

CS6460 Assignment 2

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1 RESEARCH LOG

1.1 Background

Building upon last week's research, I delved deeper into 7 out of the 15 sources from the previous week, conducting more thorough readings beyond just the Abstract, Introduction, and Conclusion sections. I also identified additional papers that align with my research direction, allowing me to refine my study further. My primary progress up to this point includes the following:

- I have determined my focus area: to investigate the impact of curiosity and self-motivation on learning.
- I am exploring the potential of technology to enhance the quality of learning by stimulating curiosity and self-motivation in students.

In this week's exploration, I aim to gain further clarity on the following points:

- Identifying the specific learner group I will study next.
- Determining the phase of the learning process at which technology can be introduced as an independent variable.

If everything goes smoothly and I have enough time, I plan to search existing databases to check if any available data can support my research. However, if not, I will likely begin designing my data collection program.

1.2 Papers

1.2.1 Paper 1 – Peer Reviewed

Wittrock, M. C. (2010). Learning as a Generative Process. *Educational Psychologist*, 45(1), 40–45. <https://doi.org/10.1080/00461520903433554>

This is a paper from a Georgia Tech Library search.

Summary - The paper introduces a comprehensive cognitive model of human learning called the generative model, supported by empirical research spanning cognitive development, human learning, information processing, and aptitude-treatment interactions, offering a unified framework for transferring knowledge and skills across diverse contexts.

Key takeaways - This paper, along with other human learning models (e.g., repetition theory), will help me build the theoretical foundation for my paper. The tables and charts also provide potential support for my qualitative analysis.

1.2.2 Paper 2 – Peer Reviewed

Shanks, D. R. (2010). Learning: From Association to Cognition. *Annual Review of Psychology*, 61(1), 273–301. <https://doi.org/10.1146/annurev.psych.093008.100519>

This is a paper from a Georgia Tech Library search.

Summary - The article delves into the conflict between association-based and cognitive learning theories. Additionally, the article investigates the emerging concepts of noncognitive and unconscious (implicit) learning versus cognitive and explicit learning, scrutinizing the supporting and opposing evidence for these explanatory frameworks.

Key takeaways - Both association-based and cognitive learning theories offer valuable theoretical foundations for investigating the role of Educational Technology in various aspects of human learning. I need to consider further how curiosity and motivation synergize the theories in this article to make my research more convincing.

1.2.3 Paper 3 – Peer Reviewed

Shuell, T. J. (1986). Cognitive conceptions of learning. *Review of Educational Research*, 56(4), 411–436. <https://doi.org/10.3102/00346543056004411>

This is a paper from a Georgia Tech Library search.

Summary - The article underscores the trend toward adopting a cognitive psychology approach to learning, focusing on impact shifts in human performance, knowledge structures, and conceptions. It delves into the differences between behavioural and cognitive learning, particularly emphasizing active learning,

comprehension, the role of prior knowledge, and the cumulative nature of human learning. Qualitative analysis is primarily implemented.

Key takeaways - I am reserving this paper for an in-depth read this week because I would like to see the authors analyze assertions about curiosity and motivation as part of Cognitive conceptions of learning - but the authors do not. Referring to this paper could provide valuable insights when exploring technology's potential applications in on-demand learning scenarios.

1.2.4 Paper 4 – Peer Reviewed

Gobet, F., Lane, P. C. R., Croker, S., Cheng, P. C.-H., Jones, G., Oliver, I., & Pine, J. M. (2001). Chunking mechanisms in human learning. *Trends in Cognitive Sciences*, 5(6), 236–243. [https://doi.org/10.1016/S1364-6613\(00\)01662-4](https://doi.org/10.1016/S1364-6613(00)01662-4)

This is a paper from a Georgia Tech Library search.

Summary - This article has provided an overview of chunking mechanisms in human learning, focusing on the EPAM/CHREST family of computational models and their practical uses. Two main categories of chunking, goal-oriented and perceptual, have been delineated.

Key takeaways - It may be helpful to draw on this paper when considering where technology can be useful for drop-in learning. I will not continue to read this paper next week because it seems irrelevant to the topic I wish to research. However, it is essential to understand Chunking mechanisms in human learning.

1.2.5 Paper 5 – Peer Reviewed

Sweller, J. (2020). Cognitive load theory and educational technology. *Educational Technology Research and Development*, 68(1), 1–16. <https://doi.org/10.1007/s11423-019-09701-3>

This is a paper from a Georgia Tech Library search.

Summary - This paper uses qualitative analysis to discuss the relationship between Cognitive load theory and educational technology. Although the article argues that Cognitive load theory applies to technology-assisted learning, it does not discuss the relationship between Intrinsic motivation, curiosity and learning.

Key takeaways - I will not continue to read this paper next week because it does not seem very relevant to the topic I wish to research, nor does it lack concrete data to support its findings. However, it is crucial to understand Cognitive load theory for educators and students. It may be helpful to draw on this paper when considering where technology can be useful for drop-in learning.

1.2.6 Paper 6 – Peer Reviewed

Oudeyer, P.-Y., Gottlieb, J., & Lopes, M. (2016). Intrinsic motivation, curiosity, and learning: Theory and applications in educational technologies. *Progress in Brain Research*, 229, 257–284. <https://doi.org/10.1016/bs.pbr.2016.05.005>

This is a paper from a Georgia Tech Library search.

Summary - This paper explores possible future directions for Education Technology by looking at advances in Intrinsic motivation, curiosity and learning in psychology, neuroscience and computational learning theory. The author lists several charts that support the current theory but does not use the data they collected.

Key takeaways - The learning progress (LP) hypothesis and mechanisms of curiosity in this paper provide helpful insight for my research to understand further how curiosity works for learning. Also, many of the article's references are relevant to the topic I want to research, providing me with a good source for next week's investigation.

1.2.7 Paper 7 – Peer Reviewed

Yeung, K. L., Carpenter, S. K., & Corral, D. (2021). A Comprehensive Review of Educational Technology on Objective Learning Outcomes in Academic Contexts. *Educational Psychology Review*, 33(4), 1583–1630. <https://doi.org/10.1007/s10648-020-09592-4>

This is a paper from a Georgia Tech Library search.

Summary - This paper discusses the impact of different forms of technology on student learning outcomes by presenting the numeric results of a comparative experiment including video-based instruction, online courses, computer-assisted instruction, mobile devices, simulations, animations, games and flipped classrooms. The authors conclude that technology is neutral for learning when

presenting information but can be beneficial when it offers unique affordances that leverage practical learning principles.

Key takeaways – Specific comparative experiments provided solid data to support my research. I think I can further synthesize the findings in this article and apply them in my paper.

1.2.8 Paper 8 – Peer Reviewed

Orcutt, J. M., & Dringus, L. P. (2017). Beyond Being There: Practices that Establish Presence, Engage Students and Influence Intellectual Curiosity in a Structured Online Learning Environment. *Online Learning (Newburyport, Mass.)*, 21(3), 15–. <https://doi.org/10.24059/olj.v%vi%i.1231>

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - The study explores how instructors establish teaching presence and its impact on the intellectual climate of online classrooms using the Community of Inquiry (CoI) model. It finds that instructors who demonstrate active interest, passion for teaching, and an ability to connect course topics to students' interests and responsibilities are likelier to engage students, inspire curiosity, and create authentic relationships, ultimately fostering a positive online learning environment.

Key takeaways – Leveraging technology in online learning should go together with creating an inclusive and equitable online environment that promotes collaborative interaction, critical thinking, and knowledge sharing among students, ultimately leading to better learning outcomes.

1.2.9 Paper 9 – Peer Reviewed

Ha, Y., & Im, H. (2020). The Role of an Interactive Visual Learning Tool and Its Personalizability in Online Learning: Flow Experience. *Online Learning (Newburyport, Mass.)*, 24(1), 205–. <https://doi.org/10.24059/olj.v24i1.1620>

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - This study investigated the impact of interactive online learning tools on college students' learning experiences, guided by the “Flow” concept. The study examined how dynamic visual learning affected students' experience, test performance, and perceived value of the activity. Additionally, the study

explored how the personalizability of difficulty levels in online activities influenced students' enjoyment and satisfaction.

Key takeaways - The study highlights the positive impact of interactive online learning tools on student learning, including increased attention, curiosity, and interest in the activities. Additionally, the study suggests that personalizability of difficulty levels can boost students' enjoyment and satisfaction, underscoring the potential of customization in fostering curiosity and engagement in learning.

1.2.10 Paper 10 – Peer Reviewed

Karcher, E. L., Koltes, D., Wenner, B., & Wells, J. (2022). Sparking curiosity and engagement through an online curriculum. *Poultry Science*, 101(2), 101577–101577. <https://doi.org/10.1016/j.psj.2021.101577>

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - Responding to the sudden shift to remote learning during the COVID-19 pandemic, instructors faced the challenge of engaging students, particularly in hands-on learning courses. The article highlights the importance of strategies like live demonstrations, polls, and collaborative projects to engage students in the virtual environment. The experiences during the pandemic may shape the future of higher Education.

Key takeaways – This paper documents the attempt to overcome the challenges brought by online Education, providing an informative entry point for me in exploring at what stage of human learning technology can be helpful.

1.2.11 Paper 11 – Peer Reviewed

Murayama, K., FitzGibbon, L., & Sakaki, M. (2019). Process Account of Curiosity and Interest: A Reward-Learning Perspective. *Educational Psychology Review*, 31(4), 875–895. <https://doi.org/10.1007/s10648-019-09499-9>

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - This paper addresses the challenge of defining curiosity and interest, proposing that these concepts are inherently subjective and not meant to have predefined scientific definitions. Instead, it introduces a reward-learning framework for autonomous knowledge acquisition, emphasizing the importance of a process-oriented approach.

Key takeaways – This article provides another perspective on evaluating and quantifying human curiosity and interest, which can be a great addition to my research. By focusing on the knowledge-acquisition process rather than precisely defining curiosity and interest, the framework aims to facilitate interdisciplinary discussions and unify research in these areas, offering insights into how these constructs relate to the learning process.

1.2.12 Paper 12 – Peer Reviewed

Huang, Y.-C., Backman, S. J., Backman, K. F., McGuire, F. A., & Moore, D. (2019). An investigation of motivation and experience in virtual learning environments: a self-determination theory. *Education and Information Technologies*, 24(1), 591–611. <https://doi.org/10.1007/s10639-018-9784-5>

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - This study explores the potential of virtual reality technology in Education and professional training, using Self-Determination Theory (SDT) and hedonic theory. It highlights the importance of psychological needs and hedonic experiences in virtual reality interactions, emphasizing their role in enhancing learner motivation and overall learning experiences.

Key takeaways - The findings from this paper suggest that incorporating interactive, emotionally engaging, and culturally relevant elements in virtual learning environments can contribute to more effective Education and training, providing me with a variety of possibilities on how technology can help in Education.

1.2.13 Paper 13 – Peer Reviewed

Vallerand, R. J. (1997). Toward A Hierarchical Model of Intrinsic and Extrinsic Motivation. *Advances in Experimental Social Psychology*, 29, 271–360. [https://doi.org/10.1016/S0065-2601\(08\)60019-2](https://doi.org/10.1016/S0065-2601(08)60019-2)

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - The article introduces a hierarchical model of intrinsic and extrinsic motivation: 1. It offers a framework for organizing research on motivations and understanding the psychological mechanisms behind motivational changes; 2. It generates new hypotheses and highlights areas for future research, emphasizing the model's potential to integrate existing literature.

Key takeaways – This paper helps me understand the psychological mechanisms behind motivational changes and ponder how to map this mechanism to the human learning process. Additionally, this is an excellent overview for me to learn about intrinsic and extrinsic motivation.

1.2.14 Paper 14 – Peer Reviewed

Litman, J., Hutchins, T., & Russon, R. (2005). Epistemic curiosity, feeling-of-knowing, and exploratory behaviour. *Cognition and Emotion*, 19(4), 559–582. <https://doi.org/10.1080/02699930441000427>

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - This study explored how knowledge gaps, as measured by feelings-of-knowing (FOK), and individual differences in epistemic curiosity impact university students' state curiosity and exploratory behaviour. The findings revealed that the level of curiosity and exploration was highest in "TOT" (tip-of-the-tongue) states, followed by "Do not Know" states and was lowest in "I Know" states, indicating that smaller perceived knowledge gaps were associated with more curiosity and exploration.

Key takeaways – I can use the findings as references in my research to improve student's learning outcomes – Can software help adjust students' curiosity to a certain level so they would learn better?

1.2.15 Paper 15 – Peer Reviewed

Kashdan, T. B., Rose, P., & Fincham, F. D. (2004). Curiosity and Exploration: Facilitating Positive Subjective Experiences and Personal Growth Opportunities. *Journal of Personality Assessment*, 82(3), 291–305. https://doi.org/10.1207/s15327752jpa8203_05

This is a search result from ChatGPT, verified in the Georgia Tech Library.

Summary - This article presents a theoretical model of curiosity, defining it as a positive emotional-motivational system related to seeking novelty and challenge. The authors introduce the Curiosity and Exploration Inventory (CEI), a measurement tool comprising two dimensions: exploration (desire for novelty and challenge) and absorption (full engagement in specific activities). They argue that understanding curiosity's role can benefit various research fields.

Key takeaways – Since the authors claim that they can use CEI to explore its impact on individual differences, skill acquisition, goal perseverance, and positive subjective experiences, I can leverage the CEI as a measurement tool to analyze the data in my research.

1.3 Synthesis

The papers reviewed cover various aspects of human learning and the role of technology in Education, focusing on human cognition and curiosity perspectives. Key trends and takeaways include the importance of cognitive models such as the generative model (Paper 1) and the conflict between association-based and cognitive learning theories (Paper 2) in building a theoretical foundation for research. Papers 7 and 8 emphasize the impact of technology on learning outcomes and the need for creating an inclusive online learning environment to foster curiosity and engagement. The concept of chunking mechanisms (Paper 4) offers insights into how technology can aid in drop-in learning scenarios. At the same time, Paper 9 highlights the positive impact of interactive online learning tools on student curiosity and engagement. Papers 11 and 15 introduce frameworks for understanding curiosity and interest, which can be valuable in studying how technology influences these constructs in the learning process. Finally, Paper 13 delves into intrinsic and extrinsic motivation, providing insights into the psychological mechanisms behind motivational changes and their connection to learning (Paper 13).

Open questions that arise from these trends can be extracted as follows:

- What strategies and technologies can be employed in online learning to create an inclusive and equitable environment that fosters curiosity, engagement, and positive learning outcomes, as highlighted in Papers 7 and 8?
- How can the concepts of curiosity and interest, as discussed in Papers 11 and 15, be quantified and leveraged through technology to optimize individualized learning experiences and skill acquisition, goal perseverance, and overall positive experiences in educational settings?

To conduct my future research, I have identified the graduate students as the target learner group to study and collect data from. Although this will create some limitations for my research, graduate students from Georgia Tech are the most accessible and reliable research subjects, which is crucial to finishing a one-semester research project. In addition, I will focus my research on how curiosity and internal motivation contribute to initiating learning behaviours before they begin. Although many theories explain the process of learning behaviour once it begins, these theories are not unified, and to avoid theoretical conflicts and misunderstandings, the pre-learning stage is an excellent place to start.

1.4 Reflection

In this week's resource-finding process, I first sifted through last week's research logs to find seven papers that were more specific to my current research direction and then used ChatGPT to help me list more papers that might interest me. However, the knowledge of ChatGPT is limited to the period before September 2021, and only some sources provided by ChatGPT are reliable. Therefore, I further Googled or checked on the GT digital Library to verify each item on the reading list provided by ChatGPT to identify more articles to read for this week.

For the papers I read last week, I focus on and understand the data and related analysis provided; for the new paper, I start with the Abstract, Introduction and Conclusion to understand the content. During this process, I thought it would be a challenge to find existing data to support my future research, although I have found myself more comfortable finding resources this week.

For my upcoming research, I have chosen to gather data from graduate students as my target learner group. While this decision comes with some limitations, it is essential for the feasibility of a one-semester research project. Moreover, my research will examine the roles of curiosity and internal motivation in initiating learning behaviours before they commence.

1.5 Planning

For next week, I would like to go further with my research to:

- Sift through the week's research logs for more detailed reading of papers that align with my research topic and look for more potentially relevant resources.

- GT Digital Library and Kaggle would be good starting points for searching for valuable data from existing databases.
- Begin to integrate content from Assignments 1 and 2 and begin to frame out qualifier questions.

Also, the Introduction section of the final project is ready to start being drafted. In combing through this section, I can find the missing logic chain and fill it in for the following research stage.

2 ACTIVITY

The relationship between online Education and equitable access is intricately tied to students' socioeconomic status. In the current context, we can roughly distinguish different socioeconomic statuses based on internet access and necessary study tools - minimum hardware is required to receive online Education. Within comparable socioeconomic strata, online Education exerts an equalizing influence. However, it is imperative to recognize that online Education widens disparities between distinct socioeconomic groups, exacerbating the educational divide among students of varying economic backgrounds. I will argue my above argument in the following two paragraphs by citing some peer-reviewed papers that I found helpful.

Similar socioeconomic status means students in this cluster have similar educational conditions, including internet access and necessary learning tools. Before the popularization of online Education, students' academic performance in similar socioeconomic strata largely depended on differences in physical educational resources and information gaps. Although I think these differences still exist nowadays, online Education and Internet access allow students to study any subject they are interested in - they need to search for keywords online! On the other hand, physical schools are no longer the only access to knowledge; students no longer need to go to school to learn, but they can also access the same learning resources via the internet in different parts of the planet. Some research indicates that implementing Intelligent Learning Object (ILO) systems could potentially enhance students' learning as these systems improve in sophistication, user-friendliness, and cost-effectiveness, offering the possibility of reallocating faculty resources to benefit students through modes like directed study (Bowen et al., 2014). Online/hybrid learning was promoted to enhance accessibility for a

diverse range of students, including those who are working, mature, Indigenous, economically disadvantaged, have disabilities or learning differences, are English language learners, or reside in rural or remote areas (Ikebuchi, 2023). Online and hybrid learning, which provides flexibility and choice, is advantageous due to students' diverse backgrounds and needs (Ikebuchi, 2023). From these perspectives, online Education and MOOCs can be praised for equalizing access to Education and helping students learn more efficiently, but this all relies on the availability of internet access and primary learning conditions.

Moreover, what does online Education mean for students who need internet access and basic learning settings? Firstly, without the internet, there is no online education. Students' access to knowledge is still through the traditional school system, meaning they cannot use the internet to support or extend their learning. Secondly, even if they have internet coverage in their area, they still cannot learn online without computers or routers - the purchase of which requires financial and physical resources in their communities. Some research found that the internet divide persists among households with school-aged children. Black and Hispanic families are less likely to have reliable access to digital devices and the internet than White and Asian households. This disparity is exacerbated by income levels and the language spoken at home.

In contrast, undergraduates, particularly Hispanic students and those with low income face barriers to equitable access, such as inconsistent physical resources and frequent internet issues (Tate & Warschauer, 2022). Thus, online Education is of little help to groups of students of lower socioeconomic status, while it supports students of higher socioeconomic strata to learn better and faster. Differing access to online learning, particularly when it becomes the primary mode of Education, contributes to stratification or inclusion that is in part reflected in student attendance and achievement outcomes (Tate & Warschauer, 2022). In this case, online Education increases the gap in students' learning outcomes in different socioeconomic classes. This difference can accumulate at different stages of a student's life and learning, creating an even more significant information gap and solidifying socioeconomic class. Thus, online Education has yet to contribute to equalizing Education as expected.

In conclusion, the intricate relationship between online Education and equitable access underscores the pivotal role played by students' socioeconomic status.

Equitable learning occurs when every learner belongs, contributes, and thrives, regardless of race/ethnicity or socioeconomic status (Tate & Warschauer, 2022). For those without Internet access, online Education remains an elusive realm. Therefore, the digital divide intensifies as online Education favours students from higher socioeconomic backgrounds, fostering disparities in student learning and perpetuating socioeconomic stratification. As a result, our vision of promoting equity in Education through online Education still needs to be fulfilled.

It is crucial to avoid extreme positions and recognize that while some claims about online learning may be exaggerated, it does not necessarily lead to inferior learning outcomes or student risk (Bowen et al., 2014). Comprehensive interventions are needed to bridge this divide and ensure students have equal rights to Education in an increasingly digitalized world. Interactive online systems offer a chance to address educational costs responsibly and explore innovative solutions to contemporary educational challenges (Bowen et al., 2014).

2.1 References

1. Tate, T., & Warschauer, M. (2022). Equity in online learning. *Educational Psychologist*, 57(3), 192–206. <https://doi.org/10.1080/00461520.2022.2062597>
2. Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2014). Interactive Learning Online at Public Universities: Evidence from a Six-Campus Randomized Trial. *Journal of Policy Analysis and Management*, 33(1), 94–111. <https://doi.org/10.1002/pam.21728>
3. Ikebuchi, S. (2023). Accessing Education: Equity, Diversity, and Inclusion in Online Learning. *Canadian Journal of Learning and Technology*, 49(1), 1–20. <https://doi.org/10.21432/cjlt28349>