Assignment 2:
CS6460: Education Technology

Steven Prichard
sprichard3@gatech.edu

***Abstract*—This work covers the ongoing research around which project will be selected as the final project for CS6240. This work is broken in to 2 parts, the research log which is a structured log of all research covered (Sections 1-5). The second part is the activity, where a literature backed analysis of the space surrounding this work will take place (Section 6).**

1. BACKGROUND

In terms of where I left off last week, there has been more ideas, none of which have been the no doubt, "thats it" idea. I am slightly concerned that in week 2, I still haven't found "the idea". However, I have been seeking out input from others, and have come up with a few themes for where I want to concentrate my research energy.

The themes are, possibly extending or integrating with existing tools or systems. Put a different way, what would be the most effective to extend Canvas? With this in mind I plan to focus on LMS's (Learning Management Systems) for a portion of my research log. Also, other themes have emerged around helping teacher/instructors while empowering student to do their best work. For these themes I plan to explore the short comings of distance learning and/or e-learning. Searching specifically for sources created in that last 3-5 year as I think this is the most relevant work.

The current leading idea I have is an integration between Canvas and Slack. We use Slack at work it is way of structure "public" discourse is something that I think could really help the classroom. Slack would be the "public square" where this system will automatically created channels for assignments as to encourage conversation scoped to that assignment. Allow instructors to track sentiment around what students are discussing in these channels as well as track participation. Since channels are reflections of work around a specific assignment or test, the instructor can have a better idea of how student are doing.

2. PAPERS

2.1 Paper

Bilgrien, N., Finkelberg, R., Tailor, C., Irish, I., Murali, G., Mangal, A., Gustafsson, N., Raman, S., Starner, T., & Arriaga, R. (2019). PARQR: Augmenting the Piazza Online Forum to Better Support Degree Seeking Online Masters Students. *ArXiv:1909.02043 [Cs]*. http://arxiv.org/abs/1909.02043

2.1 Found Via

Co-worker suggested it

2.1 Summary

Introduction of a system called "PARQR", which attempts to reduce the number of duplicate thread by constantly looking at post as the author is composing them. In testing PARQR correctly recommended relevant posts, if one exists, 73.5% of the time.

2.1 Take Aways

The appears to be a "market" for tools that reduce friction in the extension of LMS space. By having a tool that reduces the number of duplicate threads, you can focus the discuss in a more concentrated fashion. This work warrants further investigation

2.2 Paper

Kraleva, R., Sabani, M., & Kralev, V. (2019). An Analysis of Some Learning Management Systems. *International Journal on Advanced Science, Engineering and Information Technology*, *9*(4), 1190. https://doi.org/10.18517/ijaseit.9.4.9437

2.2 Found Via

Google Scholar search for "shortcomings of learning management systems" since 2019

2.2 Summary

This work focuses on studying the different LMS's out there, as the space has seen a boom in recent years. This work attempts to do a comparative analysis

of 36 different LMS's which can be broken into 3 major categories, Learning skills tool, Communication tools, and Productivity tools.

2.2 Take Aways

If the idea is to extend a LMS, I should really understand the shortcomings of these LMS. By doing this, I can better answer the "why", put another way, it help define the problem statement.

2.3 Paper

Muhisn, Z. A. A., Ahmad, M., Omar, M., & Muhisn, S. A. (2019). The Impact of Socialization on Collaborative Learning Method in E-Learning Management System (eLMS). *International Journal of Emerging Technologies in Learning (IJET)*, *14*(20), 137–148.

2.3 Found Via

Google Scholar search for "shortcomings of learning management systems" since 2019

2.3 Summary

This work focuses on the impact of e-learning on the socialisation amount student in Iraq. The study contains 109 undergraduate student, who took surveys to show that knowledge could be successfully transferred from lecturer to student via a LMS or eLMS (e-Learning Management System).

2.3 Take Aways

This work is fuel to the fire that LMS's work. Could be used to prove the need, and validate that LMS's are a successful median for student/teacher interaction.

2.4 Paper

Schmitt, U. (2019). Designing decentralized knowledge management systems to effectuate individual and collective generative capacities. *Kybernetes*, *49*(1), 22–46. https://doi.org/10.1108/K-03-2019-0215

2.4 Found Via

Google Scholar search for "shortcomings of learning management systems"

2.4 Summary

This work attempts to identify the shortcomings of KM's (Knowledge Management) tools. Early signs showed that the systems descried in this work were successful in allowing diverse knowledge to be shared effectively.

2.4 Take Aways

Another example of positive impact of LMS's or KM's. This paper is very hard to read however, So I won't be using it in further work.

2.5 Paper

Songhao, H., Saito, K., Maeda, T., & Kubo, T. (2011). Evolution from Collaborative Learning to Symbiotic E-Learning: Creation of New E-Learning Environment for Knowledge Society. In *Online Submission* (Vol. 8, Issue 1, pp. 46–53). https://eric.ed.gov/?id=ED519417

2.5 Found Via

Google Scholar search of "e-learning management system "collaborative learning method""

2.5 Summary

This work expresses the importance of learning anytime, anywhere, anybody. As well as give 5 points as basic requirements for the construction of an e-learning environment which can satisfy the demand of an evolving learner.

2.5 Take Aways

This paper should be used in future work, as the idea around having Slack be the public square for a course allows for this "anytime, anywhere, anybody" concept to be realized in a tool. Further investigation into this work is needed

2.6 Paper

El Mhouti, A., Erradi, M., & El Makhfi, N. (2019). A Multi-Agent System of Semantic Analysis and Filtering of Modeled Traces to Calculate Interaction Indicators Favoring Collaboration in LMS. *2019 International Conference on Intelligent Systems and Advanced Computing Sciences (ISACS)*, 1–7. https://doi.org/10.1109/ISACS48493.2019.9068907

2.6 Found Via

Google Scholar Search, "e-learning management system collaborative learning method"

2.6 Summary

This work focuses on creating a system, and subsequently a prototype, for collecting, modeling, transforming, visualizing, and storing interaction data as to calculate interaction indicators helping tutors make optimal decisions support collaboration.

2.6 Take Away

This work is evidence that there could be a use for advanced analytics around student interaction such that a tutor or mentor could encourage or promote collaboration. This work could help drive some analytics features in the Slack/Canvas integration idea.

2.7 Paper

Alzain, H. A. (2019). The Role of Social Networks in Supporting Collaborative e-Learning Based on Connectivism Theory among Students of PNU. *Turkish Online Journal of Distance Education*, *20*(2), 46–63. https://doi.org/10.17718/tojde.557736

2.7 Found Via

Google Scholar Search, "e-learning management system collaborative learning method"

2.7 Summary

This work focused on the role of 2 social networks (Google & Edmodo) in supporting collaborative e-learning based on concepts of Connectivism. 2 questionnaires were used, one to identify the challenges in collaborative learning, and the other was designed to identify the role of social networks. Results showed a positive impact of social networks in supporting collaborative e-learning.

2.7 Take Away

This work could be used to show the positive impact of the "public square" model of the Slack/Canvas integration idea. If the Slack workspace if treated as a social network, where users are connected via channels, then is work is evidence of a potential positive impact.

2.8 Paper

Khan, M., Naz, T., & Mahmood, K. (2019). Using Blockchain to resolve Database Distribution and Security Issues in The Learning Management Systems (LMS). 13.

2.8 Found Via

Google Scholar search for "e-learning management system public square"

2.8 Summary

This work looks to "shed light" on the security aspect of Learning Management Systems. Researchers showed that there could be security issues with having a centralized database which the LMS uses for its operation. Using blockchain technology, these security issues could be resolved.

2.8 Take Away

It wouldn't be research if you didn't read at least 1 paper about blockchain right? This work highlights security issues around centralizing data collected by a LMS. This is important to consider when building tools. We should keep data safe and secure.

2.9 Paper

Zhang, X., Meng, Y., Ordóñez de Pablos, P., & Sun, Y. (2019). Learning analytics in collaborative learning supported by Slack: From the perspective of engagement. *Computers in Human Behavior*, *92*, 625–633. https://doi.org/10.1016/j.chb.2017.08.012

2.9 Found Via

Google Scholar search, "e-learning management system slack"

2.9 Summary

This work attempts to understand the impact of Slack in a collaborative learning environment. By having group participation take place over slack, group contribution can be measured. Results showed, mutual trust, social impact, reward valence promoted student engagement.

2.9 Take Away

This is evidence of the positive impact Slack can play in an e-learning, collaborative learning environment. Further investigation into this work is required as it is additional research in the very specific area I am proposing I work in for the final project.

2.10 Paper

Azizi, A. R., & Nematollahi, S. (2010). The Impact of Organizational Slack Management on the Relationship Between Organizational Slack and Innovation Performance Through Information Sciences Technology in an Iranian University. 6.

2.10 Found Via

Google Scholar search, "e-learning management system slack"

2.10 Summary

This work aims to understand the impact of an organized Slack has on a competitive environment. The need for organization management is expressed and positively impacts the competitive advantage of an organization.

2.10 Take Away

This work is not directly applicable to Education Technology. However, it shows the impact of having an organized Slack environment. Which then shows the need for having such a tool in a LMS system.

2.11 Paper

Darvishi, S., & Aghaee, N. (n.d.). The use of Slack as a social media in higher education. 45.

2.11 Found Via

Google Scholar search, "e-learning management system slack"

2.11 Summary

This work investigate the use of Slack in higher education. It attempts to understand how student perceive Slack, how interactions are done between student and teachers in Slack, and what benefits Slack provides for students as well as what challenges students face using Slack.

2.11 Take Away

This is another key piece of work that can help paint a picture of what Slack can do in an educational context. This work will help to better understand the role Slack could play in an educational environment.

2.12 Paper

Heryandi, Y., Said, I., & Herlina, R. (2020). Online Teaching in Writing by Means of Slack Application. *Journal of English Education and Teaching*, *4*(1), 49–68. https://doi.org/10.33369/jeet.4.1.49-68

2.12 Found Via

Google Scholar search, "e-learning management system slack"

2.12 Summary

This work investigates the use of a Slack application for teaching English writing. Data was collected via survey's, interviews, and observations. The data showed that Slack was used for 3 main ways, introducing, memorizing, and

giving feedback. The study showed that teachers need to apply online applications as a system to support a teachers duties.

2.12 Take Away

Another positive piece of evidence that Slack can play an effective roll in an educational environment. While this use case is specific to teach a domain, writing, some generalizations can be made that show Slacks effectiveness for being a "public square". Where users get feedback, interact with Teachers, etc.

2.13 Paper

Cook, J., Mabe, R., & Harman, B. (2019). An exploration into the use of the digital platform Slack to support group assessments and feedback and the impact on engagement—Working Paper [Working Paper]. https://dora.dmu.ac.uk/handle/2086/18073

2.13 Found Via

Google Scholar search, "e-learning management system slack"

2.13 Summary

This work begins by highlights 2 of the points of improvement for higher education institutions, Assessment & feedback. This work aims to answer the question, "can Slack facilitate an innovative and collaborative group learning community for mediating and supporting group assessments".

2.13 Take Away

The core research question this work aims to answer is in direct relation to the need of the Slack/Canvas integration. While not stated in the abstract, this work has data around 6 different focus groups around using Slack to support student engagement in group assessments.

2.14 Paper

Owusu-Ansah, S. (2019). S.W.O.T Analysis of E-Learning Platform, Sakai: Users' Perspective. http://ugspace.ug.edu.gh/handle/123456789/34777

2.14 Found Via

Google Scholar search, "e-learning management system slack"

2.14 Summary

This work highlights the strengths, weaknesses, opportunities, and threats of using eLearning platform SAKAI. 274 survey participants were used via random sampling. Results showed "the strengths, weaknesses, opportunities, and threats of SAKAI, have no significant relationship with distance learners". The study concluded with a recommendation of adoption of the platform.

2.14 Take Away

An example of a detailed analysis around the adopting of a e-Learning platform. While this is not Canvas, it shows a need for these platforms.

2.15 Paper

Nizam Ismail, S., Hamid, S., & Chiroma, H. (2019). The utilization of learning analytics to develop student engagement model in learning management system. *Journal of Physics: Conference Series*, *1339*, 012096. https://doi.org/10.1088/1742-6596/1339/1/012096

2.15 Found Via

Google Scholar search, "management system student engagement model"

2.15 Summary

This work attempts to understand the use of participation and engagement metrics with a students success rate. The purpose of this work was to create a students engagement model for a holistic involvement in a LMS.

2.15 Take Away

This work shows that having strong features around student engagement can help teachers and school administrators in understanding a learners progress. Thus these such features should be included in whatever tool is built as part of the Canvas/Slack integration.

3. SYNTHESIS

3.1 Domain Identification & Domain Summary

Through the process of compiling research a domain has been identified. I am keeping it high-level on purpose at this point. That said, the domain will be tool/tools for enabling student engagement in a collaborative environment such teachers and administers can track, assess, and action on student progress. The current specific application in this domain is an integration between Canvas and Slack. More information to follow.

3.2 High Level trends

This domain is not a novel one. While completing the research log over the past 2 weeks some high level trends have emerged. These trends include, tools for augmenting the learning process. A specific example of this is PARQR, a tool developed to reduce the number of duplicate posts on the online forum Piazza (Bilgrien et al., 2019). The use of this tool saw a 40% reduction in the number of duplicate posts. This work is an example of a tool *augmenting* the exits systems such that learning can be done in a more efficient manor.

Another trend was the use of student engagement in the teaching process. Research is ongoing in this domain, specially around the use of Slack to support group assessment and feedback and its impact on engagement (Cook et al., 2019). Existing research suggests Higher Education Institutions have a need to improve how they operationalize student assessment and feedback (Cook et al., 2019). Thus the need to have tools what achieve this are clearly stated.

The last trend is around collaborative learning, and the use of Slack in that environment. Collaborative learning as an educational concept can be addressed in follow up work, specifically around using Slack used as medium to enable collaboration. Existing research shows that mutual trust, social influence, and reward valence have a positive effect in personal success (Zhang et al., 2019). Slack could be the tools together the data to measure these concepts.

3.3 Interests moving forward

Further explore the ways Slack & Canvas could be integrated such to enabled collaboration. This could include creating workspaces for courses, channels for

assignments, advanced data collection techniques such that engagement can be objectively measured.

4. REFLECTION

Initially the synthesizing of the research, and the research itself was difficult. Due to not having a clearly defined idea. Initially, I had thoughts around Intelligent Tutoring Systems, thus research was driven in that direction. However, now the idea is around enabling student engagement in a collaborative learning environment. Which concretely is an integration between Canvas & Slack. With this idea clarified, research became more focused. With this new focus, existing research was found around this specific idea of leveraging Slack as collaborative learning tool. Once this research was found, drove the selection of this idea to be what will be used in the Final Project.

5. PLANNING

The current preliminary plan is to integrate Slack & Canvas. Base features should include creating a workspace in Slack for a Canvas course. For each assignment in canvas, a channel in Slack must be created. In addition, this systems should track a Slack users usage statistics. Which should include, but is not limited to, the number of posts accords all channels, number of private messages, The number of posts per assignment (or channel) . A stretch goal will be to gather the sentiment analysis around assignment such that the teacher or administer can have a sense of how the student are reacting to the assignment. Additional though should be put around more statistics around usage as to assist the teacher and administer to monitor student progression.

To accomplish these goals in the short term. Research will be done around what is required to extract this data from Slack, as well as how to programmatically create a workspace via the Slack API. As well as the information that can be extracted from Canvas in terms of courses, assignments, and modification of the grade-book.

6. ACTIVITY

6.1 Background Information

Canvas is a Learning Management System (LMS) used by Georgia Teach, and others to help manage all the goes into having an online distribution of a course. While Georgia Teach is a Higher Education Institution, the application of Canvas can be used in other industries. For example, a Corporation could use Canvas as a way of management the content required for its employees to learn and grow within their business. Canvas has entities such as courses, assignments, quizzes, grade books, and others. Which are all basic entities needed to administer an online distribution of a course.

Slack is a communication tool used by different industries. Personally I use Slack at my work as a Software Developer. We use it for general company wide announcements, team specific communication, external application notification like our ticket tracking system Jira, private messaging and more. Slack has a rich set of existing integration what augment the experience of collaborating and sharing information. Which make the communication process light, fun, and interactive.

6.2 General Problem Statement

An objective way to measure collaboration & engagement.

6.3 Scholarly Support

Existing research has been done in this area. Specifically around finding learning analytics from the perspective of engagement in collaborative learning (Zhang et al., 2019). Where 181 people were used to analyze the problems around learning in a collaborative environment. Issues around effort assignment in a collaborative environment are discussed. Put a another way, trying to measure the feeling that 1 or more of the people in the group don't actually contribute to a project or discussion. Anyone who has done a group assignment in school has felt some part of this.
Other research has shown a need to develop tools that measure some model of student engagement in a Learning Management System (LMS) (Nizam Ismail et al., 2019). Here, a University attempted to model student engagement using trace data in an effort to objectively measure student engagement.
Having the ability for student to work in a collaborative fashion anywhere, anytime is covered in previous research. Specifically how the affect of student

being isolated causes difficulties in maintaining learning motivation (Songhao et al., 2011). This defines a need such that students/learners can learn from each other without the need of overview (teacher intervention).

6.4 Specific Problem Statement

Objectively measure collaboration & engagement via an integration between a Learning Management System & a social interaction platform.

6.5 Closing Commentary

Society could be affected in a positive way by enabling the learning from others. The concept of Collaborative Learning has been proven in previous work, and is not the goal of this work. The goal of this work is to attempt to objectively measure engagement via integrating Canvas & Slack in a structured fashion. If this integration can be done effectly, having the ability to report metrics around engagement should be a side-affect. The question of actionable insight is one that maybe explored in this work, but is not a prominent goal as I am not an expert in how to assess what is actionable and what is not. This will be left as future work or domain experts such as teachers or school administers.

6.6 Research Question

Can student engagement be objectively measured in a collaborative learning environment?

6.6.1 Decomposed Research Question 1

Can Slack be used as a "public square" where students & teachers work together to facilitate a collaborative learning environment?

6.6.2 Decomposed Research Question 2

Is there meaningful & actionable insights that can be gathered from an organized Slack workspace such that student engagement can objectively be measured?

6.6.3 Decomposed Research Question 3

Is the students overall experience positively affected in a structure/organized Slack workspace?

Justification

Complexity of these question meet the criteria in that they are not yes/no questions. They require multiple levels of sub-problems to be solved, and the impact of these problems would then need to measured. For example, integrating Canvas and Slack needs to be solved. Once that is solved, the collection of the interactions needs to be solved. Once that is done, analysis will need to be completed such that the integration of these 2 systems has a positive impact on the student learning, the teacher teaching, and the administer monitoring student progression.

The attempting to model student engagement is not novel work (Zhang et al., 2019). Part of the complexity of this problem comes from structuring the environment in such a way as to enable proper data collection such engagement metrics can be gathered. Thus a dependency is formed between the environment (Slack), and the model of student engagement.

Layer onto that the concept of actionable insight. Assuming the environment is structured in a way to enable proper data collection. As well as a model for defining student engagement is define. There is still the concept of making that actionable. We may see a student is engaged or not, but what does this system do to empower the teacher to act? Currently, my best though it to attempt to provide the teacher with the insights, aka the data, and allow them to action on it. Possible actions might be, sending private messages, creating automatic reminders for students that are less engaged, etc. Much of this will most likely be pushed off to future work, and require further in investigation via teacher survey's and interviews.

Finally, the complexity of measuring the impact of such a product in a student's learning experience is subjective. Qualitative method would most likely be deployed in the form if user surveys as done in previous work (Muhisn et al., 2019). This will require a built product, with core features implemented. Thus will most likely be pushed to future work once the system has sustained adoption. Steps can be taken in the design of these user surveys as to ensure less subjectivity in the measurement of the impact on to the student as part of the learning process. A concern here is the variance in the way students learn, it may become challenging to develop a tool to meet the needs of all the different

students. The best attempt at solving this problem will be user surveys as part of future work.

It is important to also acknowledge that these research questions must be answered via facts not opinions. Two different methods could be deployed in an attempt to answer these questions with facts. One, qualitative research in the form of teacher, admin, and student surveys. Two, quantitative research in the form of usage static's gathered by the system itself. To do this, basic statistical analysis should be deployed around measuring engagement and impact. Some examples of this could be, average number of messages sent, number of channels where at least 1 message was sent, etc. These metrics could be used in isolation, or could be normalized to the class as to objectively measure one students engagement over another within the same class. Additional statistics should be developed as the project progresses.

In conclusion, attempting to answer these research question is complex in that they can not be answer with a simple yes or no. They have interdependencies on each other. As well as require software to be developed for use and tracking. Even then, assuming everything is in place, the subjectively of gaging user impact is additional complexity. A best attempt of designing a user survey should be deployed.

References

Bilgrien, N., Finkelberg, R., Tailor, C., Irish, I., Murali, G., Mangal, A., Gustafsson, N., Raman, S., Starner, T., & Arriaga, R. (2019). PARQR: Augmenting the Piazza Online Forum to Better Support Degree Seeking Online Masters Students. *ArXiv:1909.02043 [Cs]*. http://arxiv.org/abs/1909.02043

Kraleva, R., Sabani, M., & Kralev, V. (2019). An Analysis of Some Learning Management Systems. *International Journal on Advanced Science, Engineering and Information Technology*, *9*(4), 1190. https://doi.org/10.18517/ijaseit.9.4.9437

Muhisn, Z. A. A., Ahmad, M., Omar, M., & Muhisn, S. A. (2019). The Impact of Socialization on Collaborative Learning Method in E-Learning Management System (eLMS). *International Journal of Emerging Technologies in Learning (IJET)*, *14*(20), 137–148.

Schmitt, U. (2019). Designing decentralized knowledge management systems to effectuate individual and collective generative capacities. *Kybernetes*, *49*(1), 22–46. https://doi.org/10.1108/K-03-2019-0215

Songhao, H., Saito, K., Maeda, T., & Kubo, T. (2011). Evolution from Collaborative Learning to Symbiotic E-Learning: Creation of New E-Learning Environment for Knowledge Society. In *Online Submission* (Vol. 8, Issue 1, pp. 46–53). https://eric.ed.gov/?id=ED519417

El Mhouti, A., Erradi, M., & El Makhfi, N. (2019). A Multi-Agent System of Semantic Analysis and Filtering of Modeled Traces to Calculate Interaction Indicators Favoring Collaboration in LMS. *2019 International Conference on Intelligent Systems and Advanced Computing Sciences (ISACS)*, 1–7. https://doi.org/10.1109/ISACS48493.2019.9068907

Alzain, H. A. (2019). The Role of Social Networks in Supporting Collaborative e-Learning Based on Connectivism Theory among Students of PNU. *Turkish Online Journal of Distance Education*, *20*(2), 46–63. https://doi.org/10.17718/tojde.557736

Khan, M., Naz, T., & Mahmood, K. (2019). Using Blockchain to resolve Database Distribution and Security Issues in The Learning Management Systems (LMS). 13.

Zhang, X., Meng, Y., Ordóñez de Pablos, P., & Sun, Y. (2019). Learning analytics in collaborative learning supported by Slack: From the perspective of engagement. *Computers in Human Behavior*, *92*, 625–633. https://doi.org/10.1016/j.chb.2017.08.012

Azizi, A. R., & Nematollahi, S. (2010). The Impact of Organizational Slack Management on the Relationship Between Organizational Slack and Innovation Performance Through Information Sciences Technology in an Iranian University. 6.

Darvishi, S., & Aghaee, N. (n.d.). The use of Slack as a social media in higher education. 45.

Heryandi, Y., Said, I., & Herlina, R. (2020). Online Teaching in Writing by Means of Slack Application. *Journal of English Education and Teaching*, *4*(1), 49–68. https://doi.org/10.33369/jeet.4.1.49-68

Cook, J., Mabe, R., & Harman, B. (2019). An exploration into the use of the digital platform Slack to support group assessments and feedback and the impact on engagement—Working Paper [Working Paper]. https://dora.dmu.ac.uk/handle/2086/18073

Owusu-Ansah, S. (2019). S.W.O.T Analysis of E-Learning Platform, Sakai: Users' Perspective. http://ugspace.ug.edu.gh/handle/123456789/34777

Nizam Ismail, S., Hamid, S., & Chiroma, H. (2019). The utilization of learning analytics to develop student engagement model in learning management system. *Journal of Physics: Conference Series*, *1339*, 012096. https://doi.org/10.1088/1742-6596/1339/1/012096