform and inspire different ways of teaching. But the practicalities are quite thorny.

First, there is the question of if viable, valid and useful reification / quantification is possible in a paradigm with a long qualitative history whose intellectual roots intentionally resist neatly pre-defined categorization. Very few examples exist, and those focus largely on mobilization of funds of knowledge towards academic navigation generally rather than learning activities particularly (e.g. [15]). A qualitative approach to data generation that uses large language models for analysis might then be of interest, though critical concerns about bias would need to be satisfactorily addressed [16]. Second there is the concern that even if possible, such assessment could become extractive in nature, separating from students the very strengths that ought to foster their own agency. Finally, there is a danger of trivialization, where cultural characteristic are used for surface level of personalization (e.g. setting a data science problem to be about flavors of tacos) rather than deep integration for specific students with the curriculum (e.g. designing an investigation of the relationships among differences in ingredients, regulation and pricing of candies in Mexico and the U.S. in response to learning about the entrepreneurial nature of Mexican students bringing candy back with them to sell in Arizona [17]).

2.2. New Possibilities for Modeling: Expansive Identification of Possibilities

Without fully resolving the issues raised above, we move now to a consideration of the ways in which traditional, and potential new types of data could be modeled. Here three possibilities are worth exploring. First, identification of student strengths that they attempt to bring into the classroom space, but are not being recognized or valued. This is concerned with the spoken but unheard ideas that got lost in classroom conversations. This could be due to the speaker not being supported to articulate their ideas, peers / instructors needing support in translating a fresh perspective to something they can connect to, or a lack of space for co-articulation and co-elaboration of promising but under-received ideas. Such work could build on prior analytics work within the computer-supported collaborative learning community developing computational methods to track uptake of ideas introduced by one person by others in the learning community [18, 19]. Flipping the script, the algorithms would be used to identify the introduction of ideas that are not taken up [20] but could be, with the intent of driving tools to support more inclusive dialogue [21].

A second modeling approach would seek to connect student expertise not-yet-articulated to the existing curricular activities with the intent of revealing multiple entry points for students which with students could be invited or chose to step in from a position of strength. Here we might look to prior work on content analytics [22] for methods, particularly those related to recommendation generation; yet the value of such an approach will rely heavily on the quality

of the representations of students' strengths, reinforcing the criticality of the new data questions raised above.

Finally, a third modeling approach could seek to identify potential synergies between students' strengths and the larger set of possibilities associated with a course or learning activity. Different from the first two possibilities, this approach is inherently generative in nature and seeks to feed into questions of learning design by tackling the challenge of counter-narrative in terms of what different topics, examples, approaches could be possible. Here recently developed computational approaches using human-in-the-loop applications of foundational models seem most appropriate. Critical to success will be both attention to robust training data and the potential of multi-modality to include non-canonical sources (i.e. image-based, oral tradition), and skilled instructors to thoughtfully select among possibilities and bring this potential to life. While again, the value of such an approach will necessarily rely on the quality of the representations of students' strengths, the expansive potential here perhaps aligns most closely with the original vision and intent from the funds of knowledge work.

2.3. New Visions for Tools: Who, What, When and Why

While the discussion of data and models hinted at the kinds of tools that might be built, here we engage with the topic explicitly, considering the audiences of self, peers, and instructor. There is also potential to consider other, non-traditional analytics stakeholders as audiences as well, for example from families and communities.

Beginning with the self, key questions arrive around the form and timing of analytics delivery [23]. With the goal of supporting students' agency in contributing unique skill sets and ways of thinking into different topics under discussion, one could imagine an analytic app that monitors whole-class or small-group discussion to offer private prompts to students of where their prior experiences, knowledge, skills, or cultural assets could be resources for their current learning. This might prompt personal connections for their own benefit or ones they might be motivated to share with their peers. Another version of this would provide each student of a personal map of resources carried by their different identities (e.g., bilingual strength) with suggestions on how to leverage them in different contexts. In complement to such a real-time aid, we can also imagine prospective and retrospective modes for use outside the classroom, for example to prompt connections that could aid knowledge construction through reflection after class or one that identifies potential connections between student strengths and an upcoming lesson to help them prepare and plan for joint knowledge building in community. Both of these can thus support students' in advancing their self-regulated learning skills [24]. This latter mode also has the benefit of reduced concerns about surveillance and privacy compared with the other two which would require real-time discourse monitoring.

Moving to the peer audience, a parallel version of the real-time mode of the app could be imagined that aims to open up more inclusive spaces for collaborative learning, by surfacing to the group what each team member can bring (or has brought) to the table. Here tools could expand on existing classes of group awareness tools [25] that provide visualizations in communal ways to support group responsibility and socially-shared regulation. Finally, instructors might have access to both real time visualization of relevant student strengths to draw on and the prospective and retrospective modes described earlier to support their own reflection and planning activities. As a teacher will have a much greater number of students to attend to at one time, information presentation will have to be carefully designed to avoid being

overwhelming and perhaps selectively temporal in nature (i.e. relevant strengths of all students not shown all the time but a selection that varies over time based on weight of potential connection and/or who has not engaged recently). While there are many details to be figured out, the core idea is to help teachers see potential in each and every student, especially those experiences and whose perspective may have been marginalized rather than valued in the past.

3. Growth-Based Learning Analytics

Having explored some of the possibilities and challenges related to strength-based learning analytics, we now overview an alternative approach we have begun to work on centered on the core concept of growth. This provides a useful contrast that can both offer a different path to asset-based analytics construction and provide a reflective mirror that might help further hone the needs for the strength-based approach.

Growth-based learning analytics differ from strength-based ones in that rather than focus on what students have and can contribute, they draw attention to what students are developing and becoming. Thus growth-oriented learning analytics offering feedback that makes salient representations of how far students have come along paths they define as personally relevant (cf. [26] for a discussion on learner-centered authentic assessment practices). In thinking through the new kinds of data this might engender we can imagine, for example, a tool that lets students capture moments in which they find experiences, knowledge, skills, and cultural assets associated with their different identities connecting to their current learning ("moments of success"). New models could take into account students' prior preparation when setting a personalized baseline for tracking progress to celebrate growth and highlight how far they have come rather than reporting whether they match a pre-defined standard. This can be especially powerful in helping to recognize students' trajectories as "identities-in-development." Models might also be used to identify patterns in "moments of success" noted, thus identifying new skills to be added to their map of strengths. Finally, tools might share such trajectories and connections of assets with future students of similar profiles, inspiring strategies for mobilizing their strengths and resources.

4. Conclusion

In conclusion, this paper has attempted to help concretize the conceptualization of asset-based learning analytics by unpacking some of the possibilities and challenges for new data, models, and tools associated with a strengths-based approach and outlining the growth-based approach as a contrasting case. We see this writing as a work-in-progress offering a useful starting point for engaged conversation among researchers interested in advancing asset-based approaches to learning analytics.

Acknowledgements

The work reported in this manuscript was made possible, in part, by a grant from the Spencer Foundation (#202300165) who sponsored the LA4Equity workshop in May 2023 which sparked some of the thinking included in this writing. The views expressed are those of the authors and do not necessarily reflect the views of the Spencer Foundation.

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