

researching. Grounded within new learning theory [8], offer recursive feedback from multiple sources such as the CGScholar environment has been purposely learning analytic tools, crowdsourcing peer judgment, developed to effectively take advantage of e-learning teacher feedback, as students themselves produce affordances that take into account all learner-generated knowledge step by step throughout the course. To innovate assessments, we need to take advantage of big data and learning analytic tools. These collect and through the analysis of the data from the case study as we analyze tremendous amounts of data generated and evaluate quantitative and qualitative data in an effort to recorded related to learner behavior. Learning analytics shed light on the entire process. We also take into account can be used to make sense of these data, tracing the ways of the environment as a means to collect their data and platform and how to direct them to achieve their mastery generate an assessment through the learning analytics tool, level of learning, while holding them accountable of their The paper comes to a close with evaluative own learning with the support of instructors [5], [7]. considerations while drawing conclusions regarding the use of big data and learning analytics. Insights about adaptive and diagnostic testing, the use of natural future research will also feature as the feedback provided language processing technologies in assessments, and by the learners turned out to be instrumental and essential embedded formative assessments in digital and online within our research methodology. curricula. As a consequence, formative assessment is becoming much easier than before, and with this, the capacity to assess performance in meaningful and equitable ways. Integrating machine learning tools allows feedback to become instant, ubiquitous, more accessible, our everyday life from smartphones, wireless connections recursive and meaningful for all learners to advance at digital media apps, online learning models such as their own pace and develop a mastery level of learning MOOCs and big data bring an urgent need to rethinking assessments for the of 21st Century learners. Assessment An example of using learning analytics tools to has become an increasingly pressing educational priority promote better performance in higher education level is WR PHDVXUH Olande J. Hassel's teacher and been in CGScholar platform which we will discuss below school accountability in K-12 and higher education in more details. This paper presents a case study of settings alike. Often times, summative assessment has integrating learning analytics in an online course to predominated, at the expense of formative assessments innovate and improve assessments in higher education is important to distinguish between these two approaches settings. to aim for innovative assessments.

II. LITERATURE REVIEW

The ubiquity of technology innovations we witness in feedback to become instant, ubiquitous, more accessible, our everyday life from smartphones, wireless connections recursive and meaningful for all learners to advance at digital media apps, online learning models such as their own pace and develop a mastery level of learning MOOCs and big data bring an urgent need to rethinking assessments for the of 21st Century learners. Assessment An example of using learning analytics tools to has become an increasingly pressing educational priority promote better performance in higher education level is WR PHDVXUH Olande J. Hassel's teacher and been in CGScholar platform which we will discuss below school accountability in K-12 and higher education in more details. This paper presents a case study of settings alike. Often times, summative assessment has integrating learning analytics in an online course to predominated, at the expense of formative assessments innovate and improve assessments in higher education is important to distinguish between these two approaches settings. to aim for innovative assessments.

assessment is retrospective assessment of learning, typically a test at the end of a unit of work, a period of We present here a case study of a higher education course in the College of Education at the University of WLP H RU D FRPSRQH QW RI D SU Illinois, Urbana-Champaign. The targeted course in this mode of high-stakes standardized testing puts both addressed issues of pedagogy and it was taught in 58 students and teachers under pressure to pass the graduate level students during the first 8 weeks of the Fall examinations, but not necessarily assist in making sense semester 2018. of learning and knowledge construction. In this mode of The main course structure includes weekly Updates assessment, teachers are worried about how to help (like blog posts based on the topic of the week) created students pass the exam and in turn students become traumatized by the stresses such high stakes hurdles [9]. Update of the instructor with the various topics, which is distributed in the beginning of each week. Finally, the Furthermore, the meaning of these assessments is limited course requires students to create two multimodal Works FR PPH QW H D F K Z H H N R Q W K H L U S H H L U (one theoretical, the other practice-oriented) that are peer- Update of the instructor with the various topics, which is distributed in the beginning of each week. Finally, the course requires students to create two multimodal Works (one theoretical, the other practice-oriented) that are peer- reviewed and revised before the final submission and In this context, students are framed as knowledge review by the instructor. consumers and rigid replicators of processes, rather than review by the instructor. knowledge producers, or flexible real world problem solvers [10], [11]. The peer reviews are based on rubrics, that are created by the instructor, and guide students both in the progress as they produce knowledge through ongoing requirements of their Works, but also in the reviewing activities until reaching mastery level of learning. This process of peer Works.

should also take into consideration potential differences The design and delivery of course were based on the in their learning pathways, tracked via the process of social learning platform CGScholar (Fig. 1), created by formative assessments [8]. ³) RUPDWLYH DVVHVPPQW Dr. Bill Gope and Dr. Mary Kalantzis. The theory that supports the functionality of this platform is termed OHDUQHUV DQG WKHLU WHDFKHUV ³UHLHFLYH SHG DJR JJ' 7 Kddvssv D L S H J the needs that education presents in the contemporary [6], p. 207]. A key aspect of formative assessment is to

society, where learners need to be active participators of the learning process and knowledge producers, instead of passive consumers [12]. Through this lens, knowledge needs to be created and interaction. The web-based learning environment makes extensive use of social collaborative skills that learners are encouraged to adopt throughout their course of study as they join dedicated communities, posting updates and following the activities of their peers as well as their instructors. This rich environment also allows learners to provide feedback through social-media like comments together with generating knowledge through a typical online editing console.

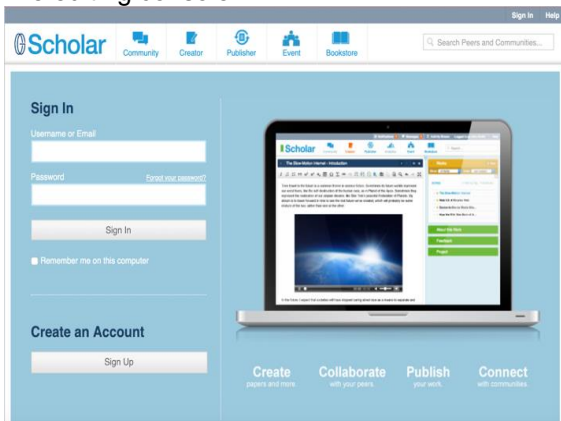


Figure 1. CGScholar interface.

Reflexive pedagogy in online environments is constructed with a view to optimizing the use of seven affordances of the digital, introduced by Cope & Kalantzis [12] as follows:

- x Ubiquitous learning (learning anywhere, anytime),
- x Active knowledge making (learner as knowledge producer),
- x Multimodal meaning (multiple digital media used in texts and representations),
- x Collaborative intelligence (peer-peer learning),
- x Metacognition (thinking about thinking),
- x Differentiated learning (addressing all students needs),
- x Recursive feedback (formative and constructive assessment).

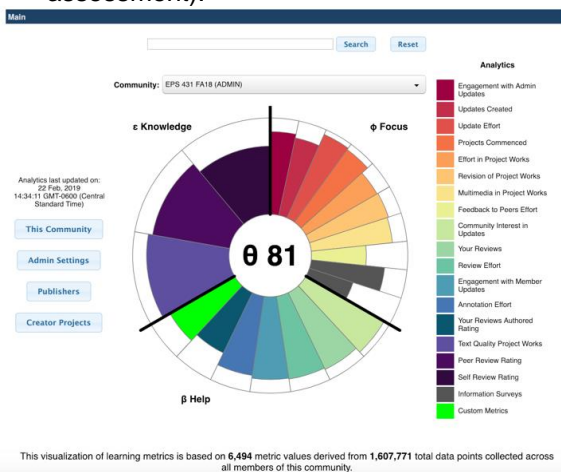


Figure 2. Aster Plot Learning analytics tool of CGScholar

This paper is centered around recursive feedback and its realization in CGScholar. To provide students with constructive feedback during the process of learning, the needs to be created and reporting of data about learners and their contexts, are encouraged to adopt throughout their course of study for purposes of understanding and optimizing learning as they join dedicated communities, posting updates and following the activities of their peers as well as their instructors. This process in CGScholar is realized through a visualization application that is an Aster Plot shows that information.

The platform gathers millions of data points for every single activity that students do in the course and these points are analyzed and displayed to students in the aster plot. Thus, every time a student does an activity in the platform, for example the creation of an Update, the Aster Plot shows that information.

The way this diagram is constructed corresponds to the principles of reflexive pedagogy with its measures of Knowledge, Help and Focus. Each of the petals represents a kind of task that students have to achieve in the course. In the middle of the aster plot, there is an average score of all the points the students gather through their various activities. By giving the opportunity to learners to have an instant visual representation of their progress in the course, the platform shows them how their learning is evolving and what more they need to do to improve. This is feedback that comes continuously during the course, rather than at the end of it.

IV. DATA ANALYSIS

A. The Quantitative Analysis

Twenty-three participant answered the survey out of 30 enrolled students. Below are the results from three survey learning analytics tool to improve their performance, which was used in this course.

Q1: I felt that the analytics Tool in CGScholar gave me useful information about my progress in the course.

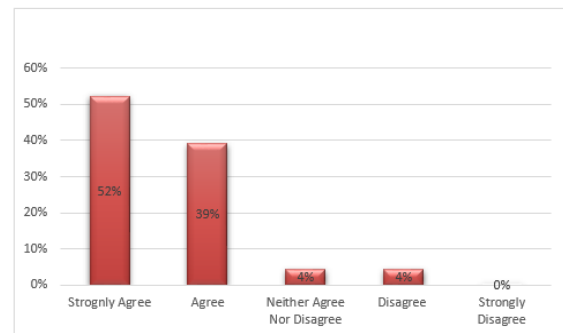


Figure 3. Level of agreements regarding the use of learning analytics tool

Findings have shown high level of agreement among students that the learning analytics tool was helpful to provide information for them to know where they are in the learning process and where they need to be to master learning. On average, 52% of the students were in strong agreement and 39% of them were in agreement with this

statement. Only 4% of the students did not agree with the usefulness of the learning analytics tool (see Fig. 3 above).

Q2: The analytics tool in CGScholar motivated me to contribute more than the requirements indicated.

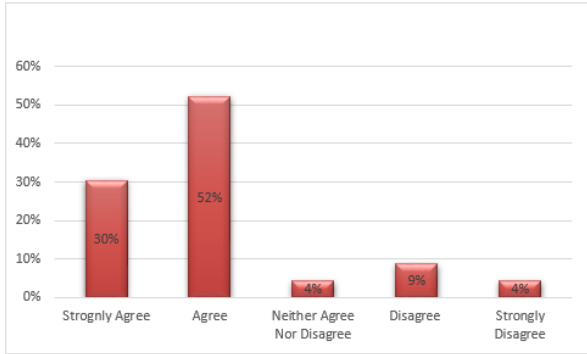


Figure 4. Level of Agreements regarding the use of learning analytics for motivation purposes.

Results indicate that nearly 82% of the survey respondents agreed that the learning analytic tool has motivated to a higher level of learning beyond their intended educational goal. Only, 13% of the students were in in disagreement with this statement (see Fig. 4).

Q3: I am more motivated by courses or study materials that allow me to work at my own pace.

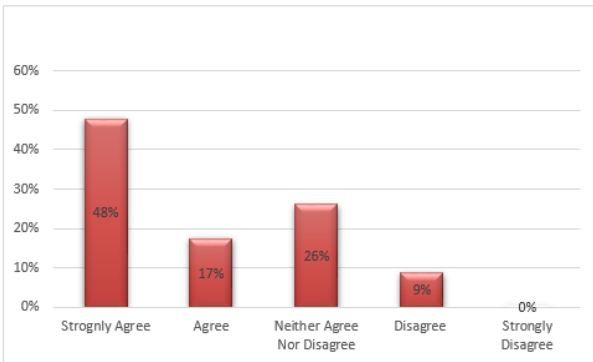


Figure 5. Level of Agreements regarding the use of learning analytics to optimize educational experiences.

Moreover, students reported a high level of agreement in regard to the potential benefits of this tool to optimize learning according to their needs and time availability. As it appears in the data analysis in Fig. 5, nearly 65% of the survey respondents were in agreement with this valuable feature of the learning analytic tool. Only, 9% were in disagreement with this statement and 26% of the students had a neutral opinion, neither agreeing nor disagreeing.

B. The Qualitative Data Analysis

In addition to the quantitative analysis, this study incorporated qualitative analysis of the open-ended questions of the survey. The purpose was to provide a learning analytics tool embedded in the software CGScholar that was used to facilitate the process of learning in the course. Data analysis of this section have

shown why students like this tool. Also, students indicated some concerns and challenges that can be taken into consideration to improve this tool in future courses.

their experiences of using the learning analytics tool. One made the grade I earned in the class my responsibility and highlighted routes for how I could improve. There was an easy way to see accountability on what I have accomplished and what I needed to continue to do to achieve the score. It works like gamification element and makes me looking forward to 'level up' and fill all the petals. I could be analytics area because it allowed me to see how I progressed through the course as more assignments were completed. The fact that I was able to see my grade continuously improve let me know that I was achieving the goals of the course. The analytical area was a great way to know where I was and what I needed to do through the course, instead of when it's too late.

While most of the students valued the analytics tool in CGScholar, some others have indicated issues of concerns associated with understanding how to use it at first. This was confusing. I ended question that we analyzed. Understanding this concern is significant to improve the tool in future courses or provide additional user instruction and support.

V. CONCLUSION

In this paper we have attempted to discuss the needs of new assessment to transform teaching and learning in the era of big data and learning analytics. We presented a case study from an online course at the University of Illinois Urbana Champaign to show how both big data and learning analytics can be integrated in an online learning platform to produce immediate feedback to learners, so they are aware of their progress and what to do to achieve mastery level of learning while proceeding at their own pace. Although this is a work in progress study, data analysis from the survey revealed interesting using the analytics tool. This study suggests that big data and learning analytics have the potential to improve assessments and optimize learning for all learners in online educational environments. Future research will include additional courses from various disciplines, including medicine, veterinary medicine and engineering to have a better understanding on how big data and learning analytics tools work in different contexts, and if perspectives.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Samaa conducted the research; analyzed the data; wrote the literature review; the data analysis section and the conclusion Anastasia presented the case study and the platform we used in this paper. Kerasto conducted the quantitative data analysis, Matthew wrote the introduction and edited the paper. Both Mary Kalantzis and Bill Cope both have reviewed and edited the paper. All authors had approved the final version.

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